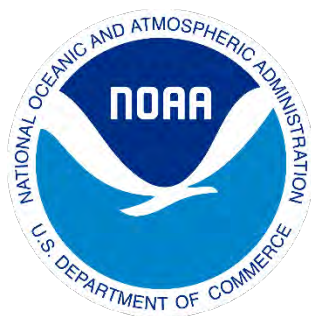


Draft Environmental Impact Statement and Regulatory Impact Review

**Proposed Amendment to the
Fishery Management Plan for Groundfish of the
Bering Sea/Aleutian Islands Management Area**

Bering Sea Chum Salmon Bycatch Management

September 2025



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, AK 99802-1668

September 12, 2025

Dear Reviewer:

In accordance with the National Environmental Policy Act (NEPA), we enclose for your review the National Oceanic and Atmospheric Administration's (NOAA) *Draft Environmental Impact Statement and Regulatory Impact Review for a Proposed Amendment to the Fishery Management Plan for Groundfish of the Bering Sea/Aleutian Islands Management Area - Bering Sea Chum Salmon Bycatch Management*.

This DEIS is prepared pursuant to NEPA, NOAA procedures (NOAA Administrative Order 216-6A and Companion Manual for NAO 216-6A) and related Executive Orders to assess the environmental impacts associated with alternative management measures for reducing chum salmon bycatch in the Bering Sea pollock fishery. The purpose of this proposed action is to minimize bycatch of Western Alaska origin chum salmon in the Bering Sea pollock fishery, consistent with the Magnuson-Stevens Act, National Standards, and other applicable law.

This document is available on NOAA Fisheries Alaska Region's website at: <https://www.fisheries.noaa.gov/resource/document/draft-environmental-impact-statement-and-regulatory-impact-review-proposed>

NOAA Fisheries will be accepting public comments on this DEIS from the date of publication until **January 5, 2026**. Due to the short time between this deadline for public comments and the North Pacific Fishery Management Council's February 2026 meeting, at which the Council expects to recommend a preferred alternative, an extension of the public comment period is unlikely, as it could impact the timing of subsequent rulemaking and implementation. Nonetheless, please check the Alaska Region's website noted above for updates on the comment period start and close dates.

Written comments on the DEIS should be directed to the responsible official identified below by the end of the comment period. Written comments may be submitted by U.S. Mail to the address below, or electronically through the www.regulations.gov portal by entering NOAA-NMFS-2023-0089 in the search box.

Responsible Official:

Jonathan M. Kurland
Regional Administrator, Alaska Region
National Oceanic and Atmospheric Administration
P.O. Box 21668
Juneau, AK 99802-1668

Sincerely,

Jonathan M. Kurland
Regional Administrator



**Draft Environmental Impact Statement and Regulatory Impact Review
for a Proposed Amendment
to the Fishery Management Plan for Groundfish of the Bering Sea/Aleutian
Islands Management Area**

Bering Sea Chum Salmon Bycatch Management

September 2025

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Kuskokwim River Inter-Tribal Fish Commission

Tanana Chiefs Conference

Abstract: This Draft Environmental Impact Statement and Regulatory Impact Review analyzes proposed management measures to minimize chum salmon (*Oncorhynchus keta*) bycatch in the Bering Sea pollock (*Gadus chalcogrammus*) fishery. The purpose of this action is to minimize chum salmon bycatch in the Bering Sea pollock fishery, with a particular focus on chum salmon of Western Alaska origin, consistent with the Magnuson-Stevens Fishery Conservation and Management Act, its National Standards, and other applicable law. The management measures being considered include limits or “caps” on the number of chum salmon that may be caught in the pollock fishery and closure of all or part of the Bering Sea to pollock fishing once the limit is reached. This document addresses the requirements of the Magnuson-Stevens Fishery Conservation and Management Act, National Environmental Policy Act, Executive Order 12866, and other applicable Federal law.

PUBLIC COMMENTS DUE: JANUARY 5, 2026

For definition of acronyms and abbreviations, see online list: <https://www.npfmc.org/library/acronyms>

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Executive Summary

This executive summary outlines the Bering Sea chum salmon bycatch Draft Environmental Impact Statement (DEIS) and Regulatory Impact Review (RIR), which provides an evaluation of the potential environmental, economic, and social impacts of alternative management measures to minimize non-Chinook salmon prohibited species catch (PSC)¹ in the Bering Sea pollock (*Gadus chalcogrammus*) fishery.² “Non-Chinook” is a category in the National Marine Fisheries Service’s (NMFS) Catch Accounting System (CAS) that includes chum salmon (*Oncorhynchus keta*, *kangitneq*, *iqalluk*, *srughot’aye*, *dog salmon*)³, sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and pink salmon (*O. gorbuscha*). Over 99% of the salmon bycatch in the non-Chinook catch accounting category are chum salmon (Table 5-2). For this reason and ease of the reader, the DEIS primarily uses “chum salmon” in reference to the non-Chinook salmon category.

The proposed alternatives would amend the Fishery Management Plan (FMP) for the Groundfish of the Bering Sea and Aleutian Islands (BSAI) Management Area and Federal regulations to establish new measures to minimize chum salmon bycatch in the Bering Sea pollock fishery, consistent with National Standard 9 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA or Magnuson-Stevens Act) and all other National Standards. The Magnuson-Stevens Act is the primary law governing Federal marine fisheries management.

Management of marine fishery resources within the nation’s Exclusive Economic Zone (EEZ) in Federal waters 3 to 200 nautical miles from shore is vested in the Secretary of Commerce (Secretary) and eight Regional Fishery Management Councils. In the Alaska Region, the North Pacific Fishery Management Council (Council) is responsible for preparing FMPs and FMP amendments, such as the one being considered in this DEIS for chum salmon bycatch management. The Council is not a Federal agency but submits its fishery management and conservation recommendations to the Secretary. If the recommendations are approved by the Secretary, NMFS is the Federal agency charged with carrying out the mandates of the Department of Commerce.

NMFS is the lead Federal agency preparing this DEIS. Three tribal and state entities are participating as cooperating agencies under 42 U.S.C. 4336a(a)(3) and 4336e(2). The cooperating agencies include the Alaska Department of Fish and Game (ADF&G), Kuskokwim River Inter-Tribal Fish Commission (KRITFC), and the Tanana Chiefs Conference (TCC).

Bering Sea Pollock Fishery

The proposed action is focused on the Bering Sea pollock fishery because it catches approximately 99% of the chum salmon bycatch caught in all BSAI groundfish fisheries (Table 2-1). Participants in this fishery would be directly regulated by the proposed regulatory changes. The Bering Sea pollock fishery is the largest U.S. fishery by volume. The 2024 and 2025 Bering Sea subarea total allowable catch (TAC)

¹ The Magnuson-Stevens Fishery Conservation and Management Act defines “bycatch” as fish which are harvested in a fishery but are not sold or kept for personal use including regulatory and economic discards. Certain species are designated as “prohibited species” in the Bering Sea Aleutian Island (BSAI) Groundfish Fishery Management Plan (FMP) because they are the target of other, fully utilized domestic species and include Pacific halibut, Pacific herring, Pacific salmon, steelhead trout, king crab, and Tanner crab. While bycatch is therefore a broader term, in this document both bycatch and prohibited species catch are used to refer to the catch of chum salmon in the pollock fishery.

² Although this is a combined draft environmental impact statement and regulatory impact review, collectively it shall be referred to in this document as the “DEIS”.

³ Traditional names for chum salmon in the Yukon and Kuskokwim regions include iqalleq (Central Yup’ik), nalay (Deg Xinag and Holikachuk), srughot’aye (Upper Kuskokwim Athabascan), nulaga (Koyukon), nuleghi (Middle Tanana), and khii (Gwich’in). These names were shared by the Kuskokwim River Inter-Tribal Fish Commission and Tanana Chiefs Conference. Additional traditional names for chum salmon can be found in Appendix 8 and Appendix 9, independently authored by these entities. More information on Alaska Native languages outside these regions is available at the [Alaska Native Knowledge Network](#) and the [Alaska Public Interest Research Group’s Alaska Native Language Translation Protocols](#).

was set at 1.30 million and 1.375 million metric tons (mt), respectively. The TAC is set annually and allocated among four different sectors.

Annually, the Community Development Quota (CDQ) Program first receives 10% of the pollock TAC. After the CDQ allocation is subtracted, the NMFS Regional Administrator determines an amount to be further subtracted for the incidental catch of pollock in other groundfish fisheries. This amount is typically around 4% of the TAC. The “directed fishing allowance” is the remaining amount of pollock, and it is allocated to the inshore catcher vessel (CV) sector (50%), the catcher processor (CP) sector (40%), and the mothership sector (10%). The Bering Sea pollock TAC is further initially apportioned among two fishing seasons – 45% to the A season (January 20 to June 10) and 55% to the B season (June 10 to November 1).

The pollock industry is organized under fishing cooperatives. A purpose of the cooperatives is to further subdivide each sector’s pollock allocation among member vessels through private contractual agreements. The cooperatives manage their pollock allocations to ensure individual vessels and companies do not harvest more than their quota, facilitate transfers of quota among members, and enforce contract provisions. Five inshore sector cooperatives are currently active, as are two cooperatives for the CP sector and one cooperative for the mothership sector.

Salmon Bycatch in the Bering Sea Pollock Fishery

Salmon sometimes commingle in the same times, locations, and depths as pollock and are caught as bycatch in the Bering Sea pollock fishery. Of the five species of Pacific salmon found in Alaska’s waters, Chinook salmon and chum salmon are most often encountered in the pollock fishery. NMFS manages all species of salmon as prohibited species in the BSAI groundfish fisheries, which means they must be avoided because they are not the target species and are fully allocated for other uses, including subsistence, commercial, and recreational salmon fisheries in and off Alaska and Canada. NMFS-certified observers are on board pollock vessels or stationed at shore-based processing plants accepting Bering Sea pollock deliveries. After an observer has identified the species of salmon, counted it, and collected any scientific data or biological samples, the salmon must be either discarded or donated to the Prohibited Species Donation Program (see 50 CFR 679.21(a)(2)(ii)).

While the proposed action aims to minimize chum salmon bycatch to the extent practicable, there are several management measures currently in place to reduce salmon bycatch in the Bering Sea pollock fishery. At present, chum salmon bycatch is primarily managed under a Rolling Hotspot Program (RHS) for chum salmon avoidance. The RHS program issues dynamic time/area closures based upon weekly catch and bycatch data. Discrete areas on the pollock fishing grounds with high chum salmon encounters are closed typically for 3 to 7 days at a time. The RHS program for chum salmon operates in the B season pollock fishery, which is when the fleet encounters chum salmon (Figure 1-1).

The RHS program is managed under incentive plan agreements (IPAs) and a third-party entity, Sea State, Inc., identifies and issues the hot spot closure areas. The IPAs are legally binding civil contracts that establish incentives and penalties for entities governed by the contract to avoid salmon while pollock fishing. Three IPAs were originally implemented in 2010 as part of the Chinook bycatch program. They include the Catcher Processor IPA, Inshore Salmon Savings Incentive Program (Inshore SSIP), and Mothership Salmon Savings Incentive Program (MSSIP). Federal regulations currently specify 13 provisions that must be addressed in the IPAs (see 50 CFR 679.21(f)(12)(iii)(E)).

Chinook salmon bycatch is managed under a PSC limit which the CDQ groups and AFA cooperatives are prohibited from exceeding. This is referred to as a “hard cap” because fishing cannot continue once the PSC limit is exceeded. The Chinook salmon hard cap is divided among the A and B seasons and apportioned among the four pollock sectors previously mentioned. There are two annual hard caps of 60,000 and 47,591 Chinook salmon initially apportioned among the sectors. The higher cap applies to a sector if there is at least one IPA in place and the sector has not exceeded its apportionment of the lower

hard cap (performance standard) in any 3 of 7 years. Once a sector exceeds the lower cap in 3 of 7 years, the sector would be required to operate under the lower hard cap in the future (see 50 CFR 679.21(f)(2)). The hard cap amounts decrease in times of low Western Alaska Chinook salmon abundance to 45,000 and 33,318 Chinook salmon respectively.

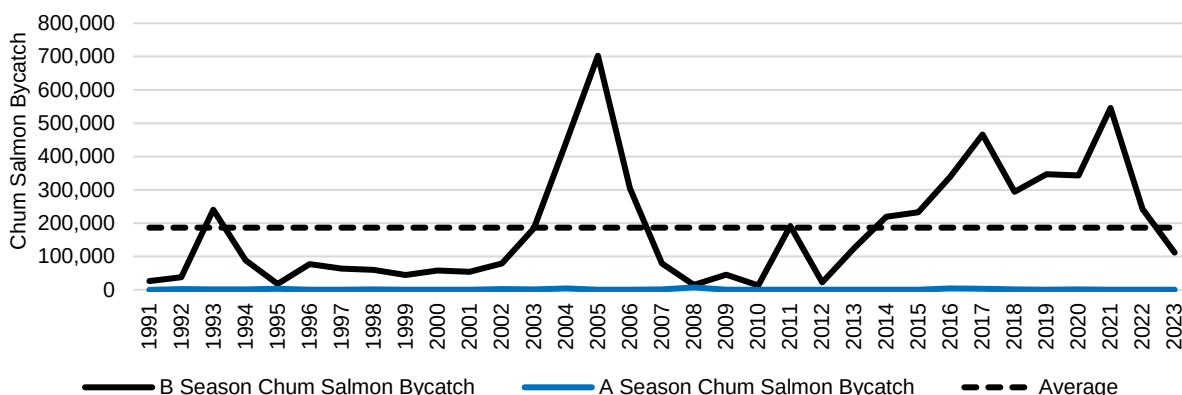


Figure 1-1 Chum salmon bycatch in the Bering Sea pollock fishery for the A season (blue), B season chum salmon bycatch (black), and the annual average level of bycatch (dashed), 1991–2023

Source: NMFS Alaska Region CAS, data compiled by AFKIN.

Purpose of the Proposed Action

As recognized in the Council’s purpose and need statement, salmon are an important fishery resource throughout Alaska, and chum salmon that rear in the Bering Sea support subsistence, commercial, sport, and recreational fisheries throughout Western and Interior Alaska. Western and Interior Alaska salmon stocks are undergoing extreme crises and collapses, with long-running stock problems and consecutive years failures to achieve escapement goals, U.S.-Canada fish passage treaty requirements, and subsistence harvest needs in the Yukon, Kuskokwim, and Norton Sound regions. From 2020 through 2023, and depending on the year, the Yukon River summer chum salmon run fell 63% to 94% below average and the Yukon River fall chum salmon run fell 74% to 90% below average. Chum salmon abundance in the Kuskokwim area was 16% to 94% below average, and 44% to 83% in the Norton Sound region during the same period (see Section 3.3.3.1 and Figure 3-11). These declines have created adverse impacts to culture and food security and have resulted in reduced access to traditional foods and commercial salmon fisheries.

The Council’s purpose and need statement states that the best available science suggests that ecosystem changes and increasing temperatures are the leading causes of recent chum salmon run failures. In this DEIS, “WAK chum salmon” refers to Western Alaska populations from Kotzebue Sound in the north, south through Bristol Bay, and across the range of the Yukon River. Chum salmon originating from Western Alaska river systems spend their first summer in the Bering Sea as juveniles and then migrate to the Gulf of Alaska in late fall for their first winter at sea. These fish spend 1 to 6 more years migrating between the Bering Sea (summer) and Gulf of Alaska (winter) (Myers et al., 2009). In 2016 and 2019, WAK chum salmon were subject to heat waves in these marine habitats, which shifted the food web and altered chum salmon diets (von Biela et al., 2019). Juvenile chum salmon were observed to consume less diverse and nutritious foods and exhibited significantly lower energy density (stored energy), presumably because of dietary changes and higher metabolisms associated with warmer ocean conditions. WAK chum salmon that rear in the Bering Sea had not acquired enough energy stores (fat) prior to their migration and over-wintering in the Gulf of Alaska in the recent warm years, and juvenile salmon abundance has been linked with adult returns (Farley et al., 2024).

In addition to being directly harvested in coastal fisheries in the Gulf of Alaska and Bering Sea, WAK chum salmon are also caught as bycatch in the Bering Sea pollock fishery, all of which reduces the

number of salmon returning to Western and Interior Alaska rivers and fisheries. The chum salmon caught as bycatch in the Bering Sea pollock fishery originate from river systems across the North Pacific. The genetic make-up of the pollock fishery's bycatch varies each year, but approximately 19% of the fishery's total bycatch originated from WAK river systems from 2011 to 2023 (see also Table 3-28). Figure 1-2 provides a snapshot of the genetic stock composition for the 2023 B season, when the total bycatch was 111,852 chum salmon and approximately 11% (~11,490 fish) originated from WAK rivers. Genetic stock composition estimates of chum salmon harvested in other coastal commercial fisheries can be found in Munro et al. (2012) and Dann et al. (2023).

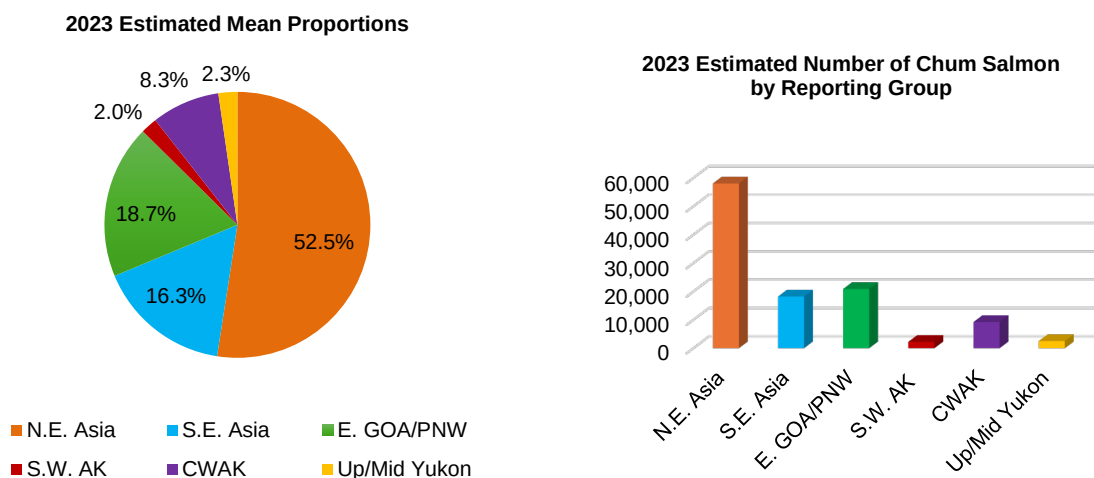


Figure 1-2 Genetic stock composition estimates (left) and the estimated number of chum salmon taken as bycatch (right) from each reporting group for the 2023 pollock B season. For the figures, chum salmon bycatch proportions and numbers have not been adjusted to adult equivalents. Chum salmon in the CWAK and Up/Mid Yukon reporting groups are WAK chum salmon.

In light of the critical importance of chum salmon to Western Alaska communities and ecosystems, the proposed action considers additional measures to minimize WAK chum salmon bycatch in the pollock fishery. **The purpose of this proposed action is to minimize bycatch of WAK chum salmon in the Bering Sea pollock fishery, consistent with the Magnuson-Stevens Act, its National Standards, and other applicable law.**

The Council intends to consider establishing additional regulatory non-Chinook bycatch management measures that reduce WAK chum salmon bycatch; provide additional opportunities for the pollock trawl fleet to improve performance in avoiding non-Chinook salmon while maintaining the priority of the objectives of the amendment 91 and amendment 110 Chinook salmon bycatch avoidance program; meet and balance the requirements of the Magnuson-Stevens Act, particularly to minimize salmon bycatch to the extent practicable under National Standard 9; include the best scientific information available including Local Knowledge and Traditional Knowledge as required by National Standard 2; take into account the importance of fishery resources to fishing communities including those that are dependent on Bering Sea pollock and subsistence salmon fisheries as required under National Standard 8; and to achieve optimum yield in the BSAI groundfish fisheries on a continuing basis, as required under National Standard 1.

Alternatives

The Council and NMFS have taken an iterative approach to developing the purpose and need statement for the proposed action, as well as the range of alternatives considered to meet its specified objectives, beginning with a Salmon Bycatch Committee in 2022 (see Section 2.1). This Committee was composed of representatives of the Bering Sea pollock industry, as well as communities and Tribes across Western

and Interior Alaska, to develop and recommend a purpose and need statement and alternatives for the Council’s consideration. The proposed alternatives were most recently modified in February 2025. These changes included modification of the inseason corridor in Alternative 5 and the addition of an apportionment suboption for a CDQ Reserve Pool under Alternatives 2, 3 and 5, as described below.

Alternative 1: No Action

A “No Action” alternative is required in an environmental impact statement (EIS) and represents the baseline against which the impacts of the action alternatives are compared. The No Action alternative, also referred to as Alternative 1, would maintain all aspects of the current chum salmon bycatch management program. This includes the incentives for Chinook and chum salmon avoidance under the voluntary IPAs, including the RHS program for chum salmon avoidance described above (50 CFR 679.21(f)(12)(iii)(E)). Entities governed by an IPA are exempt from the Chum Salmon Savings Area as a time/area closure triggered by a PSC limit (50 CFR 679.22(a)(10)). The Chum Salmon Savings Area would continue to exist as a backstop measure.

Alternative 2: Overall Chum Salmon PSC Limit

Alternative 2 would establish an overall chum salmon PSC limit during the B season that would function as a hard cap, such that fishing must cease for the remainder of the season if it is met. PSC limits ranging between 100,000 and 550,000 chum salmon are being considered. This range is based on historical chum salmon bycatch data (see also Table 2-3). The PSC limit would be apportioned among the four sectors using one of these four options.

Option 1: 3-year average level of chum salmon bycatch (2020–2022)

Option 2: 5-year average level of chum salmon bycatch (2018–2022)

Option 3: a pro rata approach that weights the amount 25% to the sector’s AFA pollock allocation and 75% to the sector’s 3-year historical average chum salmon bycatch

Option 4: the sector’s AFA pollock allocation

Table 1-1 Each pollock sector’s apportionment percentage by option under Alternatives 2 and 3

Apportionment Option	CDQ	CP	Mothership	Inshore
Option 1: 3-Year Avg.	6.1%	21.9%	9.1%	62.9%
Option 2: 5-Year Avg.	7.1%	25.2%	9.5%	58.2%
Option 3: Pro Rata	7.1%	25.4%	9.1%	58.4%
Option 4: AFA	10.0%	36.0%	9.0%	45.0%

Source: NMFS catch accounting system, data compiled by AKFIN.

The inshore sector’s apportionment of the PSC limit would be further divided among the inshore cooperatives and open access fishery in applicable years. The CDQ apportionment would be further divided among the six CDQ groups. A cooperative and/or sector would have the ability to transfer chum salmon PSC to provide more opportunity for these entities to fully harvest their pollock allocation. This is allowed under the Chinook program. A sector would need to request NMFS move a specific amount of chum salmon PSC from one entity’s account to another’s during a fishing season. Apportionments of chum salmon PSC do not constitute a use privilege.

An apportionment suboption is also being considered that would establish a “CDQ chum salmon Reserve Pool” to exist outside of the overall chum salmon PSC limit. It may only be accessed by a CDQ group that informs NMFS in writing by November 15 of any year that it intends to harvest its pollock CDQ with the inshore or mothership sector in the upcoming B season. Upon such notification, NMFS would apportion an additional amount of chum salmon PSC to the group(s) from the CDQ Reserve Pool. This amount would scale the CDQ group’s apportionment of the PSC limit to the sector that is harvesting its pollock quota. The details of this suboption are further discussed relative to management and monitoring

in Chapter 5, and the maximum amounts of chum salmon PSC that could be accessed by CDQ groups in the CDQ Reserve Pool under Alternative 2 or 5 are identified in Section 2.4.1.1.

Alternative 2 is mutually exclusive to Alternative 3.

Alternative 3: Overall Chum Salmon PSC Limit with Abundance Indices

Alternative 3 is similar to Alternative 2, because it would establish an overall chum salmon PSC limit (see Section 2.4.1.1). However, whether the overall limit applies and the amount of the limit would depend on whether certain indices of WAK chum salmon inriver abundance are met. In general, if chum salmon are less abundant, a lower limit would be applied.

Two options for an abundance index are being considered. The apportionment options, suboptions, and transferability provisions for Alternative 3 are the same as Alternative 2.

Option 1 includes a three-area index based on chum salmon inriver abundance in the Yukon, Kuskokwim, and Norton Sound regions, based on data from 1992–2022.

Suboption 1 would use the 25th percentile of historical inriver abundance for each area’s abundance threshold.

Suboption 2 would use the 50th percentile of historical inriver abundance for each area’s abundance threshold.

If all three areas have abundance indices above their thresholds, an overall chum salmon PSC limit would not be applied the following year.

If two areas have abundance indices above their thresholds, an overall chum salmon PSC limit would be applied the following year and set between 100,000 and 550,000 chum salmon.

If one or zero areas have abundance indices above their thresholds, an overall chum salmon PSC limit would be applied and set at 75% of the amount selected when two areas have returns above their thresholds.

Option 2 includes an index using the Yukon summer and fall chum runs, based on data from 1992–2022.

Suboption 1 would use the 25th percentile of historical inriver abundance for each area’s abundance threshold.

Suboption 2 would use the 50th percentile of historical inriver abundance for each area’s abundance threshold.

If both stocks have abundance indices above their thresholds, an overall chum salmon PSC limit would not be applied the following year.

If one or zero stocks have abundance indices above their thresholds, an overall chum salmon PSC limit would be applied the following year and set between 100,000 and 550,000 chum salmon.

Alternative 3 is mutually exclusive to Alternative 2 and Alternative 5, Option 3.

Alternative 4: Additional Regulatory Requirements for IPAs

Alternative 4 would modify regulations at 50 CFR 679.21(f)(12)(iii)(E) to incorporate six additional provisions, for the IPAs to respond to:

1. require the IPAs to describe how genetic stock composition data are included in chum salmon avoidance strategies;
2. require the IPAs to describe how the sector will monitor for potential chum salmon avoidance closures more than once per week;
3. require the IPAs to mandate the use of salmon excluders throughout the A and B seasons;

4. require the IPAs to develop and implement vessel outlier provisions specific to chum salmon bycatch;
5. require the IPAs to provide weekly bycatch reporting to Western and Interior Alaska salmon users; and
6. require IPAs to prohibit fishing in bycatch avoidance areas when weekly bycatch rates exceed specific thresholds.

Alternative 4 may be selected in combination with any other action alternative.

Alternative 5: Inseason Corridor Caps

Alternative 5 would establish an inseason corridor with closure provisions. Three different inseason corridor options are being considered under Alternative 5 but only one may be selected for implementation. The corridor boundary is the same among all three options and encompasses genetic cluster areas 1 and 2 where roughly 84% of the WAK bycatch was encountered from 2011–2023 (Figure 1-3 and Section 3.3.4.1.2). The options differ based on the number and location of ADF&G statistical areas (“stat areas”) inside the corridor that would close.

Option 1 would close the entire corridor (40 of 40 stat areas)

Suboption 1 would close 29 of the 40 stat areas, as set in regulation

Option 2 would close between 19 and 29 of the 40 stat areas, as described and approved through IPAs

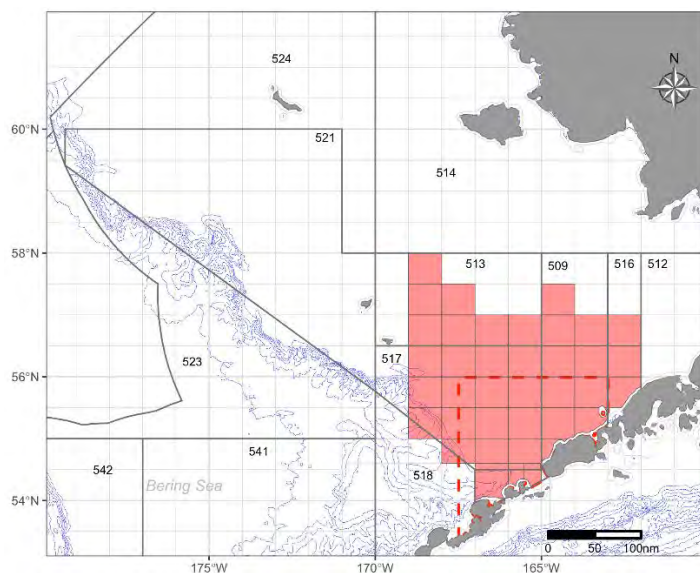


Figure 1-3 Inseason corridor boundary under Alternative 5 (red) which represents the combined area of genetic clusters 1 and 2

Notes: The Catcher Vessel Operational Area is shown by the red dashed line.

All non-Chinook (*i.e.*, chum salmon) caught inside the 40 stat areas that compose genetic clusters 1 and 2 from June 10 – August 31 would accrue towards the corridor’s chum salmon PSC limit. The range of corridor PSC limits being considered is 50,000 to 350,000 chum salmon. Some or all of the corridor would close to a cooperative or sector that attained its apportionment of the corridor PSC limit from the date the limit was met through August 31, depending on the option. Impacted vessels may continue fishing outside the corridor through August 31 and return to fishing inside the corridor on September 1.

The apportionment options/suboption and transferability provisions for Alternative 5 are the same as Alternatives 2 and 3, except that the apportionment percentages for each sector are only based on catch

in the corridor area and during the closure window (June 10 to August 31). The maximum amounts of chum salmon PSC that could be accessed by CDQ groups in the CDQ Reserve Pool under the corridor chum salmon PSC limits for Alternative 5 are identified in Section 2.7.4.1 of the DEIS.

Table 1-2 Each pollock sector's apportionment percentage by option under Alternative 5

Apportionment Options	CDQ	CP	Mothership	Inshore
Option 1: 3-Year Average	7.2%	11.7%	10.3%	70.8%
Option 2: 5-Year Average	6.4%	13.9%	8.7%	71.0%
Option 3: Pro Rata	7.9%	17.7%	10.0%	64.4%
Option 4: AFA	10%	36%	9%	45%

Source: NMFS catch accounting system, data compiled by the Alaska Fisheries Information Network.

Option 3 would include abundance-based thresholds for Yukon summer and fall chum salmon runs that when met or exceeded suspends the application of the inseason corridor limit and closure provisions.⁴

Suboption 1 would use the 75th percentile of historical abundance for each stock.

Suboption 2 would use the 90th percentile, based on data from 1992–2022.

Option 3 of Alternative 5 is mutually exclusive to Alternative 3, and Option 3 may only be selected as an element of Alternative 5.

Option 4 would adjust the start date for when the Winter Herring Savings Area (HSA) closure takes effect from September 1 to September 30 for the pollock fishery. No other element of the Pacific herring PSC management framework specified in regulation at 50 CFR 679.21(e)(3)(iv)(B) through (F) would be changed.

Option 4 may only be selected as a component of Alternative 5.

Summary of the Alternatives in Combination

If the Council chooses to recommend a preferred alternative (PA) at final action, Table 1-3 may be of assistance. It provides information on whether different options and elements of the alternatives may be selected in combination with one another.

⁴ This contrasts with Alternative 3, where the failure to exceed one or more of the abundance-based thresholds triggers the application of a PSC limit.

Table 1-3 Summary of the how alternatives and options that may or may not be combined

Alternative	Option	Summary Description	Potential to Combine with Other Alt./Opt.
2	Overall Chum Salmon PSC limit		For all but Alternative 3.
	1	3-year average apportionment	Yes. Apportionment options are mutually exclusive to one another and the same for Alt 3 and 5.
	2	5-year average apportionment	
	3	Pro rata apportionment	
	4	AFA apportionment	
	<u>Suboption</u>	CDQ Reserve Pool	Yes. Must be combined with one of the four Alternative 2 apportionment options. May also be selected for Alt 3 and 5.
3	Overall Chum Salmon PSC limit based on chum salmon abundance		For all but Alternative 2 and Alternative 5, option 3.
	1	3-Area Index	Suboptions are mutually exclusive to one another.
	2	Yukon Area Index	
4	Additional IPA provisions		All alternatives and options.
5	Inseason corridor PSC limit		All alternatives and options.
	1	If cap is met, the entire corridor closes (100%) through August 31.	Mutually exclusive to Suboption 1 and Option 2.
	<u>Suboption</u>		
	1	If cap is met, 29 stat areas (~75%) inside the corridor close through August 31	Mutually exclusive to Option 1 and 2.
	2	If cap is met, IPA's pre-approved stat areas close for remainder of time period.	
	3	Abundance-based threshold. Corridor not in effect if Yukon summer and fall chum abundance exceeds thresholds.	May be selected with any corridor option/suboption, Alt 2 and Alt 4. May not be selected with Alt 3.
	<u>Suboption</u>		
	1	75th percentile of Yukon summer and fall chum salmon abundance	Suboptions are mutually exclusive to one another.
	2	90th percentile of Yukon summer and fall chum salmon abundance	
	4	Adjust Winter Herring Savings Area start date	May only be included in Alternative 5.

Background Information for the Impact Analysis

This DEIS analyzes the potential environmental, economic, and social impacts of the proposed alternatives. **Chapter 3** contains the evaluation of the effects of the alternatives on the pollock stock (the target species), chum salmon, WAK chum salmon, and other resource components. **Chapter 4** contains the evaluation of the proposed alternatives and their potential/likely effects on human dimensions and satisfies the requirements of EO 12866 for a regulatory impact review. This chapter is focused on the potential impacts to the pollock fishery, communities that rely on pollock fishing and processing, as well as communities that depend on WAK chum salmon for subsistence, food security, and economic wellbeing. **Chapter 5** contains several considerations regarding management and enforcement for the Bering Sea pollock fishery in relation to the proposed alternatives. **Chapter 6** provides an assessment of the proposed alternatives in relation to each of the 10 National Standards for fishery conservation and management.

As discussed above, the proposed alternatives aim to reduce chum salmon bycatch in the Bering Sea pollock fishery to the extent practicable with an emphasis on reducing the bycatch of WAK chum salmon. The proposed action alternatives and options/suboptions (Alternatives 2–5) would implement additional measures to achieve this purpose. Bycatch could be reduced from the status quo (or the conditions that would be expected to continue if Alternative 1 is selected) by vessels changing their fishing behavior prior to a PSC limit being met (Alternatives 2, 3, and 5), by requiring vessels to move away from areas

with high PSC encounters (Alternatives 4 and 5), and/or by a total closure once a PSC limit is met (Alternatives 2 and 3).

Pollock harvesters will react to the proposed management changes to the extent they are able to do so because the proposed alternatives create different incentives for bycatch avoidance. Alternatives 2 and 3 could close the B season earlier than it otherwise would, which may result in some amount of pollock harvest and revenue being forgone. Neither Alternative 4 nor 5 inherently include the possibility of reduced pollock harvest, although some inseason corridor options under Alternative 5 may make this scenario more likely. Rather, these alternatives create an incentive for fishermen to avoid chum salmon bycatch to maintain access to as many fishing areas as possible, which affords them operational flexibility. Operational flexibility is valued because, among other reasons, it allows vessels to move with the target species to stay on good aggregations of quality pollock, shift their fishing location away from PSC species, and maximize their efficiency and/or coordinate deliveries.

Behavior changes could come with avoidance costs (*e.g.*, increased fuel expenses, time spent traveling rather than fishing, or fishing in sub-optimal locations). Under Alternatives 2 or 3, vessels that are less successful at staying below a PSC limit may forgo some revenue. Under Alternative 5, vessels that reach the inseason corridor PSC limit would be prohibited from fishing within the closed corridor area and need to recover the displaced pollock catch elsewhere, putting the associated revenue at risk of being forgone. The proposed alternatives may also create unintended consequences for other PSC species like Chinook and herring. The pollock fishery encounters chum salmon, Chinook salmon, and herring in the B season, but the distributions of these three species varies. The alternatives being considered in this action create incentives for pollock fishermen to avoid chum/WAK chum salmon. Meanwhile existing regulations for Chinook salmon and herring PSC create separate incentives for those species to be avoided. How fishermen respond to one or more of the proposed alternatives may create negative outcomes for Chinook and herring PSC.

Changes in fishing behavior also underpin the expected impacts on chum and WAK chum salmon. To provide context to the subsequent discussion of the consequences of the alternatives, Table 1-4 provides a summary of the advantages and disadvantages of the alternatives relative to chum and WAK chum salmon and Chinook salmon, in light of the purpose and need statement (see Section 1.1). These dynamics are further described in the next section summarizing the consequences of the alternatives.

Table 1-4 Comparison of the potential advantages and disadvantages for each alternative related to chum salmon, WAK chum salmon, and Chinook salmon PSC.

Alternative	Advantages to Chum/WAK Chum Salmon	Disadvantages to Chum/WAK Chum Salmon	Other Considerations to Chinook Salmon
Alternative 1	- No change relative to status quo. - Status quo includes: - incentive plan agreements that require vessels to try to avoid WAK chum salmon; - rolling hot spot program; - salmon excluders; - comprehensive bycatch monitoring; and - Chum Salmon Savings Area (vessels in IPAs are exempt)	- No change relative to status quo. - No chum salmon bycatch limit for vessels in IPAs. - Voluntary chum salmon avoidance provisions incorporated in 2022 would not be subject to regulatory requirements to be included in IPAs.	No change relative to status quo.
Alternative 2	- Provides a ceiling for the number of chum salmon that could be incidentally caught each B season. - Creates incentives for fishermen to stay below the PSC limit set in regulation. - A PSC limit set at the lower end of the range is more likely to reduce WAK chum PSC.	Does not create a clear/specific incentive for WAK chum salmon avoidance.	- An early closure because the chum PSC limit is met could reduce Chinook PSC. - In contrast, Chinook PSC could be neutral if vessels are able to balance their operations against catches of both species. - Chinook PSC could increase if the B season is extended.
Alternative 3	Similar to Alternative 2 when an overall PSC limit is in effect.	- Similar to Alternative 2 when an overall PSC limit is in effect. - PSC limit would be suspended in periods of high abundance which decreases the potential positive impacts to chum/WAK chum PSC.	- Impacts would be neutral in years the PSC limit is suspended and the same as Alternative 2 in years the PSC limit is in effect. - Uncertain outcome for Chinook similar to Alternative 2.
Alternative 4	- IPAs could create tailored incentives/penalties. - RHS program could have a greater emphasis on WAK chum avoidance using genetic data. - Closure of whole stat areas with very high PSC rates.	- Does not include a PSC limit for total bycatch or limit the PSC that could be taken in a specific time/area. - May not have a greater impact than changes in fishing behavior since 2022 (i.e., the fleet has already made these changes).	Close to neutral impacts to Chinook salmon PSC.
Alternative 5, Option 1	- Management measure captures time/area of greater chum/WAK chum encounters. - Creates a strong incentive for preemptive changes in fishing behavior to constrain PSC while fishing inside the corridor. - Requires vessels move out of corridor if the PSC limit is met to areas with lower chum/WAK chum PSC rates (in most years).	- Does not include a PSC limit for total bycatch. - Could redistribute large amounts of fishing effort/catch to outside areas with unknown PSC rates, creating the potential for unintended impacts.	- Not expected to reduce Chinook PSC but outcomes could be neutral if vessels are able to balance their operations against catches of both species. - Could have negative consequences for Chinook PSC if displaced pollock catch cannot be recovered in areas with equally good CPUE.
Alternative 5, Suboption 1	- Similar to Option 1. - The chum/WAK chum PSC rates could be lower inside 11 stat areas exempted from closure but it would provide greater flexibility for vessels to move to optimal fishing locations.	- Does not include a PSC limit for total bycatch. - By ensuring access to parts of historic fishing rounds within the closure corridor, it may diminish the incentive for vessels to preemptively change their fishing behavior. - PSC rates could be greater inside the 11 exempted stat areas (but provides greater flexibility for vessels to move to optimal fishing locations).	Similar to Option 1, but the risk of creating negative consequences for Chinook is less.
Alternative 5, Option 2	- Similar to Option 1/Suboption 1. - IPAs could issue a closure more quickly than NMFS. - Areas to close could be modified without a regulatory amendment if the conditions change. - Provides greater flexibility for fleet movement to optimal fishing locations.	- Does not include a PSC limit for total bycatch. - By ensuring access to parts of historic fishing rounds within the closure corridor, it may diminish the incentive for vessels to preemptively change their fishing behavior.	Holds the lowest risk of creating negative consequences for Chinook salmon.

Hatchery Chum Salmon Considerations

Hatchery releases of chum salmon are relevant to this analysis because the majority of chum caught as bycatch in the pollock fishery are commonly estimated to be of Asia origin (Southeast and Northeast Asia reporting groups). As described in Section 3.3.2.1, the Southeast Asia reporting group is largely composed of hatchery released fish while the Northeast Asia genetic reporting group is composed of hatchery and wild fish of unknown proportions. From 2011–2023, approximately 30%–55% of the chum salmon bycatch caught by the pollock fishery was attributed to the Northeast Asia reporting group, except for 2011 and 2015 when lower proportions were observed. The Southeast Asia reporting group has accounted for approximately 9%–20% of the total bycatch. The highest numbers of Asia origin chum salmon occurred in 2017 and 2021, coinciding with the highest years of total chum salmon PSC. As of 2024, Russian hatchery production of chum salmon has increased to 1.453 billion and has surpassed Japan (1.155 billion) for the largest releases of juvenile hatchery chum salmon in the North Pacific; the U.S. released ~838 million during that year. Increases in hatchery chum salmon production may further complicate the assessment and management of chum salmon bycatch in the Bering Sea pollock fishery and the alternatives.

Consequences of the Alternatives

Methodology

The methodology used across the impact analysis differs based on the alternatives and options/suboptions as well as the best scientific information available (see Section 3.1). The proposed alternatives are analyzed quantitatively for impacts to the pollock stock, chum salmon, WAK chum salmon, Chinook salmon, herring, and the related economic analyses using data from 2011 through 2023. The remaining resource categories—marine mammals, seabirds, essential fish habitat, and ecosystem dynamics—were analyzed qualitatively.

Pollock

Eastern Bering Sea pollock is currently managed to account for the capacity of the stock to yield sustainable biomass on a continuing basis, and it is not overfished nor approaching an overfished condition (see Section 3.2). Alternatives 2, 3 and/or 5 include different chum salmon PSC limits, some of which would make it more challenging for the B season TAC to be fully utilized and, thus, reduce the impact of fishing on the pollock stock. These alternatives are likely to result in some changes in the distribution of the fishery as fishermen work to avoid chum salmon, but fleet movement in the future is likely to be within the historical footprint of the fishery and would continue to be constrained by other regulatory and environmental factors. As such, these alternatives are expected to have a positive or relatively neutral impact on the Bering Sea pollock stock when compared to the status quo. Alternative 4 is expected to have a relatively neutral impact on the pollock stock because the fishery has operated under the RHS program for chum salmon avoidance since 2001, the IPAs since 2010, and its chum salmon PSC avoidance behavior since 2022 largely reflects the fleet's response to the provisions in Alternative 4.

Chum and Western Alaska Chum Salmon

Alternative 1

The pollock fishery's chum salmon bycatch varied across the analyzed period, 2011–2023, ranging from a low of approximately 22,200 fish in 2012 to a high of approximately 545,900 fish in 2021. The B season extends from June 10 to November 1 and chum salmon were typically encountered in greater numbers in August (Table 3-26). Chum salmon encounters were widely distributed across the B season fishing grounds but were usually more concentrated near the Alaska Peninsula, which is the core fishing grounds for the inshore sector.

The WAK component of the total chum salmon bycatch also varied across the analyzed period. The estimated proportion of WAK chum salmon in the total bycatch was smallest in 2020 at 9.1% and largest in 2011 at 25.1% of the total bycatch (Table 3-28). Genetic analyses of bycatch samples caught from 2011–2023 showed that the WAK component was usually greater during the early portion of the B season (June – August) and in the fishing grounds closer to the Alaska Peninsula compared to later months or the fishing grounds further northwest (Table 3-29 and Table 3-30).

The DEIS provides an adult equivalent (AEQ) analysis for WAK chum salmon broken out by the Coastal Western Alaska (CWAK) and Upper/Middle Yukon reporting groups. The purpose of an AEQ analysis is to estimate how many salmon caught as bycatch would have otherwise returned to their rivers of origin had bycatch not occurred. The AEQ analysis accounts for the ages, natural mortality, and maturation schedules for WAK chum salmon caught as bycatch. These estimates provide a more realistic depiction of the potential impact the pollock fishery may have as they represent the number of bycaught chum salmon that may have otherwise survived the marine environment and returned to their natal river systems. From 2011 to 2022, the AEQ for the CWAK reporting group averaged 38,060 chum salmon and the AEQ for the Upper/Middle Yukon reporting group averaged 6,095 chum salmon (Table 3-32).⁵ In comparison, over the same period, the chum salmon bycatch (not AEQ adjusted) for the CWAK reporting group averaged 40,926 chum salmon and for the Upper/Middle Yukon group averaged 9,028 chum salmon (Table 3-28).

The AEQ estimates are not a complete impact analysis for the pollock fishery's bycatch, which would require an estimate of the total run size for the populations encompassed within a given reporting group against which to scale the impact of bycatch. These data are not available for the CWAK reporting group, which includes populations from Kotzebue Sound in the north down through Bristol Bay, so impact rates for these reporting groups could not be calculated. The Upper/Middle Yukon reporting group represents Yukon fall chum salmon, a genetically distinguishable stock for which there is an inriver run reconstruction and harvest information available from ADF&G. This run size estimate is the abundance after removals of salmon catch and bycatch, as well as natural mortality. The impact rate calculated for the Upper/Middle Yukon reporting group ranged between 0.22% (2013) and 4.94% (2021), averaging 1.0% over the analyzed period (Figure 3-20). This impact rate does not account for estimated marine harvests of this reporting group in the Alaska Peninsula or other intercept fisheries (*e.g.*, Munro et al. 2012, Dann et al. 2023). Accounting for these harvests would increase the total run size estimates and decrease the estimated impact rate.

Harvests in directed fisheries and environmental changes make estimating the benefits of potential reductions in chum salmon bycatch due to the alternatives uncertain. From 2011 to 2022, on average 98.25% of CWAK chum salmon harvests are estimated to be from State commercial (89.44%) and subsistence (8.81%) fisheries, while the AEQ made up ~1.75% of accounted for removals over the same period (Table 3-33; Figure 3-19). Moreover, these proportional harvest estimates do not include harvests in the State's Alaska Peninsula Management Area (Area M) and such harvests are also not explicitly accounted for in the AEQ analysis. For example, immature WAK chum salmon that escaped the pollock fishery may die of natural mortality—which are accounted for in the AEQ analysis—or be harvested in Area M or other State fisheries in subsequent years. Including Area M harvests of CWAK chum salmon into the total harvest estimate would decrease the estimated percentage attributed to chum salmon bycatch in the pollock fishery. **Overall, the information indicates that bycatch in the Bering Sea pollock fishery represents a small portion of WAK chum salmon harvests and the action alternatives may not result in an appreciable increase in chum salmon spawning escapement and/or overall returns.**

The proposed alternatives aim to reduce bycatch and its subsequent impact from these levels.

Alternatives 2 and 3

⁵ The AEQ analysis does not include 2023 because age data are not available for 2023 chum salmon bycatch.

Alternative 2 or 3 would include an overall chum salmon PSC limit that would be apportioned among the four sectors. The DEIS analyzes PSC limits of 100,000, 325,000, and 550,000 chum salmon because these values represent the lower and upper bounds, as well as the midpoint, of the range being considered for Alternative 2 and generally for Alternative 3. **The Council may recommend any number within this range and is not limited to the values selected for the impact analysis.** The impact analysis was extended to include a PSC limit of 75,000 chum salmon for Alternative 3, Option 1.

The impact of Alternative 2 and 3 relative to the status quo is evaluated by comparing the actual number of bycaught chum salmon, by sector and year from 2011 to 2023, with different combinations of PSC limits and apportionments. Then, a determination is made as to whether the pollock fishery would have been closed. When a PSC limit and apportionment combination would have closed the fishery earlier in a given year than what actually occurred, an estimate is made of the pollock TAC that would have been left unharvested (“forgone pollock”) and the reduction in the amount of chum salmon PSC as a result of the closure (“salmon saved”). **Expected changes in future fishing behavior are not accounted for in these estimates but are considered in the broader evaluation of potential impacts.**

Alternative 2 or 3 would be expected to reduce the total bycatch compared to status quo with the magnitude varying by PSC limit, apportionment option, and year. Alternative 3 would conditionally apply an overall PSC limit based on chum salmon returns measured against an index of abundance. **There was a marginal difference in the maximum number of years that an overall chum salmon PSC limit would have been in effect under Alternative 3, Options 1 and 2. Rather, the suboption that would be used to set the threshold of abundance under Alternative 3 was more of a determining factor.** Since 2011, an overall PSC limit would have been in effect in 3 or 6 years under Alternative 3, Option 1, and in 5 or 6 years under Alternative 3, Option 2. This suggests that Alternative 3 would result in the overall chum salmon PSC limit being in effect in a variable number of years.

Figure 1-4 compares the pollock fishery’s historical chum salmon PSC (red line) to the chum salmon bycatch that would have occurred had the PSC limits and apportionments been in place (blue line). The difference between the red and blue lines indicates the relative magnitude in chum salmon bycatch reductions in a given year. The PSC limits under consideration were shown to have had no effect in the year with the lowest historical bycatch (2012) and a greater effect in years with high historical bycatch (2021 and 2017). As an example, a 100,000-chum salmon PSC limit apportioned using Option 4 (AFA) would have reduced the inshore sector’s bycatch by 289,446 chum salmon in 2021.

The greatest potential fleet-wide impact (in terms of potentially forgone revenue) was shown under a 100,000-chum salmon PSC limit apportioned using Option 3 (pro rata) at a reduction of 56.4% of the total bycatch across all years. As would be expected, the bycatch reductions decreased with a higher PSC limit because it would have been met in fewer years. Across all years, the greatest potential fleet-wide impact under a PSC limit of 325,000 chum salmon and 550,000 chum salmon was shown using the apportionment Option 1 (3-year average) at a reduction of 12.4% and 3.6% of the total bycatch, respectively.

Under any given PSC limit and apportionment combination, there was substantial interannual variability in the chum salmon bycatch reductions that would have occurred (2011–2023). As an example, in the years that a 100,000-chum salmon PSC limit would have been met using apportionment Option 1 (3-year average), the CDQ sector’s bycatch would have been reduced by zero chum salmon to a maximum of approximately 73,000 chum salmon (Table 3-34). This variation in savings was also the case at higher PSC limits. Thus, when considering average reductions across years from the retrospective analysis, the greater reductions accruing from years with the highest bycatch (2021 and 2017) may drive overall savings. **However, assuming this interannual variability in actual bycatch from 2011 to 2023 was influenced by factors other than the fleet’s PSC avoidance behavior, it illustrates that future chum salmon bycatch reduction may similarly depend on factors beyond the fleet’s control.**

Finally, the retrospective estimates of total chum salmon PSC reductions, when the genetic stock of origin, ages of fish, and natural mortality are not accounted for, are a lower bound of the potential positive impacts. In the future, if sectors are able to stay below the PSC limit, the actual reductions in total bycatch would be greater than what can be reported here using a method that estimates savings based upon when a PSC limit would have been met as if it was in place historically.

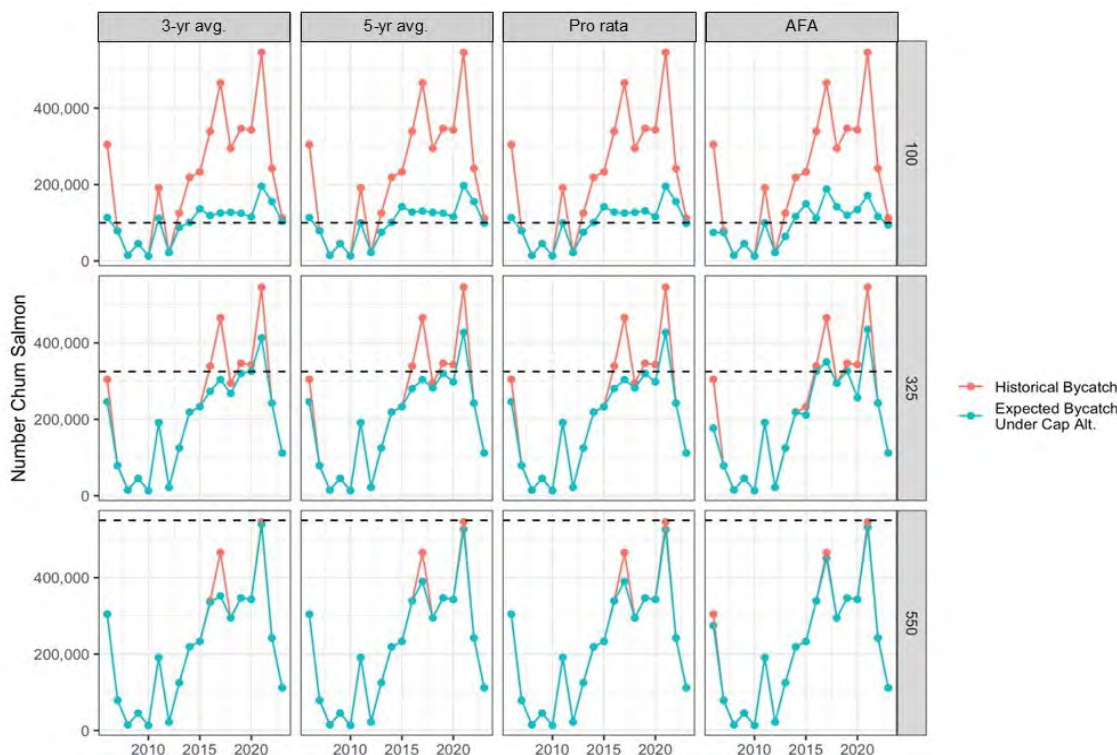


Figure 1-4 Historical B season chum salmon bycatch (red line) compared to the estimated chum salmon bycatch (blue line) as if an overall chum salmon PSC limit amount of 100,000-, 325,000-, and 550,000-chum salmon (black dotted line) and apportionments were in place from 2011–2023

Note: estimated bycatch values above the black dotted line are due to the retrospective method used to estimate early closures.

AEQ Chum Salmon Savings

Similar to the total number of chum salmon, the greatest reductions in the Western Alaska AEQ bycatch (i.e., the number of chum salmon from Western Alaska estimated to have otherwise returned to their river of origin in a given year) would have occurred under the lowest proposed PSC limit because fewer chum salmon would have been taken as bycatch. **The bycatch reductions varied marginally from one another based on the apportionment.** By apportionment option, the annual average reduction of AEQ CWAK chum salmon under a 100,000-chum salmon PSC limit would have been 21,519 fish (Opt. 1; 3-year avg.), 21,612 fish (Opt. 2; 5-year avg.), 21,652 fish (Opt. 3; pro rata), and 21,303 fish (Opt. 4; AFA), in order of apportionment option. By apportionment option, the annual average reduction of AEQ Upper/Middle Yukon chum salmon would have been 3,391 fish (Opt. 1; 3-year avg.), 3,437 fish (Opt. 2; 5-year avg.), 3,448 fish (Opt. 3; pro rata), and 3,308 fish (Opt. 4; AFA). **These marginal variations between apportionment options are shown across all analyzed PSC limits (Table 1-6), which suggests the amount the overall chum salmon PSC limit is set at would be more of a determining factor for future impacts than the apportionment option chosen.** The Alternative 1/status quo average impact rate for the Upper/Middle Yukon reporting group across years was 1.03% (Table 3-41). The greatest reduction in that impact rate would have occurred under a 100,000-chum salmon PSC limit, with an average reduction across years of approximately 0.60%.

AEQ bycatch reductions appeared even in years when the overall chum salmon PSC limit was *not met* (Table 3-36). For instance, no sector would have met a PSC limit of 550,000 chum salmon under any apportionment in 2018–2020. Yet, AEQ savings from each reporting group were shown to accrue in those years because the PSC limit was met in prior years. **Since chum salmon mature and return to their river systems at multiple ages, bycatch reductions in one year affected AEQ bycatch reductions over subsequent calendar years.** This dynamic is present across all proposed action alternatives but can only be quantitatively shown for Alternative 2 and 3.

A number of factors create uncertainty in how an overall chum salmon PSC limit would impact WAK chum salmon. **The retrospective estimates for WAK chum salmon bycatch reductions do not represent either a lower or upper bound for potential future savings, when taking into account the behavior changes that are likely to occur in the future.** An overall chum salmon PSC limit provides a clear incentive for pollock fishermen to operate in areas with the lowest PSC rates to ensure the lowest possible PSC counts while utilizing the B season quota and there is no guarantee this strategy would reduce the WAK component.

To illustrate this, Figure 1-5 shows hypothetical numbers of WAK chum salmon that could be taken as bycatch in a single B season based on historical genetic data and the PSC limits being considered. The lowest (9.1%) and highest (25.1%) proportion of WAK chum salmon in the total bycatch is multiplied by each analyzed PSC limit. The annual average WAK chum bycatch of 46,995 fish (as shown on Table 3-28) is shown as a red line across the figure. This figure shows that there could be a wide range of outcomes if conditions in the future are similar to the status quo (*e.g.*, the mixtures of genetic reporting groups, the overlap in the distribution of WAK chum and pollock on the fishing grounds, among others). For instance, under a PSC limit of 325,000 chum salmon, the number of WAK chum salmon bycatch could fall within the range of 29,575 and 81,575 fish, and the average WAK chum salmon bycatch under the status quo (46,995 fish) falls directly within this range. **Although it is somewhat counterintuitive, an overall hard cap may not guarantee reductions in the number of WAK chum salmon taken as bycatch relative to no action.** However, these values assume that the fishery would meet the hard cap (*i.e.*, because the proportions are multiplied by the value of the PSC limit). In reality, the fishery's future performance could fall well below the actual PSC limit amount.

The WAK and/or AEQ bycatch in the future would depend on the total bycatch level achieved in a given year, the proportion of WAK fish in the total bycatch, the age composition of the bycatch in that year, among other factors. Additionally, while the AEQ incorporates estimates of natural mortality, all of the saved AEQ fish may not actually return to their river systems. The pollock fishery could change its fishing behavior and reduce its total/AEQ bycatch, but those fish could still be intercepted in state-water or international fisheries (also referred to as “intercept fisheries”).

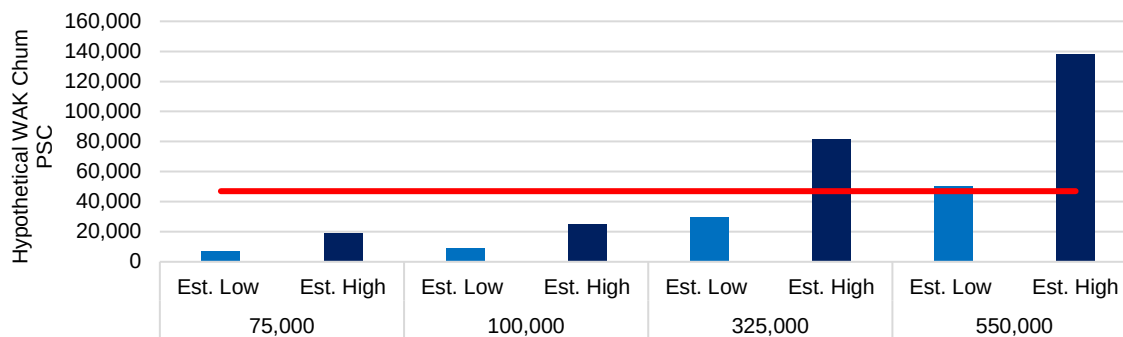


Figure 1-5 Hypothetical numbers of WAK chum salmon that could be taken as bycatch in the future under the analyzed PSC limits based on the lowest and highest proportions of WAK chum salmon from 2011–2023 being applied to each PSC limit

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Note: Red line represents the 2011 to 2023 annual average WAK chum salmon PSC of 46,995 fish (see Table 3-28).

Alternative 4

Alternative 4 would establish new regulatory provisions requiring the IPAs to develop and implement measures for vessels to avoid chum/WAK chum salmon on the pollock fishing grounds. The analysis cannot provide quantitative estimates for potential bycatch reductions under Alternative 4, but each IPA has been amended in recent years to implement measures that are largely aligned with Alternative 4. These new measures began to take effect in the 2022 B season in response to the Council’s request for the pollock industry to take immediate steps to reduce its chum salmon bycatch. The fleet’s performance since 2022 reflects years when many of the Alternative 4 provisions have been in effect.

The bycatch reductions achieved since 2021 B season, when approximately 545,000 chum salmon were caught, are likely due to many factors. For a sense of scale, the 2022 B season bycatch of 242,309 fish was a 55% reduction from 2021, the 2023 B season bycatch of 111,852 fish was an 80% reduction from 2021, and the 2024 B season bycatch of 35,125 chum salmon was a 94% reduction from 2021. For context, the average pollock fishery B season bycatch between 2011 to 2023 was 267,704 chum salmon (Table 3-24)

Alternative 4 is expected to reduce the total bycatch from the status quo by creating tailored incentives and penalties for fishermen to avoid chum/WAK chum salmon. This alternative holds relatively little risk of having a negative impact on chum/WAK chum salmon compared to the status quo, but it does not include a PSC limit on the total number of chum salmon that could be taken in a single B season (Alternative 2 or 3) nor does it place a limit on the total number of chum salmon that may be taken in a given time/area (Alternative 5). While there is no reason to expect selection of Alternative 4 would result in bycatch at levels similar to the 2021 B season, it is possible. Additionally, it is not clear whether Alternative 4 would provide additional benefits beyond what has occurred since 2022, if it is selected in isolation.

Alternative 5

Alternative 5 would establish an inseason corridor with closure provisions and it is intended to capture the time and areas with the greatest WAK chum salmon PSC encounters since 2011. To help illustrate this, Figure 1-6 shows the number of chum and WAK chum salmon caught as bycatch inside and outside the corridor during the closure window (2011–2023). **While the distribution of chum/WAK chum salmon PSC varies at smaller spatial and temporal scales, all three options could reduce chum and WAK chum salmon bycatch relative to no action.**

More specifically, Option 1 and Suboption 1 are expected to reduce chum and WAK chum salmon PSC inside the corridor and likely reduce WAK chum salmon bycatch across the entire B season.

The analysis cannot provide a similar statement (or conclusion) for Option 2 only because the stat areas that would close after the corridor chum salmon PSC limit is met are at present unknown. **Option 2 is expected to reduce chum and WAK chum salmon PSC inside the corridor prior to a closure as vessels constrain their PSC against the limit; however, the impacts that would occur after a closure are uncertain.**

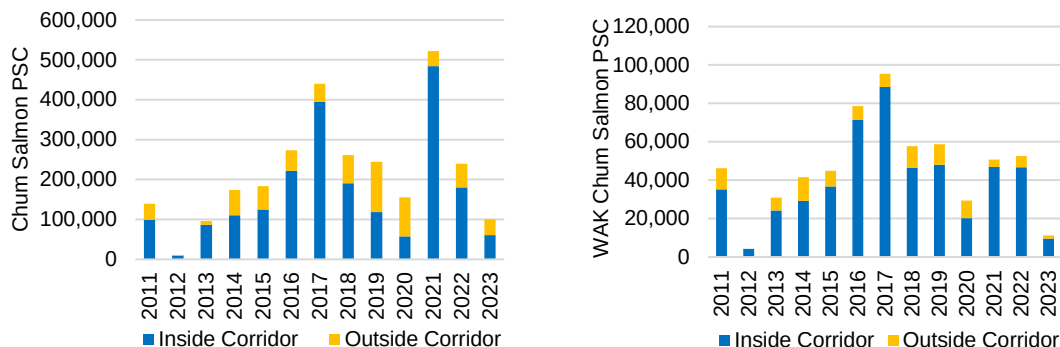


Figure 1-6 Number of chum salmon (left) and WAK chum salmon (right) caught as bycatch inside (blue) and outside (yellow) the inseason corridor during the closure window of June 10 – August 31, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Bycatch reductions could be achieved by preemptive changes in fishing behavior to constrain PSC inside the corridor. Option 1 appears to provide the strongest incentive for preemptive changes in fishing behavior because it closes the largest amount of fishing area. The risk of displacing pollock catch, combined with substantially fewer areas to recover displaced catch and reduced operational flexibility, are the driving factors informing this expectation. For example, the retrospective analysis shows greater amounts of pollock catch would have been displaced under a corridor PSC limit of 50,000 chum salmon. Across all sectors, the sum of pollock catch that would have been displaced exceeded 300,000 mt in one year (2017) and exceeded 200,000 mt in 4 of the 13 analyzed years under all apportionment options. These values provide a sense of scale for the upper bound of pollock harvest that may need to be recovered in outside areas if Option 1 is selected.

Suboption 1 and Option 2 would also provide an incentive for vessels to preemptively change their behavior to stay below the corridor PSC limit, but the risk that pollock catch could not be fully recovered after a closure is less than Option 1. Suboption 1 would exempt 11 stat areas from closure after the PSC limit was met. Approximately 47% of the pollock caught in all 40 corridor stat areas occurred in these 11 exempted areas from 2011 to 2023 (Table 3-60). Option 2 would allow the IPAs to manage the inseason corridor closure including the ability to select the stat areas to close if the corridor PSC limit was met. The potential for Option 2 to place pollock at risk of not being harvested would be the same as Suboption 1 if the IPAs selected the same 11 stat areas. Option 2 provides even greater operational flexibility because up to 21 stat areas could be exempted from closure and so it is less likely that pollock catch would be at risk of being displaced and/or not being recovered if the PSC limit were met.

Bycatch reductions could also be achieved by corridor closure that redistributes fishing effort to outside areas (Option 1) or a limited number of exempted areas inside the corridor (Suboption 1 and Option 2). However, it is challenging to determine which inseason corridor option may have the greatest impact *after* a closure because the outcome depends on the amount of pollock catch displaced, the PSC rates in the areas that vessels move to, and many other nuanced factors. The reader should also note that the best scientific information available to the analysts was different for each corridor option and so the quantitative results of the impact analysis are not directly comparable (see Section 3.1.5).

Option 1 has high potential for reducing chum/WAK chum salmon PSC after a closure so long as the chum salmon PSC rates in the stat areas outside the corridor where fishing effort is redistributed are not substantially greater. Based on the historical data from 2011 to 2023, chum salmon PSC rates were typically lower outside the corridor compared to within, which would indicate savings potential. However, redistributing one or more sectors in some years (2019 and 2020, for instance) would have increased the risk of creating a negative impact on chum salmon. For example, the inshore sector's July 2019 chum PSC rate in genetic cluster 3 (1.94 chum/mt of pollock) was greater than its corridor PSC rate (0.28 chum/mt). The inshore sector would have met a 50,000-chum salmon PSC limit in 2019 under all apportionment options on either June 29 or June 22 (Table 3-15). Across all apportionment options, the amount of displaced pollock catch greater than 200,000 mt. This example helps to illustrate a potential future impact in that, if vessels move to fishing areas with substantially greater PSC rates, it would increase the risk of greater WAK chum salmon PSC.

The impacts of **Suboption 1** after a closure occurred were evaluated using a Fleet Movement Model that redistributed pollock catch on a weekly basis to open stat areas where historical catch occurred and in proportion to the distribution of historical catch in each area (Section 3.1.5). Note there were weeks when the model was unable to redistribute catch to outside areas because no fishing occurred outside of the corridor. Changes in PSC are not estimated in these weeks and so the estimates would be different from what is reported if the model could displace fishing effort. Readers should focus most on the direction of the estimated net changes in PSC as either positive or negative and not the actual values reported.

In all years a corridor PSC limit and apportionment combination were met, the model's displacement of pollock catch from the 29 of the 40 stat areas that would close under Suboption 1 projected chum/WAK chum salmon PSC reductions, although the outcomes were close to neutral in some cases. The consistency in the direction of the net change estimates was driven by the higher historical bycatch inside the 29 stat areas compared to all other stat areas where fishing occurred (Figure 3-33). These results are promising in terms of the potential for PSC reductions, but it must be noted that vessel operators balance multiple objectives (target catch/quality/CPUE, timing, and various non-target groundfish and PSC species constraints) and so the decisions they would make in the future could be different from what was done in the past.

Option 2 would allow the IPAs to select the number and location of stat areas to close inside the corridor (between 19 and 29 of 40) with oversight and approval by NMFS. Whether Option 2 would reduce chum/WAK chum salmon PSC compared to status quo depends on the stat areas selected by the IPAs and the subsequent fishing behavior. While the IPAs could select stat areas with relatively low impact on their fishing behavior, their selections must also consider historical chum salmon PSC and genetics data. Historical data on the distribution of pollock catch and chum salmon PSC inside corridor stat areas shows each year of fishing was slightly different and that the IPAs would likely need to consider tradeoffs among stat areas when making their selections. For instance, the IPAs could close stat areas based on the highest historical chum salmon PSC rates but doing so may actually restrict fishing in stat areas where the WAK chum salmon encounters were historically low (*e.g.*, stat areas 675530 and 685600). The IPAs could also close stat areas with comparatively low pollock catch and higher WAK chum salmon bycatch rates (*e.g.*, stat areas 665500 and 685630). More nuanced tradeoffs are likely to emerge among stat areas with comparable catch and PSC. In these scenarios IPA and cooperative managers may rely more heavily on fishermen's local knowledge (LK) on chum salmon PSC encounters including the depth and contours when making selections.

Option 3 would suspend the inseason corridor and closure provisions in years following high Yukon summer and fall chum salmon returns. If Option 3 were selected as a component of Alternative 5, it would not be expected to have a positive impact beyond the status quo in years when the management measure is suspended. However, if future conditions and abundance are similar to what occurred under the status quo, selecting Option 3 is not expected to greatly reduce the potential positive impacts to chum/WAK chum salmon under Alternative 5. This is because the thresholds being considered would not

have suspended the inseason corridor in any analyzed year under Suboption 2 (90th percentile) and in 2 of 13 years under Suboption 1 (75th percentile).

Option 4 would shift the start of the Winter HSA from September 1 to September 30, allowing continued pollock fishing in this area during September if the herring PSC limit is met. This would mainly provide a benefit to the CDQ and CP sectors which have historically fished in the area (2011–2023) and is expected to have a relatively neutral effect on chum and WAK chum salmon.

Combined Effects of Alternatives 2 or 3 and 5 on Chum and WAK Chum Salmon

Selecting Alternative 2 or 3 in combination with Alternative 5 would create a regulatory program with dual chum salmon PSC limits. A potential benefit of this scenario is that the overall chum salmon PSC limit under Alternative 2 or 3 would place a hard cap on the number of chum salmon that could be incidentally taken as bycatch, regardless of whether those fish are encountered inside or outside the corridor or during the closure window. “Layering on” an overall PSC limit to an inseason corridor chum salmon PSC limit would reduce the uncertainty associated with an inseason corridor PSC limit that would allow directed fishing to continue in exempt areas after it is met. Moreover, selecting Alternative 2 or 3 in conjunction with Alternative 5 would likely reduce WAK chum salmon PSC because the inseason corridor and closure window (June 10 – August 31) spatially and temporally overlaps the majority of the WAK chum salmon bycatch since 2011. However, the relative effectiveness of a combined approach would depend on where the limits are set as lower or mid-range caps would create stronger incentives for bycatch reduction, while higher caps may lead to outcomes closer to status quo. Section 3.3.4.7 of the analysis provides a broader discussion of potential impacts on chum salmon from adopting a combination of alternatives.

Western and Interior Alaska Chum Salmon Users

The recent and ongoing declines in chum salmon (and Chinook salmon) abundance have resulted in a crisis for people, communities and Tribes across Western and Interior Alaska. WAK chum salmon play a vital role in the food security, food sovereignty, cultural practices, and wellbeing for communities and Tribes throughout their range in Kotzebue Sound in the north, south through Bristol Bay, as well as throughout the full extent of the Yukon River (see Section 4.4.3.1, Section 4.4.3.2, as well as Appendices 8, 9a, and 9b that were independently authored by KRITFC and TCC, respectively). While many factors have contributed to this crisis, the proposed action is narrowly focused on minimizing chum/WAK chum salmon bycatch in the Bering Sea pollock fishery, to the extent practicable. People, communities, and Tribes across Western and Interior Alaska may indirectly benefit if the reductions in WAK chum salmon bycatch result in increased returns. Due to this relationship, the potential impacts to these groups are an extension of the impacts to WAK chum salmon under each alternative.

The potential future outcomes for Western and Interior Alaska chum salmon users under the proposed actions would depend on the alternative(s) and options selected, harvests in other fisheries, environmental conditions, the strategies pollock harvesters use to avoid chum salmon, the location and timing, good aggregations of pollock that can sustain fishing, and the genetic mixture of the bycatch, among many other nuanced factors. There are also external factors that may limit the potential benefits of the proposed actions from materializing for Western and Interior Alaska chum salmon users. In the future, the environmental conditions may be different from today, and/or the “saved” chum salmon may face additional mortality factors including being caught in directed salmon fisheries at sea (see also Figure 4-28). **These dynamics, along with other considerations such as the fact that, on average the CWAK bycatch is estimated to be less than 1.75% of total harvests on these stocks and the average pollock fishery bycatch impact rate on the Upper/Middle/Yukon stock has been 1.0%, and the reality that the magnitude of the bycatch reductions that could be expected under each alternative are uncertain (see Section 3.3.4 and Section 4.5), make it challenging to evaluate the extent to which the alternatives will achieve their intended benefits.**

Alternative 1

Selection of Alternative 1 is expected to maintain the current variable of chum bycatch in the pollock fishery. WAK chum salmon abundance could change in the future due to factors independent from bycatch in the pollock fishery with impacts (either positive or negative) to Western and Interior Alaska chum salmon users.

Alternative 2 or 3

An overall PSC limit set at the lower end of the analyzed range under Alternatives 2 or 3 is expected to reduce WAK chum salmon PSC relative to no action. Given the interannual variability in the stock composition of the bycatch each year, results for WAK chum salmon PSC are more uncertain at medium and higher PSC limits given fishing behavioral changes that may occur, but the analysis estimates reductions in AEQ WAK chum salmon relative to past catch and bycatch trends. Section 4.5.2.1 compares the reductions in AEQ WAK chum salmon bycatch that would have occurred (2011–2022) to the Yukon summer and fall chum salmon runs.

Based on the analysis, it does not appear that an overall chum salmon PSC limit of 100,000 fish would have provided measurable improvements towards meeting escapement in years with very low abundance. The potential reductions in the AEQ bycatch for the CWAK group would also be widely diffused across river systems from Kotzebue Sound in the north down through Bristol Bay and there is no way for the analysts to predict the proportion of saved fish that would return to any given system/area. Based solely on historical catch and bycatch trends described in the analysis, it is expected that the potential benefits would largely manifest as marginal improvements of abundance, rather than increased subsistence or commercial fishing opportunities. However, the analysis cannot quantify the impact of expected changes in fishing behavior in an effort to remain under the PSC limit, which could result in additional WAK chum salmon savings, as well as a risk that a decrease in overall chum salmon bycatch is accompanied by an increase in WAK chum salmon bycatch, as previously discussed.

Alternative 4

Including Alternative 4 in a PA would codify the recent IPA amendments and subsequent changes in fishing behavior into Federal regulations. Although external factors may also be contributing, recent years' bycatch has been substantially lower than the 2021 B season. Establishing these provisions in regulation would likely continue to have a positive impact relative to no action which would allow the IPAs to lift the more recent measures used since 2022. Thus, selection of Alternative 4 would likely provide benefits to WAK chum salmon users, although the analysis cannot predict whether they would be greater than what has occurred since 2022.

Alternative 5

Alternative 5 could have a positive impact on WAK chum salmon PSC relative to no action by vessels preemptively changing their behavior while fishing inside the corridor and/or if they are required to move outside of the inseason corridor. Option 1 may hold greater potential to positively impact WAK chum salmon users, so long as vessels are not displaced to areas with higher total or WAK chum salmon PSC rates and the B season is not extended with negative impacts to Chinook salmon. While each corridor option could have unintended negative consequences from fleet movement, the risk is greater under Option 1 compared to Suboption 1 and Option 2 which presents a clear tradeoff. The analysis cannot quantify the net change in the AEQ bycatch due to any option.

Broader Implications

Even if the proposed alternatives result in only a relatively small increase in the number of returning chum salmon to Western Alaska, there could be broader benefits to communities and ecosystems alike (see Sections, 4.5.5.1, 4.5.5.3.2, and 4.5.5.3.3). The potential reductions in WAK chum salmon bycatch may be able to make marginal increases in spawning abundance, and in doing so, could aid opportunities

for directed fisheries and/or longer-term positive effects on salmon populations. Again, other factors outside of the proposed action could either amplify or diminish its potential benefits. If the bycatch reductions occur alongside positive cumulative factors (e.g., favorable environmental conditions for chum salmon), the positive impacts could be more substantial, as expressed in the independently-authored submissions provided by KRITFC and TCC (see Appendix 8 and 9) and extensive public testimony received by the Council in April 2024 and February 2025. Positive factors could cumulatively aid in broader implications such as improved food security and food sovereignty, enhanced community cohesion, and the facilitation of intergenerational knowledge transfer potentially restoring human-salmon-ecosystem relationships.

Considerations Related to Fleet Responses and Other PSC Species

The Bering Sea pollock fishery currently operates under a Chinook salmon hard cap that is in effect during the A and B seasons (see 50 CFR 679.21(f)(2)), as well as the annual herring PSC limit that triggers a series of time/area closures if it is met (see 50 CFR 679.21(e)(7)(vi) and 50 CFR 679.21(e)(7)(vi)(B)(1)). Selection of Alternatives 2 or 3 and/or 5 would add one or two additional chum salmon PSC limits to this mix. If the pollock fishery is required to operate under one or more chum salmon PSC limits in the future, vessels will work to avoid all PSC species to the extent practicable. However, operating under multiple constraining PSC limits for spatially and temporally distributed PSC species may inherently limit the ability to balance and optimize its operations for all PSC species. Alternative 4 is not expected to hold similar constraints or tradeoffs for the fleet because it has operated under the IPAs since 2010 and has largely operated under the provisions in Alternative 4 since 2022.

Chinook Salmon

An objective of the proposed action is to maintain the priority for the current Chinook salmon bycatch avoidance program (see Section 1.1). As such, the proposed alternatives must be considered against their potential impact to Chinook salmon PSC. The pollock fishery's Chinook bycatch is managed under a hard cap that is in place during the A and B seasons and indexed to Western Alaska Chinook salmon abundance (see 50 CFR 679.21(f)(2)) as well as an incentive program (see 50 CFR 679.21(f)(12)). Since the hard cap took effect in 2011, the pollock fishery's bycatch has averaged approximately 18,000 Chinook compared to an average of approximately 41,000 Chinook from 1991–2010. The pollock fishery's impact on the Upper Yukon genetic reporting group was less than 1.0% of the run size except for 2022 when the impact was 1.1%, and the fishery's impact on the combined WAK stocks averaged 2.02% (2011–2023).

The proposed action alternatives that create incentives for chum and WAK chum salmon avoidance could have a wide range of subsequent impacts to Chinook salmon PSC.

Potential for Chinook Salmon PSC Reductions Under Alternatives 2 or 3 and 5

Chinook salmon PSC is only expected to decrease under Alternative 2 or 3 if pollock fishing during the B season ends earlier than it otherwise would have because the overall chum salmon PSC limit is met. Chinook encounters increase in September and October and so an early closure, even relatively late in the B season could provide a benefit to Chinook. Across all years that an overall chum salmon PSC limit of 100,000 fish would have been met, Chinook salmon PSC would have been reduced by an average of approximately 5,200 to 5,400 fish. These values represent an upper bound for the positive impact on Chinook that would be expected under Alternative 2 or 3.

Chinook salmon PSC is not expected to decrease under Alternative 5 as vessels respond to a time/area closure triggered by a chum salmon PSC limit. If vessels are able to carefully balance their operations while operating under an inseason corridor set in regulation, the impact to Chinook salmon PSC would be neutral. While the number of Chinook salmon incidentally taken in the future could be lower, there is no reason to expect it would be *due to* the behavior changes motivated by Alternative 5. Of the three inseason corridor options under consideration, Option 2 is expected to be the most likely to have a neutral

impact on Chinook PSC because it provides greater operational flexibility and presents the lowest risk of displacing large amounts of pollock catch later in the B season.

Potential for Chinook Salmon PSC Increases Under Alternatives 2 or 3 and 5

Chinook salmon PSC is expected to increase if greater pollock catch is shifted to September and October than would have otherwise occurred under Alternative 2 or 3 and 5. This is because the timing of chum/WAK chum salmon PSC encounters and peak pollock harvests are dissimilar to Chinook PSC. Nevertheless, the pollock fishery's Chinook PSC would continue to be constrained by the existing hard cap and incentive program. Greater pollock catch could be moved to later months in the B season under Alternative 2 or 3 if the pace of the fishery slows down (*e.g.* longer trips and intermittent or slower shoreside deliveries, lower CPUE, among other reasons) due to the behavior changes used to stay below the chum salmon hard cap. A similar dynamic is possible for Alternative 5.

An overall PSC limit of 100,000 chum salmon would have been the most constraining for all sectors and was shown to result in the greatest forgone pollock. This suggests selecting a PSC limit at the lower end of the range could motivate the greatest response in fishing behavior to stay under the chum salmon hard cap, increasing the likelihood that catch is diverted to later months. A PSC limit of 75,000 chum salmon under Alternative 3, Option 1 would motivate even greater behavior changes but only in the years it would apply. Under Alternative 5, Option 1 was shown to displace the greatest amount of pollock catch that would need to be recovered in outside areas to not risk extending the B season.

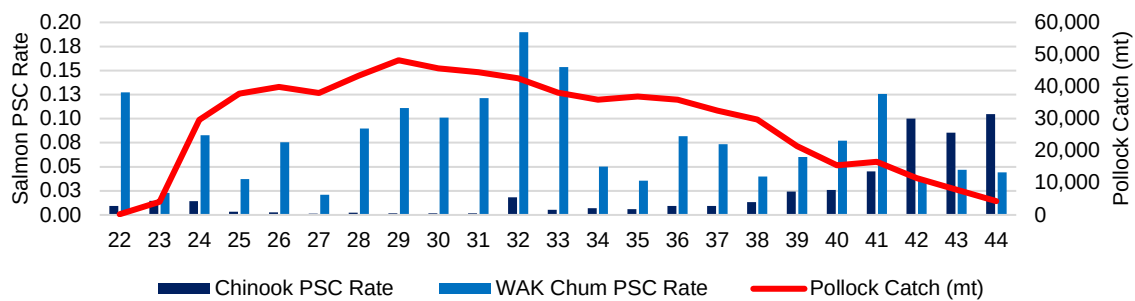


Figure 1-7 Average weekly WAK chum salmon and Chinook salmon PSC rate compared to the average pollock catch (mt) across statistical weeks during the B season, 2019–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Herring

Chum salmon, WAK chum salmon, and herring are encountered by the pollock fishery at relatively similar times during the B season. The location of these PSC encounters varies year-to-year but has sometimes presented the fleet with sub-optimal choices in fishing location because the areas with the lowest chum salmon PSC rates had greater herring PSC rates and vice versa (Table 2-38). The dynamics that would drive impacts to herring PSC are similar to what was described for Chinook PSC directly above. For instance, herring PSC is only expected to be reduced *due to* Alternative 2 or 3 if the B season closes earlier than it otherwise would have because the chum salmon hard cap is met.

However, the impact of Alternatives 2, 3 and/or 5 on herring PSC is also expected to be driven by how the fleet changes its fishing behavior inseason to respond to a chum salmon PSC limit set in regulation. If vessels are able to carefully balance their operations while operating under a chum salmon PSC limit in Alternatives 2 or 3 and/or 5, the impact to herring PSC could be relatively neutral. The similar timing of encounters but somewhat dissimilar locations of bycatch “hot spots” for each species suggests fleet movement to and from different areas would be a driving factor for herring. The alternatives and options that are most likely to have a negative consequence for Chinook by extending the B season are also the most likely to have a negative consequence for herring PSC, should the alternatives and options motivate more frequent movement or constrain the fishing area available to vessels.

Bering Sea Pollock Fishery

The proposed actions (Alternative 2–5) would apply new chum salmon bycatch regulations to the Bering Sea pollock fishery. With a focus on minimizing WAK chum salmon bycatch to the extent practicable, all of the proposed management measures are intended to either incentivize or require different fishing behavior from the Bering Sea pollock fleet. **Thus, relative to no action, these alternatives are not expected to result in cost savings or benefits to pollock harvesters, processors, and associated communities. Rather, these entities would experience either neutral or adverse economic impacts.**

Alternative 1

Recent participation in the Bering Sea pollock fishery during the B season has included 83 inshore CVs and the 6 shore-based processors they delivered to; 4 motherships that have accepted deliveries from 18 mothership CVs at-sea; 16 CPs, and 6 CDQ groups representing 65 coastal Western Alaska communities (2011–2023).

The landed value of the Bering Sea pollock fishery has made it one of the highest grossing fisheries in the nation (NMFS, 2024c) which supports a wide range of economic impacts within Alaska and across the nation. The TAC is nearly fully prosecuted each year with the fishery averaging 98% of its annual allocation during the analyzed time series (Table 4-2). This has resulted in a relatively reliable source of tax revenues for the State of Alaska, the Aleutians East Borough, and the communities of Akutan, Unalaska, and (formerly) King Cove. These three communities are home to the 6 shore-based processors participating in the fishery and support sector businesses. These processors are highly dependent on the pollock fishery because the magnitude and relative stability helps to balance the high costs and risks associated with operating in remote communities across the Aleutian Islands. The Bering Sea pollock fishery has also provided these processors the economies of scale needed to support the processing of other commercially important species (*e.g.*, crab, halibut, sablefish, Pacific cod, among others) and to withstand the variable markets of their plants in other communities.

On average, the B season pollock fishery has annually supported approximately 2,300 crew positions on vessels and 1,700 positions at shoreside processing facilities over the last decade (2014–2023). The owners of vessels that participate in the pollock fishery reside primarily in the Pacific Northwest (*e.g.*, Seattle, WA and Newport, OR) and Alaskan communities (*e.g.*, Kodiak and Unalaska). The CDQ groups are associated with approximately 29% of the total directed fishery through CDQ pollock allocations and direct investments in AFA companies. Revenue from the Bering Sea pollock fishery makes up a large portion of funding for CDQ groups, allowing them to support community programs and their other activities.

At the same time, the Alaska seafood industry has faced challenging economic conditions on the local, national, and global scale during the analyzed period. Companies are facing greater costs while international competitors are harvesting pollock in greater volumes and with increased efficiency. Companies and fishery participants alike are also navigating trade conflicts and other geopolitical factors that have created uncertainty and vulnerability for future market conditions.

Alternative 1 would maintain all aspects of the current chum salmon bycatch program. While many factors will contribute to changes in the future economic and social dynamics for fishery participants, affiliated companies, and communities, selection of Alternative 1 would not contribute to these changes.

Alternatives 2 and 3

Alternative 2 or 3 are expected to result in either neutral or adverse economic impacts on the Bering Sea pollock fishery compared to no action. Under an overall chum salmon PSC limit vessels and cooperatives will weigh the risks of pollock fishing ending early in the B season and modify their behavior as able to avoid a closure and minimize associated revenue losses.

Operational changes could increase avoidance costs. If vessels are more responsive to chum salmon PSC rates, they may need to conduct more test tows, fish further from port, move more often including moving away from areas of good pollock aggregation and/or size/flesh quality to less desirable fishing areas which could increase fuel costs and subsequently the cost per unit of catch. Decreased operational efficiency may contribute to a longer B season, increasing other variable costs, impacting crew, and increasing the risk of greater Chinook PSC. Impacts of increased chum salmon avoidance may also extend to shoreside processors and communities if the strategies employed result in slower or interrupted deliveries or lower valued products due to increased travel time or fishing sub-optimal locations.

Vessels within the fleet would be impacted differently by an overall chum salmon PSC limit. The IPAs or cooperatives could choose to internally sub-divide a chum salmon PSC limit down to the vessel-level as is done under the Chinook program. If they do so, vessel owners will need to consider the amount of chum salmon they *could* catch in a single trip, relative to the sub-divided limit. For example, the inshore sector would have been most impacted by a PSC limit of 100,000 chum salmon and the AFA apportionment (Option 4). If the overall PSC limit is apportioned down to the vessel-level, based on the methods described in Appendix 6, the inshore CVs that were active in 2023 would have received a minimum limit of 15 chum salmon and a maximum limit of 2,285 chum salmon to remain under at this lowest PSC limit and AFA apportionment. These amounts represent “vessel-level caps” that would not be part of Federal regulations but may be part of the cooperative’s management. Of the inshore CVs that were active in 2023:

- 4 vessels that would have hypothetically been apportioned the greatest amounts, would have a limit of between 1,500 and 2,285 chum salmon. In comparison, across the most recent five-year period (2018 –2023), these vessels caught between 0 and ~8,000 chum salmon per trip.
- 7 vessels would have been hypothetically apportioned a limit of less than 100 chum salmon. In comparison, across the most recent five-year period (2018 –2023), these vessels caught between 0 and ~2,300 chum salmon per trip.

This suggests an overall chum salmon PSC limit set at a lower amount would pose a risk for all vessels, regardless of their capacity (see Section 4.3.2.1 and Appendix 6). Given substantial operating costs, both harvesters and processors would need to make preseason decisions about whether and how to operate given these risks. This risk may carry different implications for economic viability and sustained participation across the fleet. **While this example is specific to the inshore sector, the insights it provides apply more broadly across the fleet.**

Changes in fishing behavior to avoid chum salmon while targeting pollock may delay or prevent a closure, but if a sector is unsuccessful and closed early, the unharvested pollock would directly affect revenue generated from the fishery. A frame of reference for the magnitude of this potential impact is provided by evaluating gross revenue hypothetically forgone had the limits been in place from 2011–2023. **Because these values do not account for the behavioral changes that are expected to occur should a chum PSC limit be implemented, they are expected to be an upper bound on future direct gross revenue impacts.** Additionally, gross revenue estimates do not account for the likely impacts on

operational costs described directly above, as cost data are not available to analysts.⁶ Instead, potential impacts on costs are discussed qualitatively.

The magnitude of unharvested pollock and the implications for revenue were highly dependent on the amount of the PSC limit and the year (see tables and figures in Section 4.3.2). The choice of apportionment is a policy decision that must weigh a sector's historical and expected future chum salmon encounters, along with the objective of reducing WAK chum salmon. The apportionment option used was less of a determining factor for whether the mothership and CDQ sectors would have closed and there was a smaller marginal difference in these sectors' potentially forgone gross revenue. **The marginal difference between the apportionment options for the CP and inshore sectors was greater, and there is a direct tradeoff between the two.**

A retrospective analysis of the application of a 100,000-chum salmon limit to historical catch revealed that the CP, mothership, and inshore sectors would all have experienced an early closure in the majority of the years between 2011 to 2023. While increased avoidance efforts may reduce or prevent this impact in some years, the prevalence of hypothetical closures at this PSC limit may require wholesale changes in harvest strategies in a way that is difficult to predict, as it may be different than past harvest strategies. A high risk of early closure to CPs could also impact the CDQ group's harvest opportunities, if lease contracts shift to prioritize harvesting non-CDQ pollock. In comparison, a 325,000-chum salmon PSC limit was estimated to close early in less than half of the years evaluated for each sector and apportionment, mitigating some of the forgone gross revenue relative to a 100,000-chum salmon PSC limit. A 550,000-chum salmon PSC limit was estimated to have ended the B season early for all sectors in 0 to 2 years, depending on the apportionment (see Section 4.3.2).

If a pollock sector reaches its chum PSC limits and ceases fishing earlier than it otherwise would have, there would be a broader scope of negative impacts to pollock fishermen, processing crew members, shore-based processors, CDQ groups, and pollock-dependent communities. Moreover, unpredictable harvest amounts or B season ending dates could destabilize shoreside processing operations in a manner that has wider implications for non-pollock communities and fishermen. These impacts would be experienced cumulatively with recent declines of other key Alaskan species, increasing costs of operation in remote locations, and global market challenges.

The cap amounts being considered under **Alternative 3, Option 2** are the same as Alternative 2 and thus the potential for adverse impacts are expected to be similar in years when a cap is in place. When a chum salmon PSC limit would not be in effect, the impacts to the pollock industry would be similar to status quo. A 75,000-chum salmon cap is possible under **Alternative 3, Option 1**, if the cap set when one area fails to meet its threshold is 100,000 chum salmon. In the limited number of years that a 75,000-chum salmon PSC limit could have been in effect, the potential adverse economic impacts to the pollock harvesters, processors, and associated communities would be greater in magnitude.

Alternative 4

Alternative 4 would add six new provisions into Federal regulations and essentially codify operational changes the fleet has adopted in recent years, with some new additions. Thus, avoidance costs may increase relative to what is required under status quo regulations. However, to the extent these new provisions increase avoidance costs, the majority of these costs have likely been incurred in recent years and would continue with the adoption of Alternative 4.

Alternative 5

Implementation of an inseason corridor with closure provisions under Alternative 5 would have neutral or adverse economic impacts on the Bering Sea pollock fishery compared to the status quo,

⁶ Fuel costs are obtained from the Amendment 91 Economic Data Reports, which are in the April 2024 version of the preliminary DEIS, available at the archived eAgenda for the April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

but the inshore sector and smaller capacity CVs may be particularly impacted. The degree of adverse impacts would vary based on the inseason corridor option and PSC limit selected. Vessels may be affected by Alternative 5 both prior to a closure and if/when a closure occurs. The level of impact also depends on the vessel's perception of the risk, consequences of a closure, and the actions prior to a closure. Impacts would also be experienced if a closure occurs and vessels are displaced outside of the corridor or choose to stand down until the corridor reopens on September 1.

Option 1 would be expected to have the greatest economic impact relative to the other corridor options because it would impose the largest closure after the corridor PSC limit is met, although the risk and consequences of this option would differ by sector.

The high dependency of the **inshore** CVs on this area historical (Table 3-12), as well as the shoreside delivery requirement, suggests a full corridor closure would present a significant consequence to these vessels in the future. If a PSC limit is perceived as a risk, inshore CVs would modify their fishing behavior inside the corridor as able to constrain their bycatch against the corridor PSC limit in order to maintain access to historically important fishing grounds. They also may encourage some vessels to fish outside the corridor because any chum salmon PSC would not accrue to the corridor PSC limit. Either strategy could increase operational costs, decrease efficiency, and/or affect the pace of deliveries, which would create challenges for shoreside processors.

If the cap is met, Option 1 would require all impacted CVs to move to areas outside the corridor's perimeter to continue fishing B season pollock through August 31. Given the pre-existing area closures for trawl gear in the Bering Sea, inshore CVs would likely travel northwest if they could make the trip safely and it was economically viable for them to do so. Given the broad closure area which includes areas near port, CVs that are smaller, lower capacity vessels would be disproportionately challenged in the event of a full corridor closure.

If and when a closure occurs would dictate the level of impact for the inshore sector as well as inshore processors (Table 3-13). For instance, the changes in inshore operations that would be required if the corridor PSC limit is met at the end of August would not be as drastic as what would be required if the limit is met on July 1. An inseason corridor closure that occurs earlier in the window could extend the inshore sector's B season, increasing variable costs of operation and the risk of greater Chinook salmon PSC.

The retrospective analysis shows a substantial amount of inshore pollock could have been displaced under Option 1 (*e.g.*, up to ~86% of the sector's pollock harvested inside the corridor during the closure window under a 50,000-chum salmon PSC limit using the AFA apportionment (Option 4) in 2019; Table 3-15). The revenue associated with this potentially displaced pollock would have been 'at risk' and needed to be recovered outside the corridor or after September 1 to mitigate the economic impact (Table 4-29). If this level of displaced catch occurred in the future it could adversely affect shoreside processors, even if the full B season TAC was harvested. Since all inshore CVs would need to travel outside the closed corridor to harvest pollock, the additional travel time between deliveries could result in interrupted and inefficient processing. **The likelihood that the inshore sector would forgo some amount of B season TAC is greater under Option 1 compared to Suboption 1 or Option 2.** Unharvested B season pollock could have broader implications across for harvesters, processors, CDQ groups, and communities as described under Alternative 2 or 3.

The **offshore sectors** had variable dependency on the corridor, with the mothership sector demonstrating the greatest average level of harvest in this area for the offshore sectors (Table 3-12). However, it is expected that all sectors value the operational flexibility this large area provides, given dynamic fishing conditions. Therefore, the offshore sectors may also choose operational strategies to prevent a closure. Similar to the inshore sector, this could look like more fishing outside of the corridor area in the early B season or fishing inside the corridor with increased avoidance strategies, to the extent possible. These strategies may come at a lower cost for offshore vessels if they were already intending to travel northwest

in the B season, but a higher cost if it results in moving into sub-optimal fishing grounds where they cannot produce the intended products due to size or quality of the pollock. These strategies could also risk extending their season if they are moving to areas with lower CPUE. The motivation to change fishing and incur additional avoidance costs may diminish the closer it is to August 31.

If a closure occurs, CPs are expected to travel further northwest, where they also have had historical dependency in the B season. Depending on the point in the B season when a corridor closure occurs the mothership sector may also move northwest or may choose to stand down until the corridor area reopens. The apportionment choices for Alternative 5 have a significant marginal effect in the risk of a closure for the CP and CDQ sectors, given the lower historic of catch and bycatch in this area relative to the inshore sector.

Suboption 1 and Option 2 are expected to mitigate some of the adverse economic effects for the pollock sectors compared to Option 1. This is because these options would define either 11, or between 11 and 21, of the 40 corridor stat areas (respectively) to remain open if the PSC limit is met. This would likely:

- decrease the amount of pollock catch that would be displaced in the event of a closure, due to fewer closed areas, which would result in less revenue at risk,
- provide more options for pollock fishing to be redistributed to by including the 11 exempted stat areas, which would increase the likelihood that revenue at risk could be achieved outside of the closed stat areas,
- provide near-port fishing opportunities during a corridor closure, which would reduce the adverse distributional impacts on smaller/ lower capacity CVs that may otherwise be challenged to continue fishing outside of the corridor closure area, and
- change the magnitude of the consequence of a closure, which may influence the preemptive measures taken and the avoidance costs willing to be incurred in order to prevent a closure.

Table 1-5 shows the inshore and mothership sectors would have met a corridor PSC limit of 50,000 chum salmon in the majority of years, suggesting these sectors are more likely to trigger closures under the lowest PSC limit in the future, unless changes in their operational strategies can prevent them. The higher PSC limits considered would reduce both the potential risk of a closure and the expected consequences of closure as less revenue is likely to be at risk from displaced catch. Table 1-5 also demonstrates that while the risk of a closure under a given PSC limit may be the same as Option 1, the consequences of Suboption 1 would be expected to be reduced in terms of revenue at risk. The reduction in revenue at risk between Option 1 and Suboption 1 demonstrates that in some years, these additional open areas were shown to substantially alleviate the risk from a corridor closure, however in some years the adverse impacts would persist (see also Table 4-30 and Table 4-31).

Table 1-5 Summary of the number of years where B season corridor closures hypothetically would have occurred and gross first wholesale revenue at risk from an Option 1 or Suboption 1 corridor closure, not accounting for behavioral changes, 2011-2023

Sector	Apportionment	Number of years fished in corridor (out of 13)	50,000 corridor PSC limit			350,000 corridor PSC limit		
			Number of years closure is triggered	Average annual revenue at risk under Option 1 (millions of 2022\$)	Average annual revenue at risk under Suboption 1 (millions of 2022\$)	Number of years closure is triggered	Average annual revenue at risk under Option 1 (millions of 2022\$)	Average annual revenue at risk under Suboption 1 (millions of 2022\$)
CDQ	Least adverse: AFA	12	4	\$8.7	\$5.0	2	\$2.9	\$1.8
	Most adverse: 5-yr avg		4	\$9.7	\$5.2	2	\$2.9	\$1.8
CP	Least adverse: AFA	13	4	\$16.4	\$15.1	1	\$3.4	\$3.4
	Most adverse: 3-yr avg		6	\$26.2	\$22.8	3	\$8.4	\$8.3
Inshore	Least adverse: 5-yr avg	13	12	\$108.5	\$34.0	1	\$6.2	\$3.2
	Most adverse: AFA		12	\$127.3	\$42.3	1	\$7.7	\$4.1
Mothership	Least adverse: 3-yr avg	13	6	\$10.6	\$4.0	1	\$2.1	\$1.2
	Most adverse: 5-yr avg		6	\$11.8	\$4.8	1	\$2.1	\$1.2

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Thus, relative to no action, Suboption 1 may result in adverse impacts to the pollock fishery, depending on the corridor PSC limit that is selected. Similar to Option 1, the perception of risk and consequence is expected to drive behavior prior to and regardless of whether a closure occurs. Because the conditions on the grounds will not be known at the beginning of the season, vessels (in particular inshore CVs) will likely use operational strategies previously described inside and outside of the corridor to preserve their operational flexibility later in the B season.

Option 2 provides the most operational flexibility compared to the other corridor closure options under Alternative 5, thus likely reduced economic impacts relative to other corridor options. The economic effects of Option 2 could mirror those of Suboption 1, if the IPAs defined the same 11 stat areas to be exempt from the corridor closures. However, Option 2 includes the possibility for a greater number of stat areas inside the corridor to remain open (up to 21 of 40), and these stat areas could change over time to be responsive to shifting conditions. The IPAs would select the exempted areas based on historical pollock CPUE, chum salmon bycatch, and relevant genetic data. Depending on how these factors are weighed this could exempt a substantial portion of the historical fishing grounds from closing in the event the cap is met. However, these areas must be defined prior to the season, at which point pollock aggregations and fishing conditions are unknown. Thus, the incentive to preserve operational flexibility may come at an operational cost relative to status quo.

Adopting **Option 3** as an element of Alternative 5 could reduce the economic impacts from the management measures in years when summer and fall chum salmon returns to the Yukon River are high. In these years, there may be no marginal impact from the corridor measures because there would be no risk or consequences of a closure. In years where the thresholds are below the 75th and 90th percentiles of historical abundance for the Yukon River summer and fall chum salmon runs, the corridor limits would be in place and in these years the expected economic impacts would mirror those described without Option 3.

Option 4 could provide the fleet additional flexibility by allowing directed fishing for pollock with trawl gear to continue inside the Winter HSA throughout the month of September, *if the pollock fishery had attained its apportionment of the herring PSC limit*. This option is intended to provide the pollock fleet with some additional flexibility as increased prioritization of chum salmon PSC avoidance may increase the likelihood of triggering the herring PSC cap. To the extent this option provides additional cost savings to the pollock fleet, it will likely be as an operational flexibility to the CP, CDQ or possibly the mothership sectors in years where chum salmon PSC and herring PSC are difficult to avoid in tandem. While this area has not accounted for substantial B season harvest in previous years, future pollock

aggregations may be different and access to additional fishing ground in the month of September may provide beneficial flexibility.

Combined Effects of Alternatives 2 or 3 and 5 on Pollock Fishery Costs

Adopting a combination of alternatives may increase the costs relative to the alternatives on their own, as further described in Section 4.3.6. For example, an overall chum salmon PSC limit in combination with an inseason corridor chum salmon PSC limit, may drive more complex operational decisions. How these management measures and the incentives they generate interact depends on the amount and the apportionment of the chum salmon PSC limits, the inseason corridor selected, vessels' ability to change their fishing behavior and operations to stay below multiple chum salmon PSC limits, and future environmental conditions affecting pollock aggregations and salmon bycatch encounters. An overall chum salmon PSC limit would generate the greatest consequence for any sector compared to any of the other proposed actions because it would end the B season for that sector with no opportunity to fish Bering Sea pollock elsewhere. However, depending on where the limits are set, it could be that the risk of a corridor closure is greater and thus drives behavior.

The combination of a low overall chum salmon PSC limit, alongside a low inseason corridor closure in which the full corridor closes in the event of a sector meeting its cap (Option 1) likely presents the greatest set of adverse impacts for pollock harvesters, processors and associated communities, with the potential to have broader implications. If the sector determines that one or both types of the PSC limits are not of high risk of being triggered, or the corridor cap is lower consequence, the adverse impacts may look more like the evaluation of Alternative 2/3 alone.

Managing and Monitoring the Alternatives

Chapter 5 of the DEIS describes how management of the pollock fishery would change under each of the alternatives and how chum salmon PSC would be monitored. This section of the Executive Summary is narrowly focused on the management and monitoring changes that must be considered at final action. First, and in general, the proposed alternatives do not require significant modifications to the status quo NMFS approach to monitoring, management, and enforcement of salmon bycatch in the Bering Sea pollock fishery. It would be able to utilize the existing approach for both Chinook and chum salmon.

NMFS Suggestions Under Alternative 5, Option 2

Selection of Alternative 5, Option 2 would allow the IPAs to choose the statistical areas that would close and manage the inseason corridor closure. NMFS has outlined several suggestions and recommendations for the Council's consideration regarding Alternative 5, Option 2 if it is included in a preferred alternative (see Section 5.1.5). In particular, NMFS is recommending as follows.

- The Council clarify its intent for the IPAs to explain how the IPAs would use historical chum salmon bycatch, pollock CPUE, and relevant genetics data to select statistical areas in the IPA amendment. NMFS makes all information included in the IPAs publicly available under 50 CFR 679.21(f)(12)(vi).
- The Council consider a provision for vessels that choose not to join an IPA. Under 50 CFR 679.21(f)(12)(ii), no vessel owner or CDQ group is required to join an IPA. For example, the Council could add a provision to prohibit vessels that are not a member of an IPA from fishing in the corridor in the B season. The Council could consider any type of opt-out provision from the range of options and suboptions in the suite of alternatives. Without this provision, a vessel could avoid the Option 2 prohibition on fishing with a designated corridor area by choosing not to join an IPA and would thus not be bound to an IPA-specific corridor closure. Note that any vessels not an IPA would also be subject to the PSC opt-out limit for Chinook salmon under 50 CFR 679.21(f)(5).

Suggestion for the CDQ Reserve Pool Suboption

The concept of a CDQ Reserve Pool was introduced at the February 2025 Council meeting during Initial Review in response to concerns raised by CDQ representatives regarding the apportionment of a chum salmon PSC limit under Alternatives 2, 3, and/or 5. CDQ pollock has primarily been harvested on CPs which have historically had lower chum salmon PSC rates. This practice has an impact on the CDQ sector's apportionment percentages that are based on PSC history. Thus, Apportionment Options 1–3 may make it more difficult for CDQ groups to have their pollock harvested by the inshore or mothership sectors in the future, if a CP platform is not available due to capacity or operational issues, or for other reasons. The CDQ Reserve Pool is intended to provide CDQ group(s) the continued flexibility to harvest CDQ pollock on inshore or mothership CVs, despite a recent history of fishing with the CP sector.

If the apportionment Suboption is selected, the Council motion specified that a CDQ group would need to notify NMFS by November 15⁷ if it plans to fish CDQ pollock with the inshore or mothership sectors to access the CDQ Reserve Pool. Upon such notification, NMFS would apportion an additional amount of chum salmon PSC from the CDQ Reserve Pool to the group(s) based on the sector with which it is associating. This annual determination would not directly affect any other CDQ group or sector as it would be an amount above the established chum salmon PSC limit. All CDQ pollock for that group must be associated with a single sector for the B season and changes could not be made inseason.

However, full use of the CDQ Reserve Pool is unlikely for several reasons, one of which is that CDQ groups have expressed their desire to continue harvesting CDQ pollock on a CP platform (see Section 3.3.4.4.1). Another reason to expect limited use of the CDQ Reserve Pool is the level of planning and commitment needed to take advantage of the flexibility because PSC limits would not be modified mid-year. For example, if a CP that a CDQ group was associated with was no longer available mid-year, that group could not access the reserve pool by notifying NMFS of their intention to associate CDQ pollock with the inshore or mothership sector. Based on the concerns that promulgated its development, the inability to be used in an emergency or unforeseen situations may make this concept less likely to be used.

As described in Section 5.1.2, the CDQ Reserve Pool concept could also be internalized among CDQ groups with contractual agreements, outside of NMFS management. Similar to the buffers that are internally generated in the IPAs for the Chinook PSC limit, a portion of the overall or corridor chum salmon PSC limit(s) could be dedicated for this particular purpose with the contracts stipulating the conditions under which this buffer pool may be accessed by a group. This would not require the Council to select the suboption as currently defined in the motion, nor would it set the terms in Federal regulation. However, a contractual buffer pool would have the advantage of providing access in emergency or unforeseen situations in which CDQ pollock is transferred to an inshore or mothership vessel. This variation on the CDQ Reserve Pool would fit within the analyzed set of alternatives as long as the total chum salmon PSC limit (including this buffer) is within the ranges analyzed under Alternatives 2 and 3.

Policy-Level Tradeoffs

As noted previously, this action is intended to minimize bycatch of chum and WAK chum salmon in the Bering Sea pollock fishery consistent with the Magnuson-Stevens Act, National Standards, and other applicable laws. The MSA requires that every fishery management plan and every regulation implementing those plans be consistent with the National Standards (see Section 6.1), such as:

- minimize bycatch to the extent practicable under National Standard 9, including chum, Chinook, herring, and other species;

⁷ NMFS recommends that the notification deadline for a CDQ group to notify NMFS of its intent be October 15 of the prior year, so that the pool may be incorporated in the proposed annual BSAI harvest specifications.

- take into account the importance of fishery resources to fishing communities including those that are dependent on Bering Sea pollock and subsistence salmon fisheries as required under National Standard 8; and
- to achieve optimum yield in the BSAI groundfish fisheries on a continuing basis, in the groundfish fisheries as required under National Standard 1.

One or more of the National Standards may be in tension with another for any Council action, and so the Council must consider how to balance them when recommending a PA. For instance, some alternatives may be more likely to reduce bycatch but may also be more likely to adversely impact pollock-dependent communities.

The analysts have summarized some of the policy-level tradeoffs, uncertainties, and risks that are apparent across the alternatives. When comparing the alternatives against each other, the Council may find it useful to bear in mind the alternatives are different management approaches that use different tools to incentivize chum/WAK chum salmon PSC reductions (i.e., a hard cap, a time/area closure, or changes to IPA requirements). If the Council would like to use one or more of the management approaches contained in the alternatives, it may then be more useful to compare the options/suboptions within the alternative against each other rather than comparing those impacts across the alternatives.

Alternative 2 or 3

Alternative 2 and 3 are mutually exclusive. **If the Council would like to recommend an overall chum salmon PSC limit, the first policy decision is whether it would like to link the PSC limit with abundance under Alternative 3.** Doing so would provide the pollock fishery greater flexibility in periods (or years) with greater WAK chum salmon abundance but the impacts to chum/WAK chum salmon PSC in years the hard cap does not apply would be close to neutral.

A second policy decision is the amount of the overall chum salmon PSC limit. The quantitative estimates from the retrospective analysis for Alternatives 2 and 3 shows a stark tradeoff between the costs (forgone pollock) and benefits (chum and WAK chum salmon PSC saved). Table 1-6, Table 1-7, Table 1-8, and Table 1-9 help to illustrate these dynamics. However, these values do not account for changes in fishing behavior in the future.

In order to be reasonably confident that an overall chum salmon PSC limit would reduce WAK chum salmon bycatch relative to no action, the PSC limit would need to be set at a lower amount within the range being considered. There is greater uncertainty in whether an overall chum salmon PSC limit would reduce WAK chum salmon PSC (and/or the AEQ bycatch) relative to no action under a PSC limit set at the middle or upper end of the range. Although Table 1-6 shows AEQ bycatch reductions for each reporting group under all analyzed PSC limits, this outcome is not certain. Rather, and contrary to the values reported in Table 1-6, the impacts to WAK chum salmon are contingent upon the fleet's harvest strategies in the future.

However, if the Council were to recommend an overall chum salmon PSC limit set at an amount at the lower end of the range being considered, this would pose a direct tradeoff in that the economic impacts to the pollock industry and associated communities could be greater. Based on historical catch and bycatch data, a 100,000-chum salmon PSC limit would likely result in an early B season closure for all sectors unless they can substantially change fishing behavior/harvest strategies. Given the significant interannual variability in historical PSC encounters, the sectors would need to be able to sustain these changes in fishing behavior/harvest strategies year-over-year to avoid erratic closures.

Related to this point, and setting aside the apportionment option used, an overall chum salmon PSC limit set at an amount marginally greater than 100,000 chum salmon would provide the fleet some greater operational flexibility. The interannual variability in historical PSC levels suggests the fleet's future bycatch performance will likely be dictated by harvest strategies and efforts to avoid chum salmon as well

as variations in future environmental and fishing conditions. Thus, in considering the amount at which to set an overall chum salmon PSC limit, there is a direct tradeoff in the potential for the alternative to reduce chum and WAK chum salmon PSC and providing the fleet sufficient flexibility to respond to variable conditions.

Finally, the choice of apportionment is a policy decision that weighs a sector's historical and expected future chum salmon encounters, along with the objective of reducing WAK chum salmon.

The apportionment option chosen was shown to have a marginal effect on the AEQ bycatch reductions and a direct distributional impact across the sectors with the starkest tradeoff being posed by the CP and inshore sectors.

Table 1-6 Comparison of the average AEQ reductions using the mean estimate for the CWAK and Upper/Middle Yukon reporting groups, average total chum salmon PSC reductions, and potentially forgone pollock (mt). The stochastic model was used for AEQ estimation.

PSC Limit	Apportionment	AEQ CWAK (# of fish)	AEQ Up/Mid Yukon (# of fish)	Total Chum PSC (# of fish)	Forgone Pollock (mt)
100,000	Option 1: 3-Year Avg.	21,519	3,391	150,355	272,620
	Option 2: 5-year Avg.	21,612	3,437	150,937	271,872
	Option 3: Pro Rata	21,652	3,448	151,009	271,777
	Option 4: AFA	21,303	3,308	149,945	266,531
325,000	Option 1: 3-Year Avg.	4,780	821	33,223	79,252
	Option 2: 5-year Avg.	4,504	798	32,614	61,735
	Option 3: Pro Rata	4,529	807	60,568	114,651
	Option 4: AFA	3,341	568	28,348	54,811
550,000	Option 1: 3-Year Avg.	1,700	357	9,564	21,116
	Option 2: 5-year Avg.	1,172	233	7,315	27,663
	Option 3: Pro Rata	1,154	235	7,330	28,503
	Option 4: AFA	292	48	2,210	15,741

Source: NMFS catch accounting system, data compiled by AKFIN.

Notes: Estimated reductions in the AEQ bycatch are based on the average for each reporting group using data from 2011–2022 while total chum PSC reductions and forgone pollock are based on data from 2011–2023.

Table 1-7 Comparison of the mean AEQ reductions for the CWAK and Upper/Middle Yukon reporting groups, total chum salmon PSC, and potentially forgone pollock (mt) as a percentage of B season total for the analyzed PSC limits and apportionment options. A stochastic model was used for AEQ estimation.

PSC Limit	Apportionment	AEQ CWAK	AEQ Up/Mid Yukon	Total Chum PSC	Forgone Pollock
100,000	Option 1: 3-Year Avg.	56.39%	55.70%	56.16%	37.46%
	Option 2: 5-year Avg.	56.64%	56.31%	56.38%	37.36%
	Option 3: Pro Rata	56.74%	56.56%	56.41%	37.34%
	Option 4: AFA	55.83%	54.24%	56.01%	36.63%
325,000	Option 1: 3-Year Avg.	12.53%	13.60%	12.41%	10.89%
	Option 2: 5-year Avg.	11.80%	13.02%	12.18%	8.48%
	Option 3: Pro Rata	11.87%	13.02%	12.18%	8.48%
	Option 4: AFA	8.76%	9.42%	10.59%	7.53%
550,000	Option 1: 3-Year Avg.	4.45%	5.52%	3.57%	2.90%
	Option 2: 5-year Avg.	3.07%	3.69%	2.73%	3.80%
	Option 3: Pro Rata	3.02%	3.70%	2.74%	3.92%
	Option 4: AFA	0.76%	0.83%	0.83%	2.16%

Source: NMFS catch accounting system, data compiled by AKFIN.

Notes: Estimated percent reductions in the AEQ bycatch are based on data from 2011–2022 while total chum PSC reductions and forgone pollock are based on data from 2011–2023.

Table 1-8 Comparison of annual average gross first wholesale revenue forgone (millions of 2022 \$) based on hypothetical B season closures, 2011-2023

PSC Limit	Apportionment	CDQ	CP	Inshore	Mothership
100,000	Option 1: 3-Year Avg.	\$21.61	\$121.40	\$153.45	\$33.57
	Option 2: 5-year Avg.	\$21.28	\$116.99	\$158.64	\$32.17
	Option 3: Pro Rata	\$21.28	\$115.26	\$158.64	\$33.57
	Option 4: AFA	\$18.32	\$85.69	\$181.81	\$33.57
325,000	Option 1: 3-Year Avg.	\$13.95	\$60.49	\$15.92	\$5.79
	Option 2: 5-year Avg.	\$13.53	\$38.09	\$17.10	\$5.79
	Option 3: Pro Rata	\$13.53	\$38.09	\$17.10	\$5.79
	Option 4: AFA	\$13.53	\$17.31	\$31.51	\$5.79
550,000	Option 1: 3-Year Avg.	\$8.56	\$17.31	\$0.00	\$0.99
	Option 2: 5-year Avg.	\$7.24	\$13.39	\$11.83	\$0.00
	Option 3: Pro Rata	\$7.24	\$13.39	\$11.83	\$0.99
	Option 4: AFA	\$3.02	\$0.22	\$11.83	\$2.09

Source: NMFS catch accounting system, data compiled by AKFIN.

Table 1-9 Percent reduction in B season gross first wholesale revenue across sectors, based on hypothetical B season closures, 2011-2023

PSC Limit	Apportionment	CDQ	CP	Inshore	Mothership
100,000	Option 1: 3-Year Avg.	16.5%	26.0%	33.7%	28.4%
	Option 2: 5-year Avg.	16.2%	24.7%	34.7%	27.2%
	Option 3: Pro Rata	16.2%	24.4%	34.7%	28.4%
	Option 4: AFA	13.9%	18.4%	40.3%	28.4%
325,000	Option 1: 3-Year Avg.	10.8%	12.9%	6.2%	5.0%
	Option 2: 5-year Avg.	10.5%	7.9%	6.5%	5.0%
	Option 3: Pro Rata	10.5%	7.9%	6.5%	5.0%
	Option 4: AFA	6.6%	3.6%	9.9%	5.0%
550,000	Option 1: 3-Year Avg.	6.6%	3.6%	0.0%	0.9%
	Option 2: 5-year Avg.	5.6%	2.8%	2.4%	0.0%
	Option 3: Pro Rata	5.6%	2.8%	2.4%	0.9%
	Option 4: AFA	2.3%	0.0%	5.0%	1.9%

Source: NMFS catch accounting system, data compiled by AKFIN.

Alternative 4

Alternative 4 aims to strengthen the effectiveness of the salmon bycatch IPAs by modifying existing regulations by requiring more stringent avoidance measures for chum/WAK chum salmon PSC. The IPAs would craft incentives and penalties specific to the vessels governed by the contract and balance their measures with the goal of fully utilizing the B season TAC and mitigating the risk of increasing Chinook salmon PSC in September and October. Compared to other alternatives, Alternative 4 is expected to provide greater flexibility for the fleet to reduce its chum/WAK chum salmon PSC without risking large amounts of potentially unharvested pollock. However, the analysis does not have a way to scale the magnitude of the potential conservation benefits in terms of AEQ reductions that Alternative 4 could provide in the future, and it is not clear whether Alternative 4 would provide additional conservation benefits beyond what has occurred in recent years if it is selected in isolation.

Alternative 5

Compared to no action (Alternative 1), all three inseason corridor options under Alternative 5 (Option 1, Suboption 1, and Option 2) could further reduce chum and WAK chum salmon PSC. All inseason corridor options under Alternative 5 are expected to result in either neutral or negative economic impacts to the pollock industry. However, Option 1, Suboption 1, and Option 2 are mutually exclusive and so only one may be selected. **If the Council wishes to include Alternative 5 as part of a PA, the primary policy tradeoff is in choosing the inseason corridor option that would be implemented.** The options differ from one another based on the areas (amount and location) that would close to vessels that attained the PSC limit.

The analysts have highlighted this tradeoff because the date that a sector would have met a combination of the corridor PSC limit and apportionment is the same across all three options because the area that chum salmon PSC accrues from (i.e., the inseason corridor) is the same. Similar to Alternative 2 or 3, corridor chum salmon PSC limits set at a lower amount within the range are more likely to be met and result in a corridor closure. **When comparing the three inseason corridor options against each other, the positive impact that may be achieved in terms of chum salmon bycatch reductions, based on the consequence the option holds (i.e., how motivating the option will be in terms of preemptive changes in fishing behavior) should be weighed against the economic impacts to the fleet if a closure does occur, as well as the potential impacts to chum and WAK chum salmon PSC after fishing effort is redistributed.**

Option 1 presents the greatest consequence for the pollock fishery because it would close the entire inseason corridor if the PSC limit is met and is especially impactful for inshore CVs and/or smaller capacity vessels. The greater consequence for reaching the inseason corridor PSC limit under Option 1 means vessels are more likely to be motivated to incur the costs associated with preemptive changes in fishing behavior, to the extent practicable. Option 1 is expected to reduce chum and WAK chum salmon PSC by redistributing fishing effort to outside areas once a cooperative or sector reaches the corridor chum salmon PSC limit. However, Option 1 has considerable economic risk for harvesters, processors and communities if the closure occurs, given the level of potentially displaced pollock catch from an early B season closure.

Compared to no action, Suboption 1 and Option 2 would create an incentive for vessels to change their fishing behavior in response to the corridor chum salmon PSC limit. However, Suboption 1 and Option 2 appear to reduce the consequence of an inseason corridor closure by exempting some stat areas inside the corridor from closure, noting the fishing and environmental conditions vary each year. As a result, these options may also reduce some of the motivation for proactive changes in fishing behavior when they are compared to Option 1. To illustrate this, Table 1-6 compares the annual average amount of pollock catch (mt) that would have been displaced from the inseason corridor under Option 1 (40 of 40 stat areas) and Suboption 1 (29 of 40 stat areas), as well as the sum total of the pollock catch that would have been displaced under each option as a percentage of total pollock catch that occurred within the corridor. Note

that similar a similar comparison cannot be provided for Option 2 because the stat areas that the IPAs may select to close are as of yet unknown. **The difference in the estimates of displaced pollock catch between Option 1 and Suboption 1 provides a sense of the extent to which Suboption 1 may scale back the incentive for preemptive changes in fishing behavior relative to Option 1.**

The direct tradeoff would be in mitigating some of the adverse economic impacts that would likely manifest from an early B season closure. Additionally, this Suboption also reduces the risk of unintended consequences for Chinook salmon relative to Option 1 that may occur with a large amount of displaced pollock catch that requires fishing later in the fall to catch. Option 2 provides the most operational flexibility but may further reduce the consequences of a closure, depending on which and how many stat areas are chosen to close by the IPAs. Option 3 further mitigates economic burden by suspending corridor closures in high abundance years. Option 4 would also provide additional operational flexibility if the herring PSC limit is met in a given year. If the distribution of the fishery in September in the future is similar to what has occurred in the past, the CP and CDQ sectors would primarily benefit from Option 4 with relatively neutral bycatch implications.

Table 1-10 Comparison of the average pollock catch (mt) that would have been displaced from the inseason corridor under Alternative 5, Option 1 and Suboption 1, as well as the total pollock catch that would have been displaced under each option as a percentage of the total pollock harvested inside the corridor during the closure window of June 10 – August 31, 2011–2023

PSC Limit	Apportionment	Option 1		Suboption 1	
		Pollock Catch Displaced	As a % of Corridor Total	Pollock Catch Displaced	As a % of Corridor Total
50,000	Option 1: 3-Year Avg.	130,168	43.9%	54,138	18.2%
	Option 2: 5-year Avg.	130,904	44.1%	53,476	18.2%
	Option 3: Pro Rata	133,433	45.0%	54,131	18.2%
	Option 4: AFA	139,621	46.9%	55,868	18.7%
200,000	Option 1: 3-Year Avg.	26,306	9.0%	17,692	6.0%
	Option 2: 5-year Avg.	26,649	9.1%	18,914	6.0%
	Option 3: Pro Rata	25,547	8.7%	14,132	4.8%
	Option 4: AFA	48,513	16.5%	17,005	5.8%
350,000	Option 1: 3-Year Avg.	16,490	5.6%	11,095	4.1%
	Option 2: 5-year Avg.	16,490	5.6%	12,944	4.1%
	Option 3: Pro Rata	17,721	6.0%	12,661	4.3%
	Option 4: AFA	14,082	4.8%	9,022	3.1%

Source: NMFS catch accounting system, data compiled by AKFIN.

Next Steps

The Council is scheduled to review the DEIS at its February 2026 meeting in Anchorage, Alaska. At that time, the Council may choose to recommend a PA. **If the Council wishes to do so, there are several points for consideration that need to be addressed and are outlined in below in Table 1-11.** Each point for consideration is written to convey the decisions the Council would need to make in a final recommendation to move that alternative forward as part of a preferred alternative. **To aid the Council in its consideration of these decision points, members of the public may also wish to consider providing comments on them.**

Table 1-11 Points for consideration to develop a preferred alternative

Alternative/Option	Points for Consideration
Alternative 1 No Action	There are no additional points for consideration related to Alternative 1. Selecting Alternative 1 would retain the current regulations for chum salmon bycatch management in the Bering Sea.
Alternative 2 Overall Chum Salmon PSC Limit	Does the Council want to include Alternative 2 in a PA? • If yes, Alternative 3 cannot be selected. • If yes, an amount must be selected for the overall chum salmon PSC limit, set at an amount between 100,000 and 550,000 chum salmon. • If yes, an apportionment approach must be selected based on one of the four options under consideration. • If yes, does the Council want to include a CDQ Reserve Pool?
Alternative 3 Overall Chum Salmon PSC Limit with Abundance Indices	Does the Council want to include Alternative 3 in a PA? • If yes, Alternative 2 and Alternative 5, Option 3 cannot be selected. • If yes, the Council must select one index for WAK chum salmon abundance, either Option 1 (Three-area Index) or Option 2 (Yukon Area Index). • If yes, the Council must select a value to use to set index thresholds, either Suboption 1 (25th percentile) or Suboption 2 (50th percentile). • If yes, an amount must be selected for the overall chum salmon PSC limit, set at an amount between 100,000 and 550,000 chum salmon. • If yes, an apportionment approach must be selected based on one of the four options under consideration. • If yes, does the Council want to include a CDQ Reserve Pool?
Alternative 4 Modifications to the IPAs	Does the Council want to include Alternative 4 in a PA? • If yes, the Council may wish to consider whether or not to include all six provisions or individually select some provisions and not others. No provisions are mutually exclusive.
Alternative 5 Inseason Corridor Cap	Does the Council want to Alternative 5 in a PA? • If yes, the Council must select one inseason corridor option to apply, either Option 1, Suboption 1, or Option 2. The three inseason corridor closure areas being considered are mutually exclusive and only one could be included in a final recommendation. • If yes, an amount must be selected for the corridor chum salmon PSC limit, set at an amount between 50,000 and 350,000 chum salmon. • If yes, an apportionment approach must be selected based on one of the four options under consideration. • If yes, does the Council want to include a CDQ Reserve Pool? • If yes, does the Council wish to include Option 3 (abundance-based threshold)? • If yes, Alternative 3 cannot be selected. • If yes, the Council must select a value to use to set index thresholds, either Suboption 1 (75th percentile) or Suboption 2 (90th percentile). • If yes, does the Council want to include Option 4 to adjust the Winter HSA start date for the pollock fishery?

1 Introduction

This Draft Environmental Impact Statement (DEIS) analyzes proposed alternatives to manage chum salmon prohibited species catch (PSC) or bycatch in the Bering Sea pollock fishery. The North Pacific Fishery Management Council (Council) is considering a range of PSC limits or “caps” on the number of chum salmon that may be caught in the Bering Sea pollock fishery and closure of all or part of the Bering Sea to pollock fishing once the limit is reached. The Council is also considering regulatory changes for the salmon bycatch Incentive Plan Agreements (IPAs). This DEIS provides an assessment of the environmental, economic, and social impacts of the proposed action alternatives and their distribution. This analysis addresses the requirements of the Magnuson-Stevens Act, the National Environmental Policy Act (NEPA), Presidential Executive Order (EO) 12866, and other applicable law and EOs.

This DEIS is a document prepared by the Council and the National Marine Fisheries Service (NMFS) Alaska Region, and it provides information for decision-makers and the public to understand a) the need for changing the current management approach for chum salmon bycatch; b) the purpose and objectives being pursued under each of the proposed management and regulatory changes c) the range of management alternatives being considered; d) relative implications (“adverse” or “beneficial”) of adopting each alternative, compared with taking no management action.

Under the MSA, the United States has exclusive fishery management authority over all marine fishery resources found within the exclusive economic zone (EEZ). The management of marine fishery resources within the nation’s EEZ in Federal waters 3 to 200 nautical miles from shore is vested in the Secretary of Commerce (Secretary) and in eight Regional Fishery Management Councils. In the Alaska Region, the Council is responsible for preparing Fishery Management Plans (FMPs) and FMP amendments for marine fisheries requiring conservation and management, and for submitting its recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the Federal mandates of the Department of Commerce with regard to marine and anadromous fish.

This DEIS is being prepared in accordance with NEPA (42 U.S.C. §§4331-4336e), as amended by the 2023 Fiscal Responsibility Act, and NOAA NEPA procedures (NOAA Administrative Order 216-6A and Companion Manual for NOA 216-6A). NEPA requires that an EIS be prepared on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment (42 U.S.C. §4332). A Notice of Intent to publish an EIS for the proposed management measures was published in the Federal Register on July 11th, 2023.

1.1 Purpose and Need

The Council recommended the following Purpose and Need statement to originate this action on April 8th, 2023.

Salmon are an important fishery resource throughout Alaska, and chum salmon that rear in the Bering Sea support subsistence, commercial, sport, and recreational fisheries throughout Western and Interior Alaska. Western and Interior Alaska salmon stocks are undergoing extreme crises and collapses, with long-running stock problems and consecutive years’ failures to achieve escapement goals, U.S.-Canada fish passage treaty requirements, and subsistence harvest needs in the Yukon, Kuskokwim, and Norton Sound regions. These multi-salmon species declines have created adverse impacts to culture and food security and have resulted in reduced access to traditional foods and commercial salmon fisheries.

The best available science suggests that ecosystem and climate changes are the leading causes of recent chum salmon run failures; however, non-Chinook (primarily chum) salmon are taken in the Eastern Bering Sea pollock trawl fishery which reduces the amount of salmon that return to Western and Interior Alaska rivers and subsistence fisheries. It is important to acknowledge and understand all sources of chum mortality and the cumulative impact of various fishing activities.

In light of the critical importance of chum salmon to Western Alaska communities and ecosystems, the Council is considering additional measures to further minimize Western Alaskan chum bycatch in the pollock fishery.

The purpose of this proposed action is to develop actions to minimize bycatch of Western Alaska origin chum salmon in the Eastern Bering Sea pollock fishery consistent with the Magnuson-Stevens Act, National Standards, and other applicable law. Consistent, annual genetics stock composition information indicates that the majority of non-Chinook bycatch in the pollock fishery is of Russian/Asian hatchery origin; therefore, alternatives should structure non-Chinook bycatch management measures around improving performance in avoiding Western Alaska chum salmon specifically.

The Council intends to consider establishing additional regulatory non-Chinook bycatch management measures that reduce Western Alaska chum bycatch; provide additional opportunities for the pollock trawl fleet to improve performance in avoiding non-Chinook salmon while maintaining the priority of the objectives of the Amendment 91 and Amendment 110 Chinook salmon bycatch avoidance program; meet and balance the requirements of the Magnuson-Stevens Act, particularly to minimize salmon bycatch to the extent practicable under National Standard 9; include the best scientific information available including Local Knowledge and Traditional Knowledge as required by National Standard 2; take into account the importance of fishery resources to fishing communities including those that are dependent on Bering Sea pollock and subsistence salmon fisheries as required under National Standard 8; and to achieve optimum yield in the BSAI groundfish fisheries on a continuing basis, in the groundfish fisheries as required under National Standard 1.

1.2 Action Area

The area that is the subject of this action is the Bering Sea sub-area of the BSAI management area. Pollock is managed as three separate units within the BSAI management area: the Bering Sea subarea, the Aleutian Islands subarea, and the Bogoslof District. Separate overfishing limits (OFL), acceptable biological catch limits (ABC), and total allowable catch (TAC) limits are specified annually for eastern Bering Sea pollock, Aleutian Islands pollock, and Bogoslof pollock.⁸ The proposed action would not directly affect the pollock fishery in the Aleutian Islands or other Bering Sea groundfish fisheries (Figure 1-8). Therefore, this analysis will primarily focus on the geographical area of the Bering Sea.

All proposed regulatory changes would solely affect the participants in the Bering Sea pollock fishery as the directly regulated entities, but the impacts of the proposed action could reach beyond the action area. To the extent deemed necessary to consider reasonably foreseeable effects logically flowing from the actions being considered by NFMS, this analysis also considers some potential effects felt outside the Bering Sea, including in Western Alaska streams where chum salmon caught as bycatch originate.

⁸ Under 50 CFR 679.22(a)(7)(i), directed fishing for pollock is not allowed in the Bogoslof District and the entire TAC is allocated as an incidental catch allowance for pollock harvested in other groundfish directed fisheries that occur in this area.

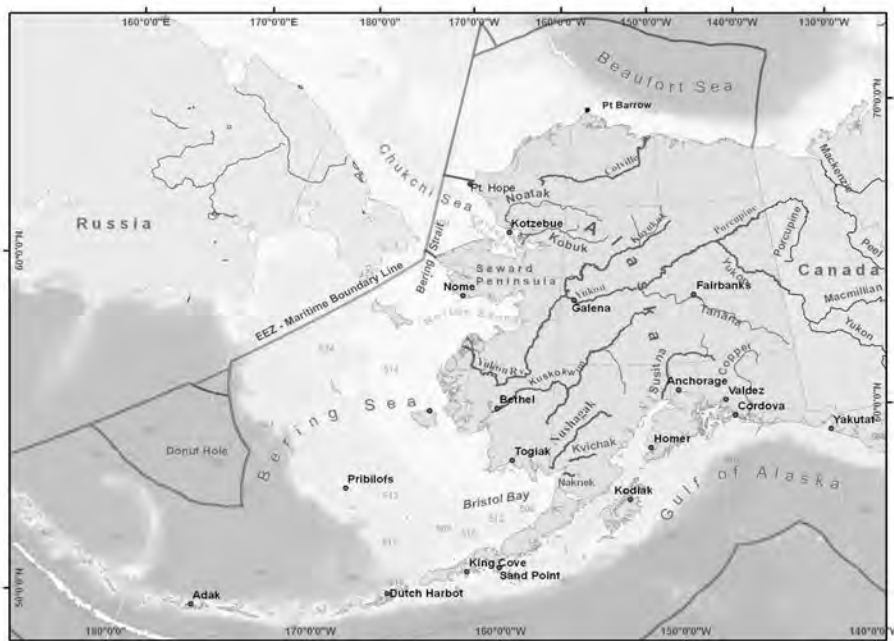


Figure 1-8 Map of the Bering Sea and salmon producing rivers

1.3 Public Participation

This DEIS was developed with many opportunities for public participation, and the issues and alternatives have also evolved during the scoping process which included a public comment period and further refined after consideration of public input communicated during the course of several Council meetings. This section describes these avenues for public participation.

Scoping, the term used for involving the public in the NEPA process at its initial stages, is designed to provide an opportunity for the public, agencies, and other interest groups to provide input on potential issues associated with the proposed action at an early stage of development. Scoping is used to identify the environmental issues related to the proposed action and identify alternatives to be considered in the EIS. Scoping is accomplished through written communications and consultations with agency officials, interested members of the public and organizations, Alaska Native representatives, and State and local governments.

Members of the public also participate and provide comments (oral, written, or both) during the Council process. The Council started considering revisions to salmon bycatch management in 2022. Since then, the Council has notified the public each time it is scheduled to discuss salmon bycatch issues. The Council process, which involves regularly scheduled and noticed public Council meetings, ad-hoc industry meetings, and Council committee meetings, started before the formal EIS scoping process and will continue as NMFS and the Council develop and refine the alternatives under consideration until the Council makes a recommendation on a preferred alternative to NMFS.⁹

This DEIS addresses the relevant issues identified during both the scoping and Council processes and provides another opportunity for public comments and participation.

1.3.1 Salmon Bycatch Committee

As discussed in Section 2.1 the Council initiated this action at its June 2022 Council meeting when it created the Salmon Bycatch Committee (SBC), which was composed of representatives of the Council,

⁹ See Section 2.1 for a description of the Council meetings at which the alternatives have been considered and modified.

CDQ groups, the Bering Sea pollock industry, and Tribal representatives.¹⁰ This committee held meetings in January and March 2023, both of which were open to the public. After receiving input from the public, this committee generated a recommended Purpose and Need statement and concept for the management alternatives, which it presented to the Council's April 2023 meeting.¹¹ After receiving the SBC's report and further public input at that meeting, the Council adopted the SBC's purpose and need statement and the preliminary alternatives for analysis.

1.3.2 Notice of Intent and Summary of Scoping Comments

The formal scoping period began with the publication of a Notice of Intent (NOI) in the Federal Register on July 11, 2023 (88 FR 44096).¹² Public comments were due by September 15, 2023. In the NOI, NMFS requested written comments from the public on the appropriate range of alternatives to minimize non-Chinook salmon bycatch in the Bering Sea pollock fishery and the impacts to the human environment resulting from alternatives.

In response to this request for comment on the scope of the EIS, NMFS received 11 individual submissions from the public, which it summarized into 87 distinct comments and presented to the Council for review at its October 2023 Council meeting.¹³ Many, if not all, of the concerns raised during this public comment period on scoping have been raised again, discussed further at subsequent Council meetings, and addressed within the DEIS. The following is a non-exclusive list of issues frequently raised throughout the scoping process and a description of how the Council has addressed them in the development of the alternatives included in this DEIS.

Scope of overall bycatch limits being considered. It was requested that the Council consider bycatch limits that are well below the average chum salmon PSC level.

As discussed further below in Section 1.3.6, at the April 2024 meeting NMFS requested that the Council lower the range of bycatch limits it was considering. In response to this request and further input from the public and Tribes, the Council did so at that meeting.

Include abundance-based bycatch limits in the range of alternatives. A Western Alaska chum salmon abundance index should consider both escapement, and the level of chum salmon abundance required to meet the subsistence needs of fishery-dependent communities.

Consistent with this comment, the Council has included an abundance-based bycatch limit under Alternative 3.

Apportionment of PSC limits based on historical performance. It was requested that the options for apportioning PSC limits not be based solely on historic bycatch performance as it could be interpreted as increasing benefits to those sectors that have historically had greater bycatch.

The Council has included four different apportionment options, including one (Alternative 2, Option 4) that is not tied to historic bycatch performance, but rather apportions PSC limits solely based on AFA allocations of pollock quota.

¹⁰ The SBC was composed of representatives from the Council, Gray Light Fisheries, United Catcher Boats, Coastal Villages Region Fund, Yukon River Drainage Fisheries Association, Association of Village Council Presidents, Arctic-Yukon-Kuskokwim Tribal Consortium, At-Sea Processors Association, Westward Fishing Company, Bristol Bay Economic Development Corporation, Kuskokwim River Inter-Tribal Fish Commission, and Aniak Native Community.

¹¹ Available at archived meeting agenda for April 2023 Council meeting (<https://meetings.npfmc.org/Meeting/Details/2983>), agenda item C2.

¹² The Notice of Intent to Prepare an Environmental Impact Statement can be accessed at: <https://www.federalregister.gov/documents/2023/07/11/2023-14581/notice-of-intent-to-prepare-an-environmental-impact-statement-for-minimizing-non-chinook-salmon>.

¹³ The Scoping Report from October 2023 is attached as Appendix 1.

Consider ecosystem impacts of the pollock fishery. It was requested that the Council select a preferred alternative that incorporates ecosystem-based management and analyzes the impacts of the pollock fishery on other species such as Chinook salmon, squid, herring, crab, and halibut.

The scope of this action is to reduce chum salmon bycatch in the Bering Sea pollock fishery, with a focus on chum salmon originating from Western Alaska river systems. However, as required under NEPA, this DEIS does include an analysis of how each alternative would impact other parts of the ecosystem and environment, including marine resources such as Chinook salmon, herring, seabirds, marine mammals, and essential fish habitat (including crab habitat).

Time and area closures. It was requested that the Council consider developing an alternative that considers spatial and temporal management measures to be responsive to changing conditions over time.

At the April 2024 Council meeting, the Council added Alternative 5, which involves the closure of a corridor area that is triggered by a bycatch limit specific to that area. At the February 2025 Council meeting, in response to further input from the public, Tribes, and industry, the Council refined Alternative 5 to include three options. For more information on these options for the closure area, see Section 2.7.

Consideration of genetic sampling. It was requested that the Council consider the genetic information available on the rivers of origin of chum salmon bycatch, so as to reduce the impact of bycatch on Western Alaska stocks.

The Bering Sea pollock fishery's chum salmon bycatch has been systematically sampled since 2011 at a rate of 1 in 30 chum salmon. Genetic analyses indicate it is common for the majority of the fish taken as bycatch in any given year to originate from Asia. Most of these fish are from hatcheries in Japan and Russia. Over the past decade (2014–2023), the majority of chum salmon hatchery production has been attributed to Japan at 1.54 billion fish, followed by Russia at 0.88 billion and the United States at 0.76 billion (see Section 3.3.2.1). On average, approximately 19% of bycatch taken by the pollock fishery was estimated to originate from Western Alaska river systems (Table 3-28). In the preliminary DEIS prepared for the April 2024 Council meeting, and at that Council meeting, the Council considered an alternative that would impose a PSC limit specific to only Western Alaska chum salmon. However, for a variety of reasons, including the fleet's inability to know the composition of its bycatch in season due to the lag between its harvest and receipt of genetics information, the Council concluded that such a management measure would not be practical. However, under Alternative 4 of the DEIS, all sectors would be required to describe in their IPAs how genetic stock composition data are included within chum salmon avoidance measures. This provision is intended to encourage the use of the latest genetics to inform avoidance measures employed in IPAs, such as rolling hotspots.

Local and Traditional/Indigenous Knowledge. It was requested that Traditional and Indigenous Knowledge be incorporated into the EIS, so that the Council consider it in the development of potential management measures.

As described further below, through collaboration with Tribal cooperating agencies KRITFC and TCC, this DEIS includes Traditional Knowledge on a variety of issues, including the impacts of salmon declines on communities that rely on salmon.

Use of Incentive Plan Agreements (IPAs). Comments received during the scoping period included both support for the continued use of IPAs due to their ability to respond to changing conditions on the pollock fishing grounds, as well as criticism of the IPAs due to their reliance on industry to develop and implement them.

The alternatives being evaluated include Alternative 1, which would allow the continued use of IPAs without modification and Alternative 4, which would impose six additional required

elements of IPAs. Alternatives 2, 3 and 5 would overlay some form of a chum salmon bycatch limit on the continued use of IPAs either under their current regulatory framework or, if adopted with Alternative 4, with new requirements. Therefore, regardless of the preferred alternative selected, IPAs will continue to be employed as a tool for minimizing chum salmon bycatch.

Bycatch Tradeoffs. It was requested that the EIS include a consideration of the potential bycatch tradeoffs for other species that could arise from increased bycatch avoidance measures for chum salmon.

This DEIS includes an analysis of the potential impacts that the alternatives may have on Chinook salmon and herring prohibited species catch as the fishing industry potentially changes fishing behaviors to avoid chum salmon.

Additional information provided by commenters during the scoping public comment period included feedback on the use of electronic monitoring (*e.g.*, cameras) in bycatch avoidance, potential reduction of realized pollock catch if constrained by chum salmon bycatch limits, limitations of the use of the “amount necessary for subsistence” or ANS, gravel-to-gravel management, the limits of describing bycatch using metrics that compare salmon caught to overall pollock harvest, the problem of the impact of the *Ichthyophonus* virus on chum salmon, the results of the adoption of new avoidance measures within IPAs, bycatch as a form of waste in the cultures of many Alaska Native Tribes, impacts of chum salmon declines on Tribal culture and food sovereignty, and environmental justice concerns.

1.3.3 Public Comment During Council Meetings

All members of the public were provided opportunities to participate in the development of the alternatives for this proposed action. The alternatives analyzed in this DEIS were developed over the course of six Council meetings (see Section 2.1). At each meeting, the Council received substantial input from representatives of the pollock fishing fleet, pollock processors, communities that rely on the pollock fishery, including CDQ groups and communities, Tribes and Tribal organizations, nonprofit groups, and interested members of the public.

Generally, the Council was directly involved with many of the other avenues for public participation described in this section. When they were not, for example during government-to-government consultations, NMFS provided summaries to the Council. Additionally, many of the same entities that provided input through the other avenues described in this section (*e.g.*, Tribal consultation) were also active in the Council process. In general, there is a significant overlap of perspectives shared with the Council at Council meetings and those that were shared through other public input processes and summarized in this section. However, some of the other perspectives specifically emphasized during public feedback at Council meetings include:

- the economic importance of the pollock industry;
- the importance of pollock revenues for CDQ communities;
- the operational challenges and costs associated with bycatch avoidance;
- the impacts of uncontrollable environmental variables and hatchery production on bycatch;
- the costs and benefits of chum salmon savings; and
- the tools that are available to reduce bycatch.

Tribal perspectives are specifically addressed in greater detail in Section 1.3.6

1.3.4 Public Comment on the DEIS

NMFS is releasing this DEIS and soliciting public comment on the DEIS over a public comment period that ends on January 5, 2026. Upon the closure of the public comment period, NMFS will review and

present a summary of the comments at the next meeting at which the Council will be considering this action. Final Council action is currently [scheduled for February 2026, but is subject to change](#).

NMFS will review all public comments received during the public comment period and revise the DEIS as appropriate in response to those public comments. After the Council takes final action and if it recommends a preferred alternative, NMFS will respond to the public comments received during the comment period and finalize the EIS. Revisions to the DEIS and NMFS' responses to public comments will be reflected in the Final EIS, which NMFS will publish with any proposed rule.

1.3.5 Community Outreach

In addition to the above-described public Council process and subsequent to the February 2025 Council meeting, Council members attended meetings of the following Regional Advisory Committees to the Federal Subsistence Board, at which either Council or NMFS staff provided a presentation on the preliminary DEIS and opportunities to provide input on the action and fielded questions from members of each RAC.

- Eastern Interior RAC
- Western Interior RAC
- Yukon-Kuskokwim Delta RAC
- Kodiak/Aleutians RAC

Council staff are currently planning on presenting a report summarizing the feedback received from these RACs to the Council at the February 2026 Council meeting.

In addition to the more formal rollout of information, conversations were initiated between analysts and the public on specific information requests deemed pertinent for the analysis. A list of persons consulted can be found in Section 7.

1.3.6 Tribal Governments and Alaska Native Claims Settlement Act Regional and Village Corporations

Pursuant to [EO 13175](#), NOAA must have an accountable process to ensure meaningful and timely input from Tribal officials in the development of Federal policies with Tribal implications. Consistent with NOAA's Tribal Consultation Handbook, NMFS consults with Tribal officials from Alaska Native Tribes on a government-to-government basis.¹⁴ In addition, because Congress required Federal agencies to consult with Alaska Native corporations on the same basis as Federally-recognized Tribes, NMFS engages in consultations with Alaska Native Claims Settlement Act corporations.¹⁵ The Tribal consultation policies of the Department of Commerce¹⁶ and NOAA¹⁷ identify the need for Federal agencies such as NMFS to consult and work with Federally-recognized Tribes when developing "regulations, legislative comments or proposed legislation, and other policy statements or actions that have substantial direct effects on one or more Tribes".¹⁸ NMFS may also conduct Tribal consultation for actions that do not fit within the definition under EO 13175.

Consistent with its commitment to an improved consultation process, on December 3, 2024, NMFS Alaska Region posted its Tribal Consultation Protocol (Protocol) in accordance with Department of

¹⁴ NOAA Procedures for Government-to-Government Consultation, <https://www.noaa.gov/legislative-and-intergovernmental-affairs/noaa-tribal-resources/information-documents>

¹⁵ Public Law (P.L.) 108-199, 118 Stat. 452, as amended by P.L. 108-447, 118 Stat. 3267. NOAA interprets the term "Alaska Native corporations" to mean "Native corporation[s]" as that term is defined under the Alaska Native Claims Settlement Act (ANCSA) of 1971 (43 U.S.C. § 1602).

¹⁶ Department of Commerce DAO 281-8 (Consultation And Coordination With Indian Tribal Governments) can be accessed at: https://www.commerce.gov/opog/directives/DAO_218-8

¹⁷ NOAA Tribal Resources can be accessed at: <https://www.noaa.gov/legislative-and-intergovernmental-affairs/noaa-tribal-resources/information-documents>

¹⁸ From the definition of "Policies that have Tribal implementations" in Section 1 of EO 13175.

Commerce and NOAA policies on government-to-government consultation, and related executive orders. To address questions about the Protocol, virtual engagement sessions with Federally Recognized Tribes and representatives were scheduled for January 7 and 8, 2025. The Protocol can be found at the NMFS Alaska Region [web page](#) on *Tribal Consultations and Engagements in Alaska*.

As described below, NMFS's engagement and consultation with Tribes to address chum salmon bycatch in the Bering Sea pollock fishery began in early 2022. NMFS issued a NOI to develop an EIS on July 11, 2023. NMFS has continued to engage and consult with Tribes as the Council has analyzed and further refined the alternatives under consideration. Additional opportunities for Tribal engagement and consultation during the development of the EIS are outlined below (see Section 1.3.6.1).

Throughout this action, NMFS received feedback and worked to better facilitate Tribal participation in the Council process. Starting in October 2022, NMFS began preparing and circulating prior to each Council meeting a Tribal newsletter that provides, among other information, notice of the upcoming agenda items. Also, prior to each Council meeting, NMFS circulates an invitation to request consultation on any of the upcoming agenda items that may affect Tribes. Starting in March 2024, NMFS began regularly holding a Tribal engagement session two to three weeks before each Council meeting. These engagement sessions provide an overview of the upcoming Council actions, a space for building relationships, and an opportunity for Tribes to ask questions of NMFS and Council staff.

1.3.6.1 Tribal Engagements and Consultations¹⁹

At the following Tribal engagement sessions and formal consultations the topic of chum salmon bycatch in the Bering Sea pollock fishery was discussed.

On **January 11, 2022**, NMFS conducted a virtual Tribal listening session attended by approximately 80 people, Alaska Region's Sustainable Fisheries Assistant Regional Administrator, and several NMFS staff. The purpose of this meeting was to allow earlier participation in the development of a management measure to address salmon bycatch in the Bering Sea pollock fishery. Tribal representatives expressed concerns about Chinook and chum salmon bycatch in the Bering Sea pollock fishery and the State of Alaska managed Area M salmon fishery amid declines in salmon runs. These run declines and accompanying State and Federal (Department of Interior) restrictions on subsistence fishing affect Tribal food security, culture, spiritual and sacred connections with salmon, the intergenerational passing on of the Tribal way of life, and the health and wellness of Tribal children and elderly. They were also concerned about poor salmon runs also having ecosystem impacts by reducing the transport of marine nutrients. They felt that the multi-jurisdictional management system between state and Federal entities makes it difficult to protect the Tribes' subsistence way of life. Participants also expressed feelings of inequity as they are at risk of being arrested for continuing their traditions and feeding their communities while pollock vessels are permitted to continue fishing.

Solutions to inequity proposed by Tribal attendees included having Tribal seats on the Council, requiring the use of hook and line gear instead of trawl nets, closing the Bering Sea to trawl fishing and creating a Federal bycatch committee. Tribal participants asked for a stand down of pollock fishing, at least temporarily, to allow salmon to come back.

The importance of government-to-government consultation and the Federal-Tribal trust responsibility were highlighted. Tribal participants requested that NMFS proactively consult with Tribes and visit affected communities. NMFS shared its extensive research program to better understand Chinook and chum salmon bycatch. NMFS explained the current measures to reduce salmon bycatch in the pollock

¹⁹ Summaries of consultations and engagements for salmon bycatch can be found at NMFS website - <https://www.fisheries.noaa.gov/alaska/consultations/alaska-native-tribal-engagement-federal-fisheries#salmon-bycatch> and the archived page at <https://www.fisheries.noaa.gov/alaska/consultations/tribal-engagement-consultations-alaska-fisheries-archive>.

fishery. NMFS noted that it encourages the reduction of bycatch, but also that changes to fishery management can take longer than some of the involved parties may like.

On **January 21, 2022**, NMFS held a virtual consultation with the Tanana Chiefs Conference (TCC), attended by the Acting Regional Administrator and numerous NMFS staff. TCC initiated this consultation to discuss concerns about Chinook and chum salmon bycatch. Specific topics discussed included: the Tribal request for an emergency action to eliminate Chinook salmon bycatch; a cap on chum salmon bycatch in the Bering Sea pollock trawl fishery; NMFS disaster declaration process; and Tribal food security.

At the **June 2022 Council meeting**, after receiving information on the current amount of chum salmon bycatch, the Council requested that its staff prepare a discussion paper and formed a Salmon Bycatch Committee composed of Tribal representatives, in-river salmon users, and representatives from the Bering Sea pollock fishery.²⁰ At the **December 2022 Council meeting**, the Council requested that the SBC develop recommendations for potential chum salmon bycatch management alternatives.²¹

On **February 3, 2023**, NMFS held a virtual Tribal consultation with the Kuskokwim River Intertribal Fish Commission (KRITFC), Association of Village Council Presidents (ACVP), TCC, Mountain Village, and the Bering Sea Fishermen's Association (BSFA). This consultation was in response to a request by these Tribal organizations to discuss the upcoming Bering Sea Aleutian Island harvest specifications. Tribal representatives shared concerns about declining salmon runs and how they believed that salmon bycatch in the Bering Sea was contributing. They also expressed a desire for greater government- to-government consultation and more meaningful opportunities for Tribal perspectives to be incorporated into management actions. They further asked that Tribes be cooperating agencies on the development of a programmatic supplement environmental impact statement. NMFS responded that it hears and empathizes with the impacts of salmon declines on Tribal communities and shares the goal of bringing salmon back.

On **February 15, 2023**, NMFS held a virtual Tribal consultation with the Aleut Community of St. Paul Island (ACSPI), Orutsaramiut Native Council (ORC), Kawerak, Inc., TCC, Yukon River Inter-Tribal Fish Commission (YRITFC), AVCP, KRITFC, Bering Sea Elders Group (BSEG), and Native American Rights Fund. The meeting focused on overall improvements for Tribal consultation and increased communication and transparency with Tribal partners.²²

At the **April 2023 Council meeting**, the Council received a staff report on the SBC's findings, adopted a purpose and need statement for a management measure to reduce chum salmon bycatch in the Bering Sea pollock fishery, and requested a preliminary review analysis of four alternatives. A number of Tribal representatives and Tribal organizations provided written public comments and oral public testimony on the proposed alternatives.

On **April 18-19, 2023**, to improve knowledge of Tribal issues and engagement strategies for staff across the region, NMFS and NOAA General Counsel Alaska staff participated in the First Alaskans Institute training on Alaska Native Governance and Protocols.

On **July 11, 2023**, NMFS issued its notice of intent to prepare an EIS and associated 60-day comment period. NMFS notified Alaska Tribal governments, Alaska Native corporations, and related organizations about the proposed action and EIS process and invited their comments and participation in the Council process. During the comment period, NMFS received 11 submissions with 87 distinct comments. Submissions were received on behalf of six Tribal coalitions, an association of Tribal fishing communities in Alaska, two nonprofits who represent Tribal interests in Alaska, and an Alaska Native

²⁰ For additional information about this meeting, see Section 2.1.1.

²¹ For additional information about this meeting, see Section 2.1.2.

²² By letter dated June 1, 2023, NMFS provided to the meeting attendees additional information about its efforts to improve its engagement and consultation process.

Corporation. NMFS summarized and included all comments into a scoping report (i.e., a summary of the public input received on the scope of alternatives the Council should analyze), which it then presented to the Council at the October 2023 Council meeting. A copy of the scoping report is attached in Appendix 1.

On **August 16, 2024**, NMFS sent an invitation for Tribal consultation for the upcoming 2023 October Council action items. No response was received from Tribal partners to consult on chum salmon bycatch at that time.

At the **October 2023 Council meeting**, the Council received the NMFS scoping report and heard from a number of Tribal representatives and Tribal organizations through written public comments and oral public testimony on the proposed alternatives. The Council then revised the proposed scope of alternatives and requested staff prepare a preliminary DEIS to be presented at the April 2024 Council meeting.

After the meeting, AVCP and TCC requested a consultation on chum salmon bycatch. NMFS staff, including the Deputy Regional Administrator, made multiple good faith attempts to contact AVCP and TCC, but received no response, and so the scheduling of this consultation on chum salmon bycatch was unsuccessful.

On **November 14, 2023**, Kawerak, Inc., KRITFC, and BSEG submitted a letter to NMFS expressing concerns with PSC limits being analyzed under Alternative 2, as well as the methods for a low abundance trigger of PSC limits under Alternative 3. These Tribal coalitions also requested that NMFS initiate engagements and consultations with all affected Tribes. By letter dated November 28, 2023, NMFS stated that it would continue to engage and consult with Tribes on this topic, including by providing regular invitations to consult and timely responding to Tribal requests for consultation.

On **January 24, February 14 and March 5, 2024**, NMFS held engagement sessions attended by Kawerak Inc., KRITFC, BSEG, TCC, ACSPI, AVCP, YRITFC, Arctic-Yukon-Kuskokwim Tribal Consortium (AYKTC), and BSFA. A summary of the input received at these meetings is included in the following subsection.

On **March 5, 2024**, NMFS invited requests for Tribal consultation on April 2024 Council agenda items. No requests for Tribal consultation were received.

On **March 19, 2024**, NMFS held a Tribal informational session at which Council and NMFS staff provided information about the alternatives that would be discussed with the Council at the April 2024 meeting and answered questions. Concerns that Tribal participants expressed included: the analyses put a dollar value on Tribal subsistence; the inshore sector seems to be catching more chum salmon than other fishing sectors; the current range of alternatives presented is insufficient and time and area closures are omitted; and industry self-management of rolling hotspot closures. Tribes also expressed an interest in contributing information about how chum salmon declines are having social and economic effects on their communities and information about baseline harvest.

At the **April 2024 Council meeting**, numerous Tribal representatives and Tribal organizations provided written public comments and oral public testimony on the proposed management alternatives.

On **January 14, 2025**, NMFS held a virtual Tribal informational session at which the Council and NMFS staff presented an overview of the alternatives that would be discussed with the Council at the February 2025 meeting and answered questions.

On **January 21, 2025**, NMFS held a virtual Tribal consultation specific to this action and the Cook Inlet salmon fisheries harvest specifications. NMFS initiated the consultation and, by email dated January 2, 2025, invited all affected Tribes. In attendance were members of the ORC, Nenana Native Association, Alakanuk Traditional Council, Native Village of Kwinhagak (NVK); Organized Village of Kwethluk, Kwethluk IRA Council (KIC), Yukon-Kuskokwim Health Consortium, Kawerak Inc., Yukon River Inter-Tribal Fish Commission (YRITFC); Arctic-Yukon-Kuskokwim Tribal Consortium (AYKTC); Associated

Village of Council Presidents (AVCP); Kuskokwim River Inter-Tribal Fish Commission (KRITFC); Northwest Planning LLC; and Mother Kuskokwim Tribal Coalition, and others in their individual capacities.

At the **February 2025 Council meeting**, numerous Tribal representatives and organizations provided written comments and oral testimony on the proposed management alternatives.

1.3.7 Input from Tribes and Tribal Coalitions

The following is a summary of Tribal input that NMFS has received since October 2023, when the Council requested the preparation of the first version of the preliminary DEIS.

Chum salmon PSC limits (Alternative 2, option 1, overall PSC limits). Many Tribes and Tribal coalitions, including Kawerak, Inc., KRITFC, and BSEG, notified NMFS that they felt that the PSC limits in the October 2023 motion (200,000-550,000 chum salmon) did not constitute a reasonable range for analysis. They requested that the Council analyze PSC limits below 200,000 chum salmon, including a PSC limit of zero chum salmon.

In response, NMFS supplemented the March 2024 preliminary DEIS to review whether the impacts predicted at a PSC limit of 200,000 chum salmon for the pollock industry, communities whose economies rely on the industry, and users of chum salmon are indicative of the impacts likely to be experienced at lower PSC limits. In its April 2024 motion, the Council expanded the lower end of PSC limits under analysis to 100,000 chum salmon.²³

By letter to NMFS on October 4, 2024, Kawerak, Inc., TCC, Native People's Action (NPA), YRITFC, Yukon River Drainage Fisheries Association (YRDFA), and AVCP expressed concerns with the alternatives in the Council's April 2024 motion. They felt that the high end of the range of PSC limits under consideration (550,000 chum salmon) need to be reduced to closer to the average bycatch that industry has achieved since 2011 (~280,000 chum salmon).²⁴

Chum salmon abundance indices (Alternative 2, option 2; abundance-based overall PSC limits). Abundance indices that solely used spawner metrics from the Yukon River were described as insufficiently representative of salmon abundance throughout the Yukon-Kuskokwim Region. It was also expressed that the abundance thresholds that would trigger the application of a PSC limit were too low. In its April 2024 motion, the Council increased the upper end of the range of the abundance thresholds.²⁵

In their October 4, 2024, letter, Kawerak, Inc., TCC, NPA, YRITFC, YRDFA, and AVCP expressed: that the 25th and 50th percentile numbers used as abundance thresholds continued to be too low to achieve a conservation benefit; the PSC limits (including no cap when the abundance threshold is met) are too high and do not meet the goal of minimizing bycatch in all times of abundance; and, the Yukon-River only approach to an index in Option 2 is insufficient.

Alternative 4 - modifications to the Incentive Plan Agreements. Leading up to the April 2024 Council meeting, representatives of several Tribal coalitions shared that they felt that Alternative 4 would not be sufficient to minimize bycatch. Their concerns included that this alternative (as described in the October 2023 Council motion) would effectively leave the solution to the pollock industry and that the language in Alternative 4 that provided for industry proposals to "consider a process to include local and traditional knowledge from Western and Interior Alaska salmon users in the development of IPA measures" was inappropriate and inconsistent with the Council's LKTK Protocol (March 17, 2023).

²³ See Section 2.9, Alternatives Analyzed but Not Considered Further, in the March 11, 2024 preliminary DEIS, accessible at the April 2024 archived meeting agenda (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

²⁴ See Tribal Coalitions letter to NMFS (October 4, 2024), in Appendix 1 to the December 2024 preliminary DEIS, accessible at the February 2025 archived meeting agenda (<https://meetings.npfmc.org/Meeting/Details/3071>), agenda item C2.

²⁵ See Section 2.5 on Alternative 3: PSC Limit with Abundance Indices.

Although the Council's April 2024 motion includes a refined version of Alternative 4, it no longer contains the LKTK provision to which the Tribes objected.²⁶

Alternative 5. In their October 4, 2024, letter, Kawerak, Inc., TCC, NPA, YRITFC, YRDFA, and AVCP expressed that the closure area chum salmon PSC limits are too high and, as designed, the mutually exclusive closure areas do not achieve the purpose of a conservation corridor. Tribal participants suggested consideration of an alternative that includes the following elements: 1) the development of a conservation corridor that includes all three areas proposed under Alternative 5 and is combined with a bycatch limit well below the historic average; 2) IPA modifications that encourage working towards the goal of real-time genetics; and 3) a program review after a specific number of years or metrics that are not achieved. They also asked for an investigation into a framework that could facilitate further bycatch avoidance measures without triggering another EIS.²⁷ YRITFC also asked for consideration of an alternative that includes a salmon migration corridor (i.e., a time/area closure) that is combined with an overall chum salmon PSC limit.

Tribal engagement. Tribes have requested better timing, more proactive engagement, meaningful Tribal consultations, and greater accessibility for people who live in rural areas. KRITFC asked NMFS to do more to reach out to Tribes that are not represented by them, as a Tribal cooperating agency. In response, NMFS held multiple engagement sessions in early 2024 with numerous Tribal coalitions and began holding engagement sessions prior to every Council meeting, as described in Section 1.3.6.1. Future opportunities for input on this action, including through NMFS engagement and consultation, are described in Section 1.3.4.

NMFS recognizes the importance of holding and attending in-person meetings to hear from people in rural communities. At the suggestion of some commenters from Tribal organizations at the October 2024 Council meeting, NMFS staff attended the Alaska Federation of Natives Workshop on Subsistence Issues and subsequent Subsistence Panel. Regional Administrator Kurland accompanied several Council members to the Tanana Chiefs Conference fall special convention in Fairbanks, on November 13, 2024. NMFS and Council members received requests to attend the Alaska Subsistence Regional Advisory Council meetings in February and March 2025. NMFS staff, Council staff, and multiple Council members attended several meetings. A report on these meetings will be shared with the Council and public during the February 2026 Council meeting.

Inclusion of Indigenous Knowledge (IK). There have been requests for NMFS to do more to include IK, including Traditional Knowledge (TK), from all Tribal entities. As described further below, NMFS is working with two Tribal cooperating agencies (as that term is defined under NEPA (42 U.S.C. 4336e(2))), KRITFC and TCC, to incorporate Tribal information and expertise, including TK. KRITFC and TCC represent 25 and 37 Federally-recognized Tribes respectively. These Tribal cooperating agencies are the primary authors of or co-authors of DEIS sections 3.3.3.1.5 (Traditional Knowledge of Chum Salmon Declines), 4.4.3.2 Importance of Chum Salmon for Indigenous Peoples in the Yukon and Kuskokwim Regions), 4.5.1.1 (Subsistence Chum Salmon Users), and 4.5.5.3.3 (Potential Benefits of the Proposed Action to Yukon and Kuskokwim Indigenous Ways of Life). They also submitted materials that include TK from their members. See Appendices 8, 9a, and 9b.

However, these cooperating agencies have emphasized that they cannot provide information and TK on behalf of affected communities who are not their members. Therefore, on **July 11, 2024**, by letter NMFS invited 175 Tribes in Western and Interior Alaska to submit information and TK that would be included in an appendix to the preliminary DEIS. In response to this invitation, on October 4, 2024, NMFS received two documents, both of which are attached in their original form in Appendices 8 and 9. YRITFC submitted a letter to NMFS regarding the historical context of commercial fisheries and salmon

²⁶ See Section 2.6 on Alternative 4: Additional Regulatory Requirements for Incentive Plan Agreements.

²⁷ See Tribal Coalitions letter to NMFS (October 4, 2024), in Appendix 1 to the December 2024 preliminary DEIS, accessible at the February 2025 archived meeting agenda (<https://meetings.npfc.org/Meeting/Details/3071>), agenda item C2.

declines and impacts to salmon users on the Yukon.²⁸ YRITFC explained that impacts of salmon declines on the Yukon River system are multidecadal in nature and have been documented with both western science and traditional and local knowledge.

The other submission was the October 4 letter from Kawerak, Inc., TCC, NPA, YRITFC, YRDFA, and AVCP. These coalitions did not include TK in their letter, but rather expressed a number of concerns with the form of and timing of NMFS's request for information and TK. NMFS acknowledged the validity of these concerns and provided more context for the request.²⁹

Co-Stewardship/Co-Management of Salmon in the Marine Environment. Many Tribal organizations have expressed a desire to develop a co-stewardship or co-management relationship with NMFS related to managing salmon in the marine environment. Tribal partners have told NMFS that an ecosystem approach to salmon management is needed and have asked NMFS, under its government-to-government relationship, to help Tribes be more involved. The Department of Interior's Gravel-to-Gravel Initiative, which involves USFWS, has been identified as an example of co-management.

NMFS has noted that, with respect to the Gravel-to-Gravel Initiative, USFWS has different authority and jurisdiction over salmon management. NMFS is committed to continuing to talk with Tribes about co-management opportunities within the scope of its existing authorities.

More Time to Review Material Prior to Council Meetings. The time between the production of the preliminary DEIS and the April 2024 Council meeting was described as insufficient for many Tribal representatives, including elders, to be prepared to meaningfully participate in the Council process. In response, Council staff worked diligently to try to post the preliminary DEIS on its webpage much farther in advance of the February 2025 Council meeting.

Production of an impact rate. In their October 4, 2024, letter, the Tribal coalitions expressed that an impact rate would fail to account for: the waste of sentient species with whom Indigenous communities have formed reciprocal relationships; the loss of thousands of eggs with each adult chum salmon that fails return to spawn; the impacts of bycatch on discreet spawning populations during low abundance; the cumulative impacts of bycatch on the marine ecosystem under climate change; and, the significance of even relatively small numbers of fish to Tribal food sovereignty and security. See Tribal Coalitions letter (October 4, 2024), Appendix 1.

1.3.8 Lead and Cooperating Agencies

NMFS is the lead agency for this EIS. Three tribal and state entities are participating as cooperating agencies under 42 USC 4336a(a)(3) and 4336e(2).

- Alaska Department of Fish and Game (ADF&G) provided special expertise related to management of salmon fisheries in State waters and inland rivers as well as impacts of salmon bycatch.
- Kuskokwim River Inter-Tribal Fish Commission (KRITFC) provided special expertise related to salmon fisheries management on the Kuskokwim River and tributaries, salmon life cycles, subsistence and commercial fisheries in the area, as well as regionally specific LK and TK.
- Tanana Chiefs Conference (TCC) provided special expertise related to chum salmon stock status in the Yukon River and tributaries, subsistence harvests of chum salmon, as well as regionally specific LK and TK.

KRITFC and TCC contributed to the following sections of this DEIS.

²⁸ See YRITFC letter to NMFS in Appendix 1 of the December 2024 preliminary DEIS, accessible at the February 2025 archived meeting agenda (<https://meetings.npfmc.org/Meeting/Details/3071>), agenda item C2.

²⁹ See NMFS letter to Kawerak et al. (October 18, 2024) in Appendix 1 of the December 2024 preliminary DEIS, accessible at the February 2025 archived meeting agenda (<https://meetings.npfmc.org/Meeting/Details/3071>), agenda item C2.

- 3.3.3.1.4 Environmental Factors Related to Western Alaska Chum Salmon Declines
- 3.3.3.1.5 Traditional Knowledge of Chum Salmon Declines
- 4.3.3.1 Regional Patterns of Subsistence Harvest of Salmon
- 4.3.3.2 Importance of Chum Salmon for Indigenous Peoples in the Yukon and Kuskokwim Regions
 - 4.3.3.2.1 Traditional and Modern Salmon Fishing
 - 4.3.3.2.2 Chum Salmon Support Holistic Wellbeing of Indigenous People
 - 4.3.3.2.2.1 Physical, Mental, and Emotional Health
 - 4.3.3.2.2.2 Culture, Identity, and Family
 - 4.3.3.2.2.3 Economies and Livelihoods
 - 4.3.3.2.3 Ecosystem and Biodiversity
- 4.3.4.1 Commercial Harvests of Chum Salmon in Western and Interior Alaska
- 4.4.1.1 {Alternative 1 Impacts} Subsistence Chum Salmon Users
- 4.4.5.3.3 Potential Benefits of the Proposed Action to Yukon and Kuskokwim Indigenous Ways of Life
- 4.5.7 Combined Effects for Chum Salmon Users

While all three cooperating agencies provided special expertise to this DEIS, and those contributions are appropriately accredited in the relevant sections, KRITFC and TCC also provided wholly independently-authored appendices. These appendices are unedited by NMFS and contain additional information on topics each cooperating agency independently determined to be of relevance. Both are available to the public and decision-makers at Appendices 8 and 9.

Between June and October 2024, NMFS facilitated four joint cooperating agency meetings, at which ADF&G, KRITFC, and TCC representatives attended. Agenda topics included coordination on Tribal contributions, abundance metrics under Alternative 3, and opportunities for Western and Interior Tribes to receive inseason reports from industry on salmon bycatch data under Alternative 4.

1.4 Laws, Treaties, and Policies

In implementing new regulations for chum salmon bycatch management, NMFS would comply with applicable international agreements; Federal, state, and local laws and regulations, and EOs.

The current regulations managing chum salmon bycatch in the pollock fishery, and the proposed actions under consideration in this DEIS are in accordance with the **Magnuson-Stevens Act, as amended (16 U.S.C. 1801 et seq.) and all National Standards.**

This DEIS was developed by NMFS as the lead agency to address the effects of proposed alternatives to change chum salmon bycatch regulations in the Bering Sea pollock fishery, in accordance with the **NEPA**. NEPA requires federal agencies to evaluate the potential environmental effects of any major planned Federal action, and to promote public awareness of the potential impacts, by preparing a detailed analysis of proposed actions that would significantly affect the quality of the human environment.

NOAA's Policy and Procedures for Compliance with NEPA and Related Authorities (NOAA Administrative Order 216-6A and Companion Manual for NAO 216-6A) establishes NOAA's policy and procedures for compliance with NEPA and related Executive Orders. This Administrative Order provides comprehensive and specific procedural guidance to NMFS and the Council for preparing and adopting FMPs. Federal fishery management actions subject to NEPA requirements include the approval of FMPs, FMP amendments, and regulations implementing FMPs.

This DEIS was also prepared in response to a variety of other law, treaties, and EOs including:

The **American Fisheries Act (AFA)** substantially changed the management structure of the Bering Sea pollock fishery by identifying the vessels and shore-based processors eligible to participate in the Bering

Sea pollock fishery, allocating specific percentages of the TAC among the fishing sectors, establishing cooperatives, among other provisions.

The **Endangered Species Act (ESA)** designed to conserve endangered and threatened species. The Act is jointly administered by NMFS and the US Fish and Wildlife Service (USFWS). With some exceptions, NMFS oversees cetaceans, seals and sea lions, marine and anadromous fish species, and marine plant species. USFWS oversees walrus, sea otter, seabird species, and terrestrial and freshwater wildlife and plant species.

The **Marine Mammal Protection Act** aims to maintain the health and stability of the marine ecosystem, with a goal of obtaining an optimum sustainable population of marine mammals within the carrying capacity of the marine habitat. NMFS has a responsibility to conserve marine mammals, specifically cetaceans and pinnipeds (other than walrus). The USFWS is responsible for sea otter, walrus, and polar bear.

The **Pacific Salmon Treaty and the Yukon River Agreement** requiring the United States and Canada to “maintain efforts to increase the in-river run of Yukon River origin salmon by reducing marine catches and by-catches of Yukon River salmon. They shall further identify, quantify and undertake efforts to reduce these catches and by-catches” (Art. XV, Annex IV, Ch. 8, Cl. 12).

The **Administrative Procedure Act** requiring Federal agencies to notify the public before rule making and provide an opportunity to comment on the rules.

The **Regulatory Flexibility Act** requiring federal agencies to consider the economic impact of regulatory proposals on directly regulated small entities, analyze alternatives that minimize adverse economic impacts on this class of small entities, and make their analyses available for public comment. This analysis is typically prepared in advance of the Council’s final action.

The **Information Quality Act** directing the Office of Management and Budget (OMB) to issue government-wide policy and procedural guidance to all Federal agencies to ensure and maximize the quality, objectivity, utility, and integrity of information disseminated by Federal agencies.

EO 12866, *Regulatory Planning and Review*, that requires Federal agencies to take a deliberative approach to rule making, including an assessment of the costs and benefits of the intended regulations (58 FR 51735, October 4, 1993). EO 12866 requires the OMB to review proposed regulatory programs that are considered to be significant.

EO 13175, *Consultation and Coordination with Indian Tribal Governments* (65 FR 67249) and **Presidential Memorandum of January 26, 2021, *Tribal Consultation and Strengthening Nation-to-Nation Relationships*** (86 FR 7491). NMFS is the Federal agency responsible for carrying out Tribal Consultations.

2 Description of Alternatives

2.1 Alternatives Development

The Council and NMFS have taken an iterative approach to developing the purpose and need statement for the proposed action, as well as the range of alternatives considered to meet its specified objectives. This section summarizes the process used to develop and refine the alternatives under consideration.

2.1.1 June 2022

The Council's June 2022 meeting was held in Sitka, Alaska. At this meeting, the Council received a) scientific reports on changing ocean conditions having an impact on chum salmon survivability, b) a report on Western Alaska salmon stock status, c) an updated adult equivalents analysis for Chinook salmon caught as bycatch in the Bering Sea pollock fishery, d) reports from the pollock industry on their recent bycatch performance under the IPAs, and e) annual reports on the stock composition estimates for the salmon caught as bycatch. Some of these information reports are part of the Council's annual cycle while others were specifically requested in the [Council's October 2021 motion](#) at its meeting in Anchorage, Alaska.

After receiving these reports, input from the Scientific and Statistical Committee (SSC) and Advisory Panel (AP), as well as substantial public comment, the [Council's June 2022 motion](#) a) requested the Bering Sea pollock industry immediately implement additional chum salmon bycatch avoidance measures; b) tasked a discussion paper updating the 2012 analysis of chum salmon bycatch and provided a list of specific information requests to be included in that discussion paper; and c) initiated a Salmon Bycatch Committee (SBC) composed of Tribal representatives, in-river salmon users, and representatives from the Bering Sea pollock industry.

2.1.2 December 2022

The Council's December 2022 meeting was held in Anchorage, Alaska. At this meeting, the Council received a) the State of Alaska Bycatch Review Task Force report from ADF&G staff, b) a presentation on the chum salmon bycatch discussion paper prepared by staff, and c) the staff report on the SBC's first meeting in November 2022. These presentations provided the Council with an opportunity to discuss and give direction on its preference for potential future work to minimize chum salmon bycatch in the Bering Sea pollock fishery. After receiving staff presentations, the AP report, and substantial public comment, the [Council's December 2022 motion](#) directed the SBC to develop recommendations for potential chum salmon bycatch management alternatives, ranging from a hard cap to additional regulatory provisions within the pollock industry's IPAs. The SBC convened for two additional meetings in January 2023 and March 2023 to achieve its goals, as directed by the Council.

2.1.3 April 2023

The Council's April 2023 meeting was held in Anchorage, Alaska. At this meeting, the Council received a) annual reports on salmon bycatch genetics, b) reports from the Bering Sea pollock industry on the prior year's salmon bycatch avoidance and performance, c) and the staff report from the SBC's January 2023 and March 2023 meetings. The SBC report included the committee's recommended Purpose and Need statement and concepts for management alternatives to meet the objectives of that statement. There was consensus to bring all concepts for alternatives forward to the Council for consideration, but the SBC did not reach consensus on the alternatives themselves. Following these reports, input from the AP, and substantial public comment, the Council adopted the committee's Purpose and Need statement and a set of preliminary alternatives. The Council requested a "Preliminary Review" analysis to provide the Council and the public with more information on how the preliminary alternatives would work.

2.1.4 October 2023

The Council's October 2023 meeting was held in Anchorage, Alaska. At this meeting, the Council received the Preliminary Review analysis, reports from the SSC and AP, as well as substantial public testimony. After receiving staff presentations, advisory body reports, and public testimony, the [Council's October 2023](#) motion approved analyzing changes to chum salmon bycatch management measures. The range of alternatives approved for analysis were modified and revised from the preliminary set of alternatives adopted at the April 2023 Council meeting. The Council recommended an initial set of alternatives to meet the purpose and need statement for impact analysis.

2.1.5 April 2024

The Council's April 2024 meeting was held in Anchorage, Alaska. At this meeting, the Council received a) the [April 2024 preliminary DEIS](#) and a [Social Impact Assessment \(SIA\)](#) analyzing the potential impacts of the proposed alternatives, b) scientific reports on salmon bycatch genetics, c) reports from the pollock industry on the prior year's salmon bycatch avoidance and performances, as well as d) presentations from IPA representatives on proposals for changes under Alternative 4, as requested by the Council. After receiving these reports, as well as input from the SSC, AP, and substantial public comment, the Council's April 2024 motion modified the proposed alternatives to better align with the purpose and need statement and requested further analysis. A primary change to the range of alternatives was the addition of three inseason corridor closures triggered by a corridor-specific chum salmon PSC limit.

2.1.6 February 2025

The Council's February 2025 meeting was held in Anchorage, Alaska. At this meeting, the Council received a) the revised [preliminary DEIS](#) analyzing the potential impacts of the proposed alternatives, based on the recommended revisions in April 2024; b) a report from NMFS staff on recent and ongoing Tribal Consultation and engagement efforts related to the proposed action; c) reports from cooperating agencies KRITFC and TCC; and d) a report on 2024 Bering Sea chum salmon bycatch genetics. After receiving these reports, as well as input from the SSC, AP, and substantial public comment, the [Council's February 2025](#) motion modified the proposed alternatives, requested additional analysis, and recommended the revised analysis be released for publication as the DEIS.

2.2 Alternatives Under Consideration

Directly below is the proposed range of alternatives to meet the purpose and need statement for this action, the latter of which is available in Section 1.1. The proposed alternatives were last revised in [February 2025](#). Alternative 2 and 3 are mutually exclusive, as is Alternative 3 and Option 3 of Alternative 5. All other alternatives and options are not mutually exclusive unless otherwise indicated.

Alternative 1: Status Quo

Alternatives 2 through 4 apply to the entire Bering Sea pollock B season, the season in which chum salmon are taken as bycatch (prohibited species catch or PSC).

Alternative 2: Overall bycatch (PSC) limit for chum salmon

Chum salmon PSC limit based on historical total bycatch numbers: range of 100,000 (~17,100 *Western Alaska chum salmon*) to 550,000 (~94,050 *Western Alaska chum salmon*). All non-Chinook salmon taken as bycatch during the B season would accrue to the limit, regardless of origin.

PSC limits are apportioned among CDQ, catcher processor, mothership and inshore sectors (using a blended adjusted CDQ bycatch rate as with amendment 91, with the exception of Option 4) based

on: the following options. The suboption must be selected in combination with another option.

Option 1: historical total bycatch by sector using the 3-year average (2020 –2022)

Option 2: historical total bycatch by sector using the 5-year average (2018 –2022)

Option 3: pro rata 25% AFA pollock allocation and 75% historical total bycatch (2020 – 2022)

Option 4: pro rata based on AFA pollock allocation

Suboption: For any of the four options above, also establish a CDQ chum salmon PSC reserve pool. The CDQ chum salmon reserve pool exists outside of the overall chum salmon PSC limit/corridor cap and may only be accessed by a CDQ group if a CDQ group informs NMFS in writing by November 15 of any year (i.e., prior to the annual groundfish specifications process) of a plan to associate their pollock CDQ with the inshore or mothership sector. Upon such notification, NMFS will apportion an amount of chum salmon PSC to the group(s) from the CDQ chum salmon PSC reserve pool that matches the chum: pollock proportion ratio apportioned to the sector with which it is associating (i.e., mothership or inshore). All CDQ pollock from a group must be associated with the same sector, and sector associations cannot be changed mid-season.

The sector limits are further apportioned at the CDQ group and inshore cooperative level in proportion to each CDQ group and inshore cooperative's pollock allocation. Chum salmon PSC can be transferred among sectors, CDQ groups, and inshore cooperatives. Reaching a limit closes the pollock fishery sector to which the limit applies.

Alternative 3: Overall bycatch (PSC) limit for chum salmon triggered by a Western Alaska chum salmon abundance index.

Indices based on the prior year's chum salmon abundance. Options below are mutually exclusive. All non-Chinook salmon taken as bycatch during the B season would accrue to the limit (based on the range specified in Alternative 2), regardless of origin.

Option 1: Three-area chum salmon index based on Yukon River summer + Yukon River fall run abundance (suboptions: 1,713,300 or 2,781,400); Kuskokwim River composed of the Kuskokwim sonar (suboptions: 151,636 or 306,017); Norton Sound composed of summed escapement for the Snake, Nome, Eldorado, Kwiniuk, and North Rivers and total Norton Sound harvest (suboptions: 57,300 or 91,500).

If 3/3 areas are above index threshold, no chum salmon PSC limit the following year.

If 2/3 areas are above index threshold, chum salmon PSC limit the following year is (suboptions: 100,000 to 550,000).

If 1 or no areas are above index threshold, chum salmon PSC limit the following year is 75% of the above limit.

Option 2: Chum salmon index based on Yukon River summer (suboptions: 1,268,700 or 1,978,400) + Yukon River fall run abundance (suboptions: 444,600 or 803,000).

If 2/2 areas are above index threshold, no chum salmon PSC limit the following year.

If 1 or no areas are above index threshold, chum salmon PSC limit the following year is (suboptions: 100,000 to 550,000).

Apportionments and transfer provisions are the same as Alternative 2.

Alternative 4: Additional regulatory requirements for Incentive Plan Agreements (IPAs).

Include in the IPA regulations at 50 CFR 679.21(f)(12)(iii)(E) the following additive changes to further prioritize avoidance of areas and times of highest proportion of coastal Western Alaska and Upper/Middle Yukon chum salmon stocks. These requirements would be added to the existing Federal regulations for IPAs at 50 CFR 679.21(f)(12), and the annual reporting requirements at § 679.21(f)(13) would still apply.

1. Require the pollock sectors to describe in their IPA how genetic stock composition data are included in chum salmon avoidance measures.
2. Require the pollock sectors to describe in their IPAs how they monitor for potential chum salmon avoidance closures more than once per week.
3. Require the use of salmon excluders for the duration of A and B season.
4. Require the pollock sectors to develop chum salmon vessel outlier provisions and implement within their IPA.
5. Require IPAs to provide weekly salmon bycatch reports to Western and Interior Alaska salmon users to allow for more transparency in reporting.
6. Require the pollock sector IPAs to prohibit fishing in bycatch avoidance areas for all vessels regardless of performance when ADFG weekly stat area bycatch rates exceed 5 chum per ton of pollock (CP) and 3 times base rate (CV and MS).

Alternative 5: Inseason Corridor Cap

PSC cap on total chum salmon in combined clusters 1 and 2 during June 10 to August 31. Cap range of 50,000 total chum salmon (~8,550 *Western Alaska chum salmon*) to 350,000 total chum salmon (~59,850 *Western Alaska chum salmon*). All non-Chinook salmon bycatch in clusters 1 and 2 accrues to the caps, regardless of origin. The caps for combined clusters 1 and 2 and closure time period are set in Federal regulations. Additional windows for salmon passage and other avoidance measures should be implemented inseason through the contractual Incentive Plan Agreements using inseason fishery data and best available genetic data. Apportionments and transfer provisions are the same as Alternative 2 and based on historical bycatch within each Cluster individually and then combined.

Option 1: If the cap is met during the time period, NMFS closes all ADF&G stat areas inside Cluster 1 and 2³⁰ to that sector(s) for the rest of the time period. The corridor area closure is set in Federal regulations.

Suboption 1: Reaching the cap triggers a corridor closure comprised of 29 ADF&G stat areas³¹

Option 2: If the cap is met during the time period, the IPA's pre-approved corridor area closes to that sector(s) for the rest of the time period. The corridor closure must be described in the IPA and pre-approved by NMFS before B season. The criteria for a corridor closure area are set in Federal regulation. The corridor closure must (1) be within combined Clusters 1 and 2, (2) comprised of a range of 19 to 29 ADF&G stat areas (~50% - 75%), and (3) be selected based on chum catch,

³⁰ Cluster 1 and 2 refer to the following 40 ADF&G statistical areas: 685730, 685700, 685630, 685600, 685530, 685500, 675700, 675630, 675600, 675530, 675500, 675430, 665630, 665600, 665530, 665500, 655430, 665401, 655630, 655600, 655530, 655500, 655430, 655409, 655410, 655412, 645700, 645630, 645600, 645530, 645501, 645434, 635700, 635630, 635600, 635530, 635504, 625630, 625600, and 625531.

³¹ The corridor closure would apply to the following 29 statistical areas: 685730, 685600, 685530, 685500, 675600, 675530, 675500, 675430, 665630, 665600, 665530, 665500, 655630, 655600, 655530, 655500, 645700, 645630, 645600, 645530, 645501, 635700, 635630, 635600, 635530, 635504, 625630, 625600, and 625531.

pollock CPUE, and relevant genetic data.

Option 3: Abundance-based threshold. Mutually exclusive to Alternative 3.

Chum salmon index based on Yukon River summer and Yukon River fall run reconstructions. If the prior year's chum salmon abundance for both the Yukon River summer and Yukon River fall run reconstructions are at or above the index values, the corridor cap and closure provisions would not apply.

Suboption 1: 75th percentile. Yukon River summer: 2,671,450; Yukon River fall: 1,150,758

Suboption 2: 90th percentile. Yukon River summer: 3,871,700; Yukon River fall: 1,390,329

Option 4: Adjust the Winter Herring Savings Area start date for the pollock fishery from September 1 to September 30.

Option 3 and 4 are not mutually exclusive and can be selected in combination with Option 1 or 2.

2.3 Alternative 1: No Action

Selection of Alternative 1 would maintain all aspects of the current regulations for chum salmon bycatch in the Bering Sea pollock fishery. This includes the existing incentives for Chinook and chum salmon avoidance under the voluntary IPAs, including the RHS program for chum salmon avoidance (50 CFR 679.21(f)(12)(iii)(E)). Note that entities which are governed by an IPA are exempt from the Chum Salmon Savings Area as a time/area closure triggered by a PSC limit (50 CFR 679.22(a)(10)). The Chum Salmon Savings Area would continue to exist as a backstop measure for any vessel(s) that chose not to participate in an IPA.

2.3.1 Salmon Bycatch Incentive Plan Agreements

The current chum salmon bycatch regulations for the Bering Sea pollock fishery include the required elements and approval process for the salmon bycatch Incentive Plan Agreements (IPAs). The IPAs are voluntary civil legal contracts that create incentives and penalties for vessels and CDQ groups that are members of the agreement to avoid Chinook salmon and chum salmon while fishing for pollock. Three IPAs have been in place since 2010: the Catcher Processor IPA (CP IPA), Inshore Salmon Savings Incentive Program (Inshore SSIP); and Mothership Salmon Savings Incentive Program (MSSIP).

Federal regulations currently include 13 provisions that specify the goals of the current salmon bycatch avoidance program (see 50 CFR 679.21(f)(12)(iii)(E)). Some of the provisions are specific to Chinook salmon bycatch avoidance while others are specific to chum salmon. Each IPA is required to address all 13 provisions for the contract to be approved by NMFS. These provisions apply equally to all IPAs, but they are written in broad language and may be met in different ways. While the regulations do not explicitly dictate how the provisions are to be addressed, the accompanying regulations at 50 CFR 679.21(f)(13) do specify the content that must be submitted in a written annual report to the Council prior to March 15 each year. Among other topics, the written annual reports must describe (see 50 CFR 679.21(f)(12)(iii)(E)(1) through (13)):

- incentives implemented for each vessel operator to avoid Chinook and chum salmon bycatch under all levels of Chinook salmon and pollock abundance, in a manner that is expected to affect individual vessel's operational choices to avoid Chinook and chum salmon (Provision 1 and 5);
- the rewards for vessels avoiding Chinook salmon and penalties for not doing so (Provision 3);
- how the IPA's incentive measures are expected to promote reductions in a vessel's Chinook and chum salmon bycatch compared to what would have occurred absent the incentive program (Provision 4);

- the RHS program for salmon bycatch that operates throughout the entire A season and B season and the agreement to provide notifications of closure areas and any violations of the RHS program (Provision 8); and
- how the IPA ensures that the operator of each vessel governed by the IPA will manage that vessel's chum salmon bycatch to avoid areas and times where the chum salmon are likely to return to Western Alaska (Provision 7).

2.3.1.1 Rolling Hotspot Program for Chum Salmon Avoidance

The rolling hotspot (RHS) program for chum salmon avoidance operates during the B season and largely responds to Provisions 4, 5, 7, and 8 specified in the current regulations for the IPAs. This program identifies “hot spots,” or areas with high chum salmon bycatch rates (number of chum salmon/mt of pollock) on the fishing grounds, which are closed for a period of time by a third-party entity, Sea State, Inc., and vessels are moved to new areas. Under the program, vessel operators are incentivized to avoid chum salmon to avoid the risk of losing access to current fishing grounds with presumably high pollock catch rates and the risk incurring the potential costs of moving to new areas which may or may not have higher incidental catches of salmon or other PSC species. For instance, a CP representative reported in the 2020 Vessel Master Survey that “...during the B season, there were areas that had a lot of chum salmon we tried to avoid or had to move out.”³²

The components of how the RHS program should work are not specified in regulations and have been designed by industry in concert with Sea State, Inc. Sea State has been contracted by AFA cooperatives to facilitate bycatch avoidance, information and data sharing, and to provide catch accounting and harvest data for the cooperative's annual reports. This management is in addition to, not supplementary of, NMFS inseason management of the fishery.

Base and Area Bycatch Rates

To identify bycatch hot spots, the first step is to determine the base chum salmon PSC rate or the “**Base Rate.**” The Base Rate is fixed at either 0.19 or 0.20 chum salmon per mt of pollock for the first three weeks of the B season (from June 10 to July 1) until there are three weeks of fishery dependent data that can be used to calculate the Base Rate. From July 1 until the end of the B season, the Base Rate is calculated as the rolling three-week average chum salmon bycatch rate. The Base Rate is updated weekly and shared with the fleet each Thursday.³³

The fleet's weekly Base Rate is compared to the “**Base Rate floor.**” The Base Rate floors are fixed rates that are stair-stepped throughout the B season. It functions as a minimum value that can be used to determine whether an area is eligible to be closed.

- June and July: The Base Rate floor is 0.19 for the inshore and mothership sectors and 0.20 chum per mt of pollock for the CP sector.
 - August: The Base Rate floor is 0.50 chum per mt of pollock for all sectors.
 - September and October: The Base Rate floor is 1.00 chum salmon per mt of pollock for all sectors.

³² The Amendment 91 Chinook Economic Data Report has three reporting requirements, one of which includes a mandatory census survey of vessel masters. The Vessel Master Survey contains information reported on how the IPA incentives affected vessel behavior, Chinook salmon bycatch conditions compared to the last two years, if/how fishing behavior was affected by Chinook salmon avoidance, among other types of information.

³³ All IPAs use a “collar” to prohibit the Base Rate from increasing by more than 20% from one week to the next throughout June and July.

In any given week, Sea State will compare the calculated Base Rate to the fixed Base Rate floor that applies and select the higher of the two values. For example, if the calculated Base Rate was 0.65 during the first week of August, that calculated rate would be applied rather than the August floor rate of 0.50.³⁴

The second step is to calculate the chum salmon PSC rate at smaller spatial scales. This is referred to as the **“Area Bycatch Rate,”** which is the calculated chum salmon PSC rate in each statistical area (referred to as “stat areas”) where a substantial amount of pollock fishing occurred. A substantial amount of pollock fishing is defined by the IPAs as a stat area where a minimum of 500 mt of pollock and at least 2% of the week’s pollock catch was harvested. If an Area Bycatch Rate is greater than the Base Rate that is used (either that which is calculated or the fixed floor), it might qualify for a closure.³⁵ It is not common for the boundaries of a RHS closure area to encompass an entire statistical area, although a single closure might overlap several. Figure 2-1 provides a composite of RHS closure areas for chum salmon avoidance from 2017–2023.

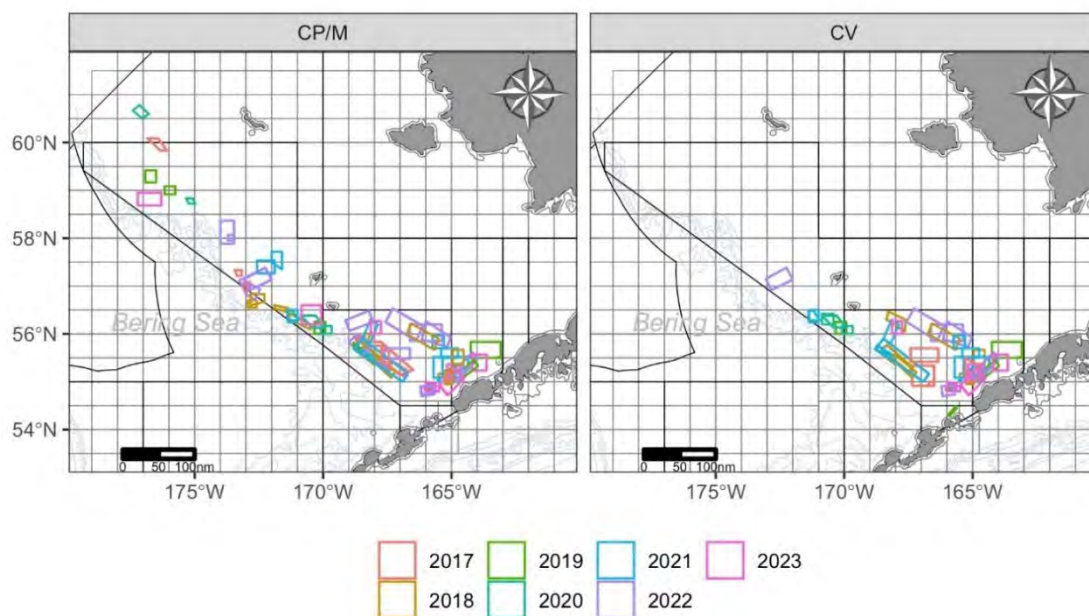


Figure 2-1 Rolling hotspot closure areas for chum salmon avoidance, 2017–2023

Source: Sea State, Inc.

Tier System

Not all vessels are prohibited from fishing in a hotspot during a given week. Under the CP IPA, a vessel’s bycatch rate must be less than 75% of the calculated Base Rate for it to maintain unrestricted access to the fishing grounds and not prohibited from hotspots. Under the Inshore SSIP and MSSIP, vessels with bycatch rates less than or equal to the calculated Base Rate are placed in “Tier 1”. Tier 2 are vessels have a bycatch rate above the week’s calculated Base Rate. Tier 1 vessels are allowed to fish in the RHS closure areas, but Tier 2 vessels are not.

Western Alaska Chum Salmon Avoidance

As mentioned previously, regulatory Provision 7 requires each IPA to describe “how the IPA ensures that the operator of each vessel governed by the IPA will manage that vessel’s chum salmon bycatch to avoid

³⁴The stair-stepped floor values were established to avoid unnecessary closures that could be counterproductive for salmon avoidance. This is because moving the fleet at very low bycatch rates runs the risk of moving vessels into new areas with higher encounters (NPFMC, 2007,138).

³⁵ The 2% minimum harvest rule was enacted to balance the need to focus on concentrated fishing in high bycatch areas with the need to rapidly close an area based on a single haul with high amounts of PSC.

areas and times where the chum salmon are likely to return to Western Alaska.” Each IPA has incorporated two measures into the RHS program to meet Provision 7:

1. The size limits of area closures are largest nearer to the Alaska Peninsula (east of 168 degrees West longitude), and the combined size of closure areas is largest during June and July. No more than four closure areas can be identified in any week with a maximum of 4,000 square miles in June and July and 2,000 square miles in August to October.
2. The Base Rate floor is fixed at its lowest value in June and July when Western Alaska chum salmon are encountered in higher proportions on the pollock fishing grounds.

Chinook Priority Provisions

Beginning on September 1 for the CP IPA, and at any point during the B season for the Inshore SSIP and MSSIP, when Chinook salmon bycatch rates are equal to or greater than 0.035 in any ADF&G statistical area, any candidate chum salmon closure area is provided as information only for the remainder of the B season. The Chinook priority provision effectively eliminates chum salmon avoidance incentives when Chinook abundance on the pollock grounds is determined to be high. This component of the RHS program for chum salmon avoidance responds to Provision 2 in the current regulations, which requires IPAs to describe “how the incentive(s) to avoid chum salmon do not increase Chinook salmon bycatch.”

Recent Hotspot Closures for Chum Salmon Avoidance

Table 2-1 and Table 2-2 provide the dates RHS closures took effect, the size of the closure area in square miles, and the number of vessels that were excluded from the area for the inshore and offshore components from 2018–2023 which are the years where comparable data were available. As shown, RHS closures for chum salmon avoidance were most frequently implemented in July, and it was common for multiple closures to be in effect during the same week. The size of the RHS closure areas varied depending on when and where the closure area was implemented. Closure areas are largest East of 168 degrees West longitude in June and July to match the time and areas when Western Alaska chum salmon are more likely to be encountered (see Section 2.3.1.1).

During the analyzed period, 47 RHS closures were implemented for the inshore sector and 77 RHS closures applied to the CP and mothership sectors. The CP and mothership sectors were subject to a higher number of closure areas because their IPAs require the use of fleet-wide data, so hotspots identified for the inshore sector also apply to CPs and motherships if they are fishing in similar areas. The average size of a closure for the inshore sector was 803 sq. miles in June and July compared to 759 sq. miles in August and September. The average size of a closure area for the CP and mothership sectors was 783 sq. miles in June and July compared to 709 sq. miles in August and September (2018–2023). No RHS closure areas for chum salmon avoidance applied to any sector in the month of October during the analyzed period.

Regulations at 50 CFR 679.21(f)(12)(iii)(E)(8) require IPAs representatives to report program violations. There were no reported instances of vessels governed by the IPAs and excluded from the RHS closures fishing inside of them. The Vessel Master Survey also indicates it has not been common practice for vessels that are allowed to fish inside a closure based on their tier status to do so. For example, a CV representative reported “even if we are Tier 1, we still generally avoid salmon closures and don’t even fish around the perimeter of them. Every once in a while, we will be tempted to fish in a closure if we are Tier 1 if we have a very reliable source that it is clean again” in the 2020 survey.

Table 2-1 Date of chum salmon RHS closure implementation, size of closure area in square miles (sq. mi), and the number of vessels excluded from the closure area (Tier 2 vessels) for the inshore sector, 2018–2023

2018	Date	1-Jul	6-Jul	6-Jul	13-Jul	20-Jul	27-Jul	3-Aug	10-Aug	28-Sep	
	Area Closed (sq. mi)	576	392	1,384	713	455	657	816	816	321	
	Vessels Excluded	0	50	50	48	44	28	26	32	21	
2019	Date	1-Jul	5-Jul	19-Jul	19-Jul	13-Sep	13-Sep				
	Area Closed (sq. mi)	1,782	512	490	485	165	75				
	Vessels Excluded	0	20	13	13	4	4				
2020	Date	3-Jul	31-Jul	7-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep		
	Area Closed (sq. mi)	459	512	94	135	326	628	628	291		
	Vessels Excluded	2	19	24	21	26	18	15	19		
2021	Date	2-Jul	2-Jul	9-Jul	16-Jul	23-Jul	30-Jul	6-Aug	6-Aug	13-Aug	13-Aug
	Area Closed (sq. mi)	600	432	597	1,828	2,529	320	2,520	534	689	2,520
	Vessels Excluded	35	35	36	36	41	33	26	26	23	23
2022	Date	22-Jul	29-Jul	29-Jul	5-Aug	12-Aug	19-Aug	19-Aug			
	Area Closed (sq. mi)	2,013	1,474	276	2,128	534	1,183	440			
	Vessels Excluded	16	33	33	17	15	24	24			
2023	Date	21-Jul	21-Jul	28-Jul	28-Jul	25-Aug	25-Aug	1-Sep			
	Area Closed (sq. mi)	866	1,149	276	1,149	477	297	691			
	Vessels Excluded	21	21	31	31	14	14	12			

Source: Sea State, Inc.

Table 2-2 Date of chum salmon RHS closure implementation, size of closure area in square miles (sq. mi), and the number of vessels excluded from the closure area for the CP and mothership sectors, 2018–2023

	Date	29-Jun	29-Jun	3-Jul	6-Jul	6-Jul	6-Jul	6-Jul	10-Jul	13-Jul	17-Jul	20-Jul	24-Jul	27-Jul	3-Aug	7-Aug	10-Aug	14-Aug	4-Sep	25-Sep	28-Sep
	Area Closed (sq. mi)	187	576	195	195	505	1,384	392	449	449	382	455	455	657	816	643	816	816	237	321	321
2018	Vessels Excluded	8	8	8	7	7	7	7	7	10	10	7	7	5	1	1	1	1	0	1	1
	Date	2-Jul	5-Jul	19-Jul	19-Jul	2-Aug	2-Aug	23-Aug	30-Aug	13-Sep											
2019	Area Closed (sq. mi)	1,782	512	490	485	490	109	331	496	165											
	Vessels Excluded	0	0	0	0	4	4	5	11	1											
2020	Date	31-Jul	7-Aug	14-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep												
	Area Closed (sq. mi)	512	94	139	398	326	628	628	291												
2021	Vessels Excluded	2	2	3	8	7	2	3	4												
	Date	2-Jul	2-Jul	9-Jul	16-Jul	23-Jul	30-Jul	6-Aug	6-Aug	13-Aug	13-Aug	27-Aug	10-Sep								
2022	Area Closed (sq. mi)	600	432	597	1,828	2,529	320	534	2,520	689	2,520	551	862								
	Vessels Excluded	2	2	2	6	7	6	4	4	2	2	4	2								
2023	Date	15-Jul	15-Jul	22-Jul	26-Jul	29-Jul	29-Jul	2-Aug	2-Aug	5-Aug	5-Aug	12-Aug	16-Aug	19-Aug	19-Aug	23-Aug	23-Aug	26-Aug	30-Aug	2-Sep	
	Area Closed (sq. mi)	1,008	1,115	2,013	276	1,474	276	2,128	276	495	2,128	534	129	1,183	440	1,519	371	1,223	163	825	
2023	Vessels Excluded	2	2	4	4	2	2	2	2	2	2	1	1	2	2	4	4	4	6	5	
	Date	7-Jul	21-Jul	21-Jul	28-Jul	28-Jul	25-Aug	25-Aug	25-Aug	1-Sep											
2023	Area Closed (sq. mi)	1,444	866	1,149	276	1,149	1,165	297	477	691											
	Vessels Excluded	2	0	0	2	2	0	0	0	1											

Source: Sea State, Inc.

2.3.2 Chum Salmon Savings Area

Alternative 1 would retain the Chum Salmon Savings Area (see 50 CFR 679.22(a)(10)), which is a fixed time and area closure in the southeastern Bering Sea (Figure 2-2). This area was identified as having high chum salmon bycatch rates in the early 1990s, established by Emergency Rule in 1994, and later incorporated into the BSAI Groundfish FMP under amendment 35. Prior to 2007, this area would close to all trawl fisheries from August 1 to August 31 and remain closed if the bycatch limit of 42,000 non-Chinook was met at any point from August 15 to October 14. The PSC limit was apportioned at the fishery level among CDQ and AFA pollock harvesters, and only those non-Chinook salmon encountered in the CVOA accrued to the limit. The CVOA is defined at 50 CFR 679.22(a)(5)).

In 2007, new regulations came into effect under amendment 84 to the BSAI Groundfish FMP and specified this area would only apply to vessels directed fishing for Bering Sea pollock using trawl gear (50 CFR 679.22(a)(10)). In 2010, the regulations were modified again such that the Chum Salmon Savings Area exists as a backstop regulatory measure, should a vessel choose not to be governed by an IPA (see 50 CFR 679.22(a)(10)). This scenario has never occurred since the IPAs took effect in 2010.

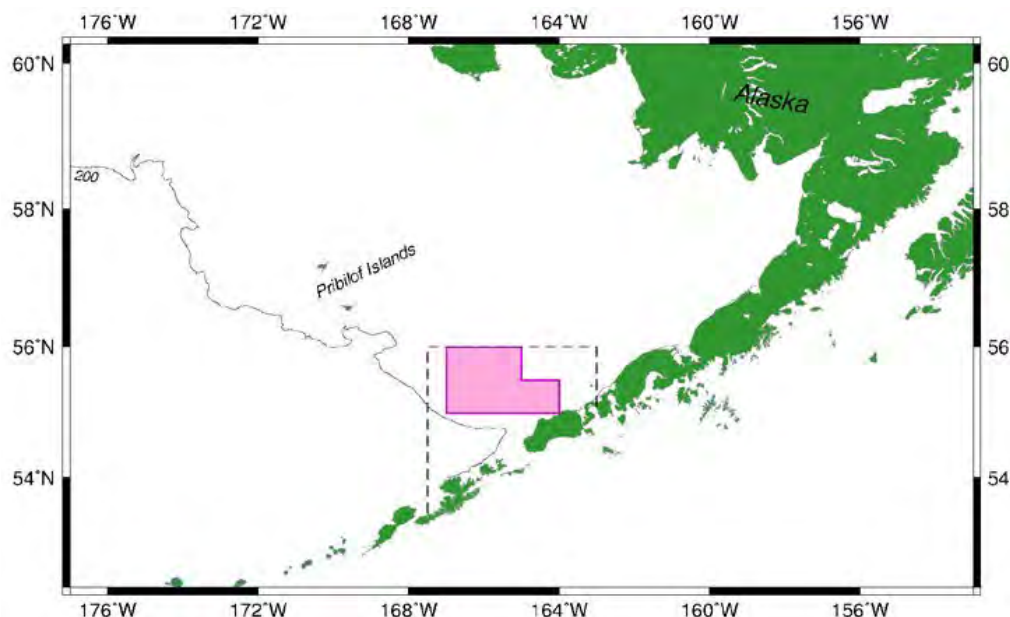


Figure 2-2 Chum Salmon Savings Area (pink) encapsulated within the Catcher Vessel Operational Area (dashed line)

2.4 Alternative 2: Overall Chum Salmon PSC Limit

This section describes the elements and options for Alternative 2 but there are many similarities between Alternatives 2 and 3 including the range of PSC limits (apart the extension of the lower bound under Option 1 of Alternative 3), the apportionment options, and transferability. The discussion here is relevant to both alternatives and contained under Alternative 2 simply because it is addressed first in this DEIS.

Alternative 2 would implement an overall chum salmon PSC limit during the pollock B season. This PSC limit would function as a “hard cap” because the B season would close to a cooperative or sector that attained the PSC limit. The range of overall PSC limits being considered is 100,000–550,000 non-Chinook (i.e., chum salmon) and is based on historical bycatch levels from 2011–2022 (Table 2-3).³⁶ All

³⁶ The Council selected 2011 to 2022 as the period to inform the alternatives because regulations implementing Amendment 91 to the BSAI Groundfish FMP, which included a hard cap for Chinook salmon bycatch, took effect in 2011. Pollock fishermen's behavior changed in response to these regulations, and the observer and monitoring requirements for the fleet were also modified (see Section 5.1.1 for more information).

salmon PSC caught by the pollock fishery during the B season and accounted for under the “non-Chinook” catch accounting category would accrue to the chum salmon PSC limit. The non-Chinook catch accounting category includes sockeye, pink, coho, and chum salmon but over 99% are chum salmon (Table 5-2).

Table 2-3 Range of overall chum salmon PSC limits under consideration

PSC Limit	Council Rationale
100,000	Lower bound added in April 2024 to expand the range of analyzed overall PSC limits
200,000	Rounded up from historical average (1991–2023) intended to balance public testimony requesting a “very low” limit with practicability considerations
300,000	Rounded down from the 10-year average level of bycatch (2013–2022)
350,000	Rounded down from the 5-year average level of bycatch (2018–2022)
400,000	Rounded up from the 3-year average level of bycatch (2020–2022)
450,000	Value between 400,00 and 550,000 chum salmon included in October 2023 addendum
550,000	Rounded value of the highest level of chum salmon bycatch in the analyzed period

2.4.1 Apportionment Options

The overall chum salmon PSC limit would be apportioned among the CDQ, CP, inshore, and mothership sectors. Amounts of chum salmon PSC apportioned to a sector would be transferable among the sectors, CDQ groups, and inshore cooperatives. A description of transferability provisions are available in Section 5.2. Four options and one suboption to divide the PSC limit among the four sectors are being considered, but only one option could be recommended for implementation. The apportionment suboption may be selected in conjunction with all four options.

- **Option 1:** based on a sector’s 3-year historical average level of bycatch (2020 to 2022)
- **Option 2:** based on a sector’s 5-year historical average level of bycatch (2018 to 2022)
- **Option 3:** pro rata apportionment based on 25% weighted to the sector’s AFA pollock allocation and 75% weighted to the sector’s 3-year historical average pollock allocation (2020 to 2022)
- **Option 4:** based on a sector’s AFA pollock allocation amount
 - **Suboption:** For any of the four options above, also establish a CDQ chum salmon PSC Reserve Pool

The apportionment percentages for Options 1, 2 and 3 are based on an adjusted blend chum salmon bycatch rate. The Council directed this method to be used because vessels fishing CDQ pollock have made operational choices when assigning hauls as CDQ or non-CDQ pollock. CDQ groups have historically been constrained by multiple hard caps for other groundfish species and prohibited species when other the pollock sectors were not. Some CDQ groups have at times requested vessel operators to assign lower bycatch hauls as CDQ and higher bycatch hauls to the non-CDQ pollock fisheries. This could make it appear as though the CDQ sector achieved lower bycatch hauls (compared to non-CDQ hauls) and would impact the CDQ apportionments that use each sector’s historical PSC.

To calculate the adjusted blend bycatch rate, the number of non-Chinook salmon reported as B season bycatch in the CDQ pollock fishery was summed with the number of non-Chinook salmon reported as B season bycatch in the CP sector in each year from 2011 through 2022. Second, the B season pollock harvest (mt) for the CDQ pollock fishery and CP sector were summed together in each year from 2011–2022. Next, the combined pool of B season non-Chinook bycatch was divided by the combined pool of pollock landings to derive an adjusted blend bycatch rate in each year. The adjusted blend bycatch rate was then multiplied by the pollock landings (mt) associated with the CDQ pollock fishery to calculate an “adjusted” number of non-Chinook salmon taken as bycatch during the B season. The same approach was taken to calculate the “adjusted” number of non-Chinook salmon for the CP sector in each year.

Since 2011, CDQ pollock has primarily been harvested on CPs, except for the 2016 B season when CDQ pollock was delivered at sea to a mothership, so the adjusted blend rate only affects the CP and CDQ sectors. The adjusted blend bycatch rate does not affect the calculation of apportionment percentages for the inshore sector or the mothership sector. Table 2-4 displays the adjusted bycatch levels and apportionments for the CDQ and CP sectors and the reported levels of chum salmon bycatch for the inshore sector. Table 2-5 shows the resulting apportionments under each option and Table 2-6 shows this proportion translated into the PSC limits. Each sector's historical performance against the different numerical values for an overall chum salmon PSC limit is based on "the actual" bycatch levels reported by NMFS observers, which reflects how the sector's performance against an overall chum PSC limit would be assessed in the future under a regulated program.

Table 2-4 Chum salmon PSC used to calculate the apportionment percentages for each sector, based on historical PSC for the inshore and mothership sectors and a blended bycatch rate for the CDQ and CP sectors, 2011–2022

Year	CDQ	CP	Mothership	Inshore	Total
2011	10,033	38,024	24,399	118,857	191,313
2012	475	1,653	977	19,067	22,172
2013	2,403	8,380	3,835	110,496	125,114
2014	14,735	50,742	8,087	145,322	218,886
2015	9,953	34,743	14,046	174,343	233,085
2016	33,654	117,599	43,101	144,882	339,236
2017	64,374	230,039	16,825	154,610	465,848
2018	28,103	97,930	21,303	147,369	294,705
2019	28,309	100,704	44,860	172,798	346,671
2020	17,420	68,299	19,743	237,632	343,095
2021	34,394	119,186	50,542	341,779	545,901
2022	17,618	60,533	32,262	131,896	242,309
3-Year Avg.	23,144	82,673	34,182	237,102	377,102
3-Year Avg. as %	6.1%	21.9%	9.1%	62.9%	100.0%
5-Year avg.	25,169	89,330	33,742	206,295	354,436
5-Year Avg. as %	7.1%	25.2%	9.5%	58.2%	100.0%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 2-5 Each pollock sector's apportionment percentage by option under Alternatives 2 and 3

Apportionment Option	CDQ	CP	Mothership	Inshore
Option 1: 3-Year Avg.	6.1%	21.9%	9.1%	62.9%
Option 2: 5-Year Avg.	7.1%	25.2%	9.5%	58.2%
Option 3: Pro Rata	7.1%	25.4%	9.1%	58.4%
Option 4: AFA	10.0%	36.0%	9.0%	45.0%

Notes: The AFA percentages under Option 4 reflect the CDQ program's pollock allocation and the AFA sectors' pollock allocation of the directed fishing allowance, the latter of which sets aside the ICA which is used for the incidental catch of pollock in other groundfish fisheries.

The CDQ apportionment would be further divided among the six CDQ groups based on each group's pollock allocation amount which has been fixed since 2005 due to amendments to the MSA (Table 2-7). The inshore sector's apportionment would be further divided among the inshore cooperatives and the inshore open access fishery in applicable years. Only inshore cooperatives that filed an application by December 1 each year and were approved by NMFS would receive a pollock allocation and an amount of the chum salmon PSC limit. There have been six inshore cooperatives in recent years, but five were active in 2024 and 2025 as the Peter Pan Fleet Cooperative did not file an AFA inshore cooperative application in these years.

If an inshore CV does not join a cooperative, it must fish in the inshore open access fishery.³⁷ The number of CVs that have entered the inshore open access fishery has been consistently small until the 2024 fishing season, when 10 vessels participated. Prior to 2024, one or more vessels participated in the

³⁷ CVs typically participate in the inshore open access fishery when they wish to leave their co-op, but a co-op could allow a vessel to deliver more of their pollock quota to the processor of the co-op the vessel would like to join (see 50 CFR 679.4(l)(6)(ii)(D)(2)(i)).

inshore open access fishery in 2015, 2016, and 2018. A cooperative's 2022 pollock allocation was used to calculate its apportionment for the purposes of this DEIS but the actual amount an inshore cooperative would be apportioned would likely be different in the future and could change over time. This is because NMFS would apportion the chum salmon PSC limit among the inshore cooperatives and the open access fishery based on the percentage of pollock allocated to each cooperative under 50 CFR 679.62(a). The amount of pollock each inshore cooperative receives is based on the catch history of member vessels. Under 50 CFR 679.26(a), an inshore cooperative that applies for and receives an AFA inshore co-op fishing permit under 50 CFR 679.4(l)(6) receives an annual pollock allocation amount based on the two years with the highest levels of non-CDQ pollock landings from 1995–1997.

Table 2-6 Number of chum salmon that would be apportioned to each pollock sector for all overall PSC limits and apportionment options under Alternative 2 or 3

PSC Limit	Apportionment	CDQ	CP	Mothership	Inshore
100,000	Option 1: 3-year avg.	6,100	21,900	9,100	62,900
	Option 2: 5-year avg.	7,100	25,200	9,500	58,200
	Option 3: Pro rata	7,100	25,400	9,100	58,400
	Option 4: AFA	10,000	36,000	9,000	45,000
200,000	Option 1: 3-year avg.	12,200	43,800	18,200	125,800
	Option 2: 5-year avg.	14,200	50,400	19,000	116,400
	Option 3: Pro rata	14,200	50,800	18,200	116,800
	Option 4: AFA	20,000	72,000	18,000	90,000
300,000	Option 1: 3-year avg.	18,300	65,700	27,300	188,700
	Option 2: 5-year avg.	21,300	75,600	28,500	174,600
	Option 3: Pro rata	21,300	76,200	27,300	175,200
	Option 4: AFA	30,000	108,000	27,000	135,000
350,000	Option 1: 3-year avg.	21,350	76,650	31,850	220,150
	Option 2: 5-year avg.	24,850	88,200	33,250	203,700
	Option 3: Pro rata	24,850	88,900	31,850	204,400
	Option 4: AFA	35,000	126,000	31,500	157,500
400,000	Option 1: 3-year avg.	24,400	87,600	36,400	251,600
	Option 2: 5-year avg.	28,400	100,800	38,000	232,800
	Option 3: Pro rata	28,400	101,600	36,400	233,600
	Option 4: AFA	40,000	144,000	36,000	180,000
450,000	Option 1: 3-year avg.	27,450	98,550	40,950	283,050
	Option 2: 5-year avg.	31,950	113,400	42,750	261,900
	Option 3: Pro rata	31,950	114,300	40,950	262,800
	Option 4: AFA	45,000	162,000	40,500	202,500
550,000	Option 1: 3-year avg.	33,550	120,450	50,050	345,950
	Option 2: 5-year avg.	39,050	138,600	52,250	320,100
	Option 3: Pro rata	39,050	139,700	50,050	321,200
	Option 4: AFA	55,000	198,000	49,500	247,500

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 2-7 Number of chum salmon that would be apportioned to each CDQ group for all overall PSC limits and apportionment options under Alternative 2 or 3

PSC Limit	Apportionment	CDQ	14% APICDA	21% BBEDC	5% CBSFA	24% CVRF	22% NSEDC	14% YDFDA
100,000	Option 1: 3-yr avg. (6.1%)	6,100	854	1,281	305	1,464	1,342	854
	Option 2: 5-yr avg. (7.1%)	7,100	994	1,491	355	1,704	1,562	994
	Option 3: Pro rata (7.1%)	7,100	994	1,491	355	1,704	1,562	994
	Option 4: AFA (10%)	10,000	1,400	2,100	500	2,400	2,200	1,400
200,000	Option 1: 3-yr avg. (6.1%)	12,200	1,708	2,562	610	2,928	2,684	1,708
	Option 2: 5-yr avg. (7.1%)	14,200	1,988	2,982	710	3,408	3,124	1,988
	Option 3: Pro rata (7.1%)	14,200	1,988	2,982	710	3,408	3,124	1,988
	Option 4: AFA (10%)	20,000	2,800	4,200	1,000	4,800	4,400	2,800
300,000	Option 1: 3-yr avg. (6.1%)	18,300	2,562	3,843	915	4,392	4,026	2,562
	Option 2: 5-yr avg. (7.1%)	21,300	2,982	4,473	1,065	5,112	4,686	2,982
	Option 3: Pro rata (7.1%)	21,300	2,982	4,473	1,065	5,112	4,686	2,982
	Option 4: AFA (10%)	30,000	4,200	6,300	1,500	7,200	6,600	4,200
350,000	Option 1: 3-yr avg. (6.1%)	21,350	2,989	4,484	1,068	5,124	4,697	2,989
	Option 2: 5-yr avg. (7.1%)	24,850	3,479	5,219	1,243	5,964	5,467	3,479
	Option 3: Pro rata (7.1%)	24,850	3,479	5,219	1,243	5,964	5,467	3,479
	Option 4: AFA (10%)	35,000	4,900	7,350	1,750	8,400	7,700	4,900
400,000	Option 1: 3-yr avg. (6.1%)	24,400	3,416	5,124	1,220	5,856	5,368	3,416
	Option 2: 5-yr avg. (7.1%)	28,400	3,976	5,964	1,420	6,816	6,248	3,976
	Option 3: Pro rata (7.1%)	28,400	3,976	5,964	1,420	6,816	6,248	3,976
	Option 4: AFA (10%)	40,000	5,600	8,400	2,000	9,600	8,800	5,600
450,000	Option 1: 3-yr avg. (6.1%)	27,450	3,843	5,765	1,373	6,588	6,039	3,843
	Option 2: 5-yr avg. (7.1%)	31,950	4,473	6,710	1,598	7,668	7,029	4,473
	Option 3: Pro rata (7.1%)	31,950	4,473	6,710	1,598	7,668	7,029	4,473
	Option 4: AFA (10%)	45,000	6,300	9,450	2,250	10,800	9,900	6,300
550,000	Option 1: 3-yr avg. (6.1%)	33,550	4,697	7,046	1,678	8,052	7,381	4,697
	Option 2: 5-yr avg. (7.1%)	39,050	5,467	8,201	1,953	9,372	8,591	5,467
	Option 3: Pro rata (7.1%)	39,050	5,467	8,201	1,953	9,372	8,591	5,467
	Option 4: AFA (10%)	55,000	7,700	11,550	2,750	13,200	12,100	7,700

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 2-8 Number of chum salmon that would be apportioned to each inshore cooperative and inshore open access fishery in applicable years for all overall PSC limits and apportionment options under Alternative 2 or 3

PSC Limit	Apportionment	Inshore	(33.788%) Akutan CV Assoc.	(0.000%) Arctic Enterprise Assoc.	(10.773%) Northern Victor Fleet Coop	(2.512%) Peter Pan Fleet Coop.	(11.454%) Unalaska Fleet Coop.	(22.094%) UniSea Fleet Coop.	(19.380%) Westward Fleet Coop.	(0.000%) Inshore Open Access
100,000	Option 1: 3-yr avg. (62.9%)	62,900	21,253	0	6,776	1,580	7,205	13,897	12,190	0
	Option 2: 5-yr avg. (58.2%)	58,200	19,665	0	6,270	1,462	6,666	12,859	11,279	0
	Option 3: Pro rata (58.4%)	58,400	19,732	0	6,291	1,467	6,689	12,903	11,318	0
	Option 4: AFA (45%)	45,000	15,205	0	4,848	1,130	5,154	9,942	8,721	0
200,000	Option 1: 3-yr avg. (62.9%)	125,800	42,505	0	13,552	3,160	14,409	27,794	24,380	0
	Option 2: 5-yr avg. (58.2%)	116,400	39,329	0	12,540	2,924	13,332	25,717	22,558	0
	Option 3: Pro rata (58.4%)	116,800	39,464	0	12,583	2,934	13,378	25,806	22,636	0
	Option 4: AFA (45%)	90,000	30,409	0	9,696	2,261	10,309	19,885	17,442	0
300,000	Option 1: 3-yr avg. (62.9%)	188,700	63,758	0	20,329	4,740	21,614	41,691	36,570	0
	Option 2: 5-yr avg. (58.2%)	174,600	58,994	0	18,810	4,386	19,999	38,576	33,837	0
	Option 3: Pro rata (58.4%)	175,200	59,197	0	18,874	4,401	20,067	38,709	33,954	0
	Option 4: AFA (45%)	135,000	45,614	0	14,544	3,391	15,463	29,827	26,163	0
350,000	Option 1: 3-yr avg. (62.9%)	220,150	74,384	0	23,717	5,530	25,216	48,640	42,665	0
	Option 2: 5-yr avg. (58.2%)	203,700	68,826	0	21,945	5,117	23,332	45,005	39,477	0
	Option 3: Pro rata (58.4%)	204,400	69,063	0	22,020	5,135	23,412	45,160	39,613	0
	Option 4: AFA (45%)	157,500	53,216	0	16,967	3,956	18,040	34,798	30,524	0
400,000	Option 1: 3-yr avg. (62.9%)	251,600	85,011	0	27,105	6,320	28,818	55,589	48,760	0
	Option 2: 5-yr avg. (58.2%)	232,800	78,658	0	25,080	5,848	26,665	51,435	45,117	0
	Option 3: Pro rata (58.4%)	233,600	78,929	0	25,166	5,868	26,757	51,612	45,272	0
	Option 4: AFA (45%)	180,000	60,818	0	19,391	4,522	20,617	39,769	34,884	0
450,000	Option 1: 3-yr avg. (62.9%)	283,050	95,637	0	30,493	7,110	32,421	62,537	54,855	0
	Option 2: 5-yr avg. (58.2%)	261,900	88,491	0	28,214	6,579	29,998	57,864	50,756	0
	Option 3: Pro rata (58.4%)	262,800	88,795	0	28,311	6,602	30,101	58,063	50,931	0
	Option 4: AFA (45%)	202,500	68,421	0	21,815	5,087	23,194	44,740	39,245	0
550,000	Option 1: 3-yr avg. (62.9%)	345,950	116,890	0	37,269	8,690	39,625	76,434	67,045	0
	Option 2: 5-yr avg. (58.2%)	320,100	108,155	0	34,484	8,041	36,664	70,723	62,035	0
	Option 3: Pro rata (58.4%)	321,200	108,527	0	34,603	8,069	36,790	70,966	62,249	0
	Option 4: AFA (45%)	247,500	83,625	0	26,663	6,217	28,349	54,683	47,966	0

Source: NMFS Alaska Region CAS, data compiled by AKFIN. 2022 Inshore cooperative apportionments available at: <https://media.fisheries.noaa.gov/2022-01/afa-inshore-allocations-2022.pdf>.

2.4.1.1 Suboption: CDQ Reserve Pool Apportionment

Description of the CDQ Reserve Pool for Alternative 2 and 3

Selection of the suboption would establish a “CDQ Reserve Pool.” This CDQ Reserve Pool would exist outside of the overall chum salmon PSC limit, and it may only be accessed by a CDQ group if it informs NMFS in writing by November 15 of any year prior to the annual groundfish specifications process of a plan to associate their CDQ pollock with the inshore or mothership sector. Upon such notification, NMFS will apportion an additional amount of chum salmon PSC from the CDQ Reserve Pool to the group(s) based on the sector with which it is associating (i.e., a mothership or inshore “adjustment”). If a CDQ group is accessing this reserve pool, all CDQ pollock quota from that group must be associated with the same sector, and sector associations cannot be changed mid-year. This process would determine the annual apportionment of chum salmon PSC to this CDQ group. This annual determination would not directly affect any other CDQ group or sector as it would be an amount above the established chum salmon PSC limit.

The Council recommended the CDQ Reserve Pool suboption be added for consideration in February 2025 to address some of the current flexibility with CDQ pollock that could be impacted by the proposed action. CDQ pollock can be harvested with any sector, and as noted above, it has typically been fished on CPs. The CPs (and CDQ pollock that is harvested on these vessels) have historically had lower chum salmon encounter rates relative to the other two sectors. Thus, any apportionment that is based fully or partially on fishing history and encounter rates (Option 1–3), would apportion a lower amount of chum PSC relative to the proportion of pollock for the CP and CDQ sectors compared to the inshore and mothership sectors. This is based on the historical harvest of CDQ pollock in the CP sector. However, the option of a CDQ Reserve Pool would create an automatic ability for an adjustment in the future, if, due to capacity issues or operational decisions, a CDQ group may wish to have its CDQ pollock harvested by a CV. If CDQ is harvested with inshore or mothership sectors, chum salmon encounter rates may look more similar to historical rates of these sectors. **The CDQ Reserve Pool is intended to provide CDQ group(s) the maximized flexibility to harvest CDQ pollock on inshore or mothership CVs in the future, despite a recent history of fishing with the CP sector.** However, even in the absence of a CDQ reserve pool, none of the alternatives prohibits CDQ groups from still harvesting their quota on an inshore or mothership CV, if there is sufficient PSC.

Calculation of the CDQ Reserve Pool for Alternative 2 and 3

This suboption considers applying an inshore or mothership sector chum PSC adjustment to a CDQ group’s chum salmon PSC limit that is based on the historical chum encounter rate for the sector they are fishing with (inshore or mothership) and is scaled to the amount of pollock the CDQ group receives. A CDQ Reserve Pool suboption could also apply under Alternative 5 but the options considered under Alternative 5 result in different apportionment proportions which are calculated separately in Section 2.7.4.1.

The first step to calculate an adjusted chum salmon PSC apportionment for one or more CDQ group, is to consider each sector’s chum apportionment under the four options compared to that sector’s pollock apportionment as a ratio (Table 2-9). If the ratio is <1 it means that sector’s proportion of chum salmon PSC was less than its proportion of the total pollock allocation. If the ratio is >1 , the opposite is true. For example, the inshore CV sector has a ratio of 1.398 for apportionment Option 1 (3-yr average) because it caught 62.9% of the chum salmon PSC on average between 2020–2022 but was allocated 45% of the pollock ($62.9:45=1.398$). Conversely, the CDQ sector caught 6.1% of the chum salmon on average between 2020–2022 but was allocated 10% of the pollock, resulting in a ratio <1 .

The AFA apportionment produces ratios of 1 as this apportionment is not based on chum salmon catch history but would apportion chum salmon PSC equally to each sector’s pollock allocation. Note that the Council’s motion suggests that this suboption could be chosen along with any of the four apportionments

for Alternative 2 or 3. However, functionally, the reserve pool could only apply (and would only need to) if the Council also selected an apportionment based fully or partially on historical PSC catch (Options 1–3). If the AFA apportionment was chosen it would divide the chum salmon PSC as an equal portion to each sector’s pollock allocation (i.e., a 1:1 ratio). Thus, the CDQ PSC apportionment would not be affected based on which sector they had fished with in the past.

Table 2-9 Each sector’s chum salmon apportionment, pollock allocation, and ratio of chum to pollock for an inseason corridor chum salmon PSC limit under Alternative 2 or 3

CDQ				Mothership			
Apportionment	Chum %	Pollock %	Ratio	Apportionment	Chum %	Pollock %	Ratio
3-yr avg.	6.10%	10.00%	0.610	3-yr avg.	9.10%	9.00%	1.011
5-yr avg.	7.10%	10.00%	0.710	5-yr avg.	9.50%	9.00%	1.056
Pro rata	7.10%	10.00%	0.710	Pro rata	9.10%	9.00%	1.011
AFA	10.00%	10.00%	1.000	AFA	9.00%	9.00%	1.000
CP				Inshore			
Apportionment	Chum %	Pollock %	Ratio	Apportionment	Chum %	Pollock %	Ratio
3-yr avg.	21.90%	36.00%	0.608	3-yr avg.	62.90%	45.00%	1.398
5-yr avg.	25.20%	36.00%	0.700	5-yr avg.	58.20%	45.00%	1.293
Pro rata	25.40%	36.00%	0.706	Pro rata	58.40%	45.00%	1.298
AFA	36.00%	36.00%	1.000	AFA	45.00%	45.00%	1.000

Note: the colors intended to demonstrate progression of this calculation through tables in this section.

The second step to calculating an adjusted PSC apportionment for a CDQ group(s) is to multiply the ratio from the sector they are associating by their pollock allocation (Table 2-10). For example, under a 3-yr average apportionment, if all the CDQ groups associated with the inshore sector in a year, a new chum salmon PSC apportionment would be calculated by multiplying 1.398 by 10% (the pollock allocation for all six groups). This adjusted chum salmon PSC apportionment (in orange in Table 2-10) would replace the original chum salmon apportionment. If only one CDQ group associated with the inshore sector, this group’s new chum salmon PSC apportionment would be calculated by multiplying 1.398 by their specific pollock allocation. The ratios from the mothership sector apportionments are all lower than the inshore ratios, therefore they do not produce as large of an adjustment.

Table 2-10 CDQ chum PSC limit apportionments adjusted by applying the mothership and inshore ratios under Alternative 2 or 3

CDQ - with Mothership Adjustment			
Apportionment	Adjusted Chum %	Pollock %	Ratio (from mothership)
3-yr avg.	10.11%	10.00%	1.011
5-yr avg.	10.56%	10.00%	1.056
Pro rata	10.11%	10.00%	1.011
AFA	10.00%	10.00%	1.000
CDQ - with Inshore Adjustment			
Apportionment	Adjusted Chum %	Pollock %	Ratio (from inshore)
3-yr avg.	13.98%	10.00%	1.398
5-yr avg.	12.93%	10.00%	1.293
Pro rata	12.98%	10.00%	1.298
AFA	10.00%	10.00%	1.000

As stated, the chum salmon PSC adjustments would be outside of the PSC limit.

Table 2-12 demonstrates that if all CDQ groups received a mothership or inshore adjustment, the apportionment would sum to over 100% of the chum salmon PSC limit. The amount over the PSC limit represents the maximum size of the CDQ Reserve Pool if all groups associated with that sector. Because an inshore sector adjustment would change a CDQ group’s chum PSC apportionment the most, the true maximum amount over the PSC limit would come from all CDQ groups associating with the inshore sector.

Table 2-12 translates these percentages into numbers of chum salmon PSC over the limit under the different PSC limits considered under Alternative 2 and 3. The overall chum salmon PSC limit and apportionment chosen would determine the maximum amount of chum salmon PSC that could theoretically be accessible in the CDQ Reserve Pool.

Table 2-11 Proportion over the total chum PSC limit if all CDQ groups receive an inshore or mothership PSC limit adjustment under Alternative 2 or 3

If all CDQ Groups Receive a Mothership Adjustment						
Apportionment	Adjusted CDQ	CP	Mothership	Inshore	Sum	% Over the PSC Limit
3-yr avg.	10.11%	21.9%	9.1%	62.9%	104.01%	4.01%
5-yr avg.	10.56%	25.2%	9.5%	58.2%	103.46%	3.46%
Pro rata	10.11%	25.4%	9.1%	58.4%	103.01%	3.01%
AFA	10.00%	36.0%	9.0%	45.0%	100.00%	0.00%
If all CDQ Groups Receive an Inshore Adjustment						
Apportionment	Adjusted CDQ	CP	Mothership	Inshore	Sum	% Over the PSC Limit
3-yr avg.	13.98%	21.9%	9.1%	62.9%	107.88%	7.88%
5-yr avg.	12.93%	25.2%	9.5%	58.2%	105.83%	5.83%
Pro rata	12.98%	25.4%	9.1%	58.4%	105.88%	5.88%
AFA	10.00%	36.0%	9.0%	45.0%	100.00%	0.00%

Table 2-12 Maximum CDQ Reserve Pool (number of fish) based on all CDQ groups receiving an inshore sector adjustment for an inseason corridor cap under Alternative 2 or 3

Apportionment	3-yr avg.	5-yr avg.	Pro rata	AFA³⁸
% Over the Limit	7.88%	5.83%	5.88%	n/a
PSC limit	Maximum Number of Chum Over the Limit			
100,000	7,878	5,833	5,878	-
200,000	15,756	11,667	11,756	-
300,000	23,633	17,500	17,633	-
350,000	27,572	20,417	20,572	-
400,000	31,511	23,333	23,511	-
450,000	35,450	26,250	26,450	-
550,000	43,328	32,083	32,328	-

Pre-season notification from individual CDQ groups would determine how much (if any) of the CDQ Reserve Pool is made available to each group. Under any limit that apportions chum salmon PSC, each CDQ group would receive a sub-apportionment based on each group's pollock allocation amount, as demonstrated in the previous Table 2-7. Table 2-13 below provides chum salmon PSC apportionments for each CDQ group based on the original PSC limit (i.e., matching Table 2-7), with a mothership adjustment that accounts for the group accessing the CDQ Reserve Pool with an intent to harvest CDQ pollock with the mothership sector, and the difference between the chum salmon PSC sub-apportionment values. Table 2-14 provides the same metrics with an inshore adjustment. This table demonstrates the chum salmon PSC numbers apportioned to each CDQ group which could be applicable if they notified NMFS of an intent to harvest CDQ pollock with the mothership sector in the following year.

³⁸ Under the AFA PSC apportionment option, chum salmon PSC would be apportioned between sectors in the same proportions as the pollock allocation and, therefore, the PSC apportionment would not be based on historical chum salmon encounter rates. As such, no CDQ reserve pool would be needed.

Table 2-13 Number of chum salmon apportioned to each CDQ group under Alternative 2 or 3, with and without a mothership adjustment from the CDQ Reserve Pool

APICDA (14% CDQ Pollock)					BBEDC (21% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference
100,000	3-yr avg.	854	1,416	562	100,000	3-yr avg.	1,281	2,123	842
	5-yr avg.	994	1,478	484		5-yr avg.	1,491	2,217	726
	Pro rata	994	1,416	422		Pro rata	1,491	2,123	632
	AFA	1,400	1,400	0		AFA	2,100	2,100	0
325,000	3-yr avg.	2,776	4,601	1,825	325,000	3-yr avg.	4,163	6,901	2,738
	5-yr avg.	3,231	4,803	1,572		5-yr avg.	4,846	7,204	2,358
	Pro rata	3,231	4,601	1,370		Pro rata	4,846	6,901	2,055
	AFA	4,550	4,550	0		AFA	6,825	6,825	0
550,000	3-yr avg.	4,697	7,786	3,089	550,000	3-yr avg.	7,046	11,678	4,633
	5-yr avg.	5,467	8,128	2,661		5-yr avg.	8,201	12,192	3,991
	Pro rata	5,467	7,786	2,319		Pro rata	8,201	11,678	3,478
	AFA	7,700	7,700	0		AFA	11,550	11,550	0
CBSFA (5% CDQ Pollock)					CVRF (24% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference
100,000	3-yr avg.	305	506	201	100,000	3-yr avg.	1,464	2,427	963
	5-yr avg.	355	528	173		5-yr avg.	1,704	2,533	829
	Pro rata	355	506	151		Pro rata	1,704	2,427	723
	AFA	500	500	0		AFA	2,400	2,400	0
325,000	3-yr avg.	991	1,643	652	325,000	3-yr avg.	4,758	7,887	3,129
	5-yr avg.	1,154	1,715	562		5-yr avg.	5,538	8,233	2,695
	Pro rata	1,154	1,643	489		Pro rata	5,538	7,887	2,349
	AFA	1,625	1,625	0		AFA	7,800	7,800	0
550,000	3-yr avg.	1,678	2,781	1,103	550,000	3-yr avg.	8,052	13,347	5,295
	5-yr avg.	1,953	2,903	950		5-yr avg.	9,372	13,933	4,561
	Pro rata	1,953	2,781	828		Pro rata	9,372	13,347	3,975
	AFA	2,750	2,750	0		AFA	13,200	13,200	0
NSEDC (22% CDQ Pollock)					YDFDA (14% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference
100,000	3-yr avg.	1,342	2,224	882	100,000	3-yr avg.	854	1,416	562
	5-yr avg.	1,562	2,322	760		5-yr avg.	994	1,478	484
	Pro rata	1,562	2,224	662		Pro rata	994	1,416	422
	AFA	2,200	2,200	0		AFA	1,400	1,400	0
325,000	3-yr avg.	4,362	7,229	2,868	325,000	3-yr avg.	2,776	4,601	1,825
	5-yr avg.	5,077	7,547	2,471		5-yr avg.	3,231	4,803	1,572
	Pro rata	5,077	7,229	2,153		Pro rata	3,231	4,601	1,370
	AFA	7,150	7,150	0		AFA	4,550	4,550	0
550,000	3-yr avg.	7,381	12,234	4,853	550,000	3-yr avg.	4,697	7,786	3,089
	5-yr avg.	8,591	12,772	4,181		5-yr avg.	5,467	8,128	2,661
	Pro rata	8,591	12,234	3,643		Pro rata	5,467	7,786	2,319
	AFA	12,100	12,100	0		AFA	7,700	7,700	0

Table 2-14 Number of chum salmon apportioned to each CDQ group under Alternative 2 or 3, with and without an inshore adjustment from the CDQ Reserve Pool

APICDA (14% CDQ Pollock)					BBEDC (21% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference
100,000	3-yr avg.	854	1,957	1,103	100,000	3-yr avg.	1,281	2,935	1,654
	5-yr avg.	994	1,811	817		5-yr avg.	1,491	2,716	1,225
	Pro rata	994	1,817	823		Pro rata	1,491	2,725	1,234
	AFA	1,400	1,400	0		AFA	2,100	2,100	0
325,000	3-yr avg.	2,776	6,360	3,584	325,000	3-yr avg.	4,163	9,540	5,377
	5-yr avg.	3,231	5,885	2,654		5-yr avg.	4,846	8,827	3,981
	Pro rata	3,231	5,905	2,674		Pro rata	4,846	8,857	4,012
	AFA	4,550	4,550	0		AFA	6,825	6,825	0
550,000	3-yr avg.	4,697	10,763	6,066	550,000	3-yr avg.	7,046	16,144	9,099
	5-yr avg.	5,467	9,959	4,492		5-yr avg.	8,201	14,938	6,738
	Pro rata	5,467	9,993	4,526		Pro rata	8,201	14,989	6,789
	AFA	7,700	7,700	0		AFA	11,550	11,550	0
CBSFA (5% CDQ Pollock)					CVRF (24% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference
100,000	3-yr avg.	305	699	394	100,000	3-yr avg.	1,464	3,355	1,891
	5-yr avg.	355	647	292		5-yr avg.	1,704	3,104	1,400
	Pro rata	355	649	294		Pro rata	1,704	3,115	1,411
	AFA	500	500	0		AFA	2,400	2,400	0
325,000	3-yr avg.	991	2,271	1,280	325,000	3-yr avg.	4,758	10,903	6,145
	5-yr avg.	1,154	2,102	948		5-yr avg.	5,538	10,088	4,550
	Pro rata	1,154	2,109	955		Pro rata	5,538	10,123	4,585
	AFA	1,625	1,625	0		AFA	7,800	7,800	0
550,000	3-yr avg.	1,678	3,844	2,166	550,000	3-yr avg.	8,052	18,451	10,399
	5-yr avg.	1,953	3,557	1,604		5-yr avg.	9,372	17,072	7,700
	Pro rata	1,953	3,569	1,616		Pro rata	9,372	17,131	7,759
	AFA	2,750	2,750	0		AFA	13,200	13,200	0
NSEDC (22% CDQ Pollock)					YDFDA (14% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference
100,000	3-yr avg.	1,342	3,075	1,733	100,000	3-yr avg.	854	1,957	1,103
	5-yr avg.	1,562	2,845	1,283		5-yr avg.	994	1,811	817
	Pro rata	1,562	2,855	1,293		Pro rata	994	1,817	823
	AFA	2,200	2,200	0		AFA	1,400	1,400	0
325,000	3-yr avg.	4,362	9,994	5,633	325,000	3-yr avg.	2,776	6,360	3,584
	5-yr avg.	5,077	9,247	4,171		5-yr avg.	3,231	5,885	2,654
	Pro rata	5,077	9,279	4,203		Pro rata	3,231	5,905	2,674
	AFA	7,150	7,150	0		AFA	4,550	4,550	0
550,000	3-yr avg.	7,381	16,913	9,532	550,000	3-yr avg.	4,697	10,763	6,066
	5-yr avg.	8,591	15,649	7,058		5-yr avg.	5,467	9,959	4,492
	Pro rata	8,591	15,703	7,112		Pro rata	5,467	9,993	4,526
	AFA	12,100	12,100	0		AFA	7,700	7,700	0

2.5 Alternative 3: Overall Chum Salmon PSC Limit with Abundance Indices

Alternative 3 is similar to Alternative 2 except that it would conditionally apply an overall non-Chinook (i.e., chum salmon) PSC limit. Under Alternative 3, an overall chum salmon PSC limit would only be in effect during a B season following a year of low Western Alaska chum salmon abundance. The range of PSC limits under consideration for Alternative 3 is generally the same as Alternative 2, as are the apportionment options and suboption, transferability provision, and the requirement that directed fishing must cease if the limit is met.

An index for Western Alaska chum salmon abundance would be used to determine whether the overall PSC limit would be in effect. Two options for an abundance index are being considered but only one may be selected. **Option 1** would implement a Three-area chum salmon index based on chum salmon inriver estimates in the Yukon, Kuskokwim, and Norton Sound areas. **Option 2** would implement an index based on Yukon summer and fall chum salmon inriver estimates. By October 1 of each year, ADF&G would provide data to evaluate whether the index met the thresholds for low abundance. The data sources ADF&G would use to measure chum salmon abundance vary by area and are described directly below (see also Table 2-15).

This DEIS uses the terms “low abundance” or “high abundance” for ease of the reader. At its April 2023 meeting, the Council indicated its interest in considering additional criteria such as whether Amount Reasonably Necessary for Subsistence (ANS) and escapement goals are met. These additional criteria provided context to help the Council determine the thresholds to recommend for use in each area at its October 2023 meeting. Thus “low abundance” years were characterized by escapement goals not being met, restrictions on subsistence and commercial chum salmon fisheries, or total closures of those fisheries. The thresholds for Option 1 and 2 represent historically poor years of chum abundance.

2.5.1 Description of Data Sources for Option 1 and Option 2

This section describes the data sources that would be used for each area to measure chum salmon returns to make a determination on whether the area is at a state of low or high abundance. The abundances indices, including the data sources that would be used, the thresholds (Suboption 1 and Suboption 2), and each area functioning as its own independent test under Option 1, underwent scientific peer review through the SSC in October 2023, April 2024, and February 2025.

Yukon summer and fall chum salmon returns would be measured by each stock’s respective inriver run reconstructions for both Option 1 and Option 2. Run reconstructions provide a total accounting of escapement and inriver harvests throughout the drainage and are available in the fall. This timing would accommodate the annual groundfish harvest specifications process. Similar to the use of run reconstruction datasets for Chinook salmon under the 3-System index (see 50 CFR 679.21(f)(2)), preliminary estimates may be available in early fall following the salmon season. These preliminary estimates include best estimates of subsistence harvest before the final subsistence harvest analysis is completed in late winter/early spring of the following year. Such estimates do not account for marine harvests that may occur in the Alaska Peninsula, Chignik, or other areas (*e.g.*, Munro et al. 2012).

Kuskokwim chum salmon returns would be measured by the Kuskokwim Sonar for Option 1.

Cumulative CPUE from the Bethel Test Fishery was previously considered as the data source for the Kuskokwim River because information is readily available, it is a reliable measure of abundance, it is used by inseason salmon fishery managers, and the test fishery is less impacted by weather conditions. However, prior to the Council’s February 2025 meeting, new information was available that indicated future funding to operate the test fishery is uncertain. After consideration, the Kuskokwim Sonar was selected to replace the Bethel Test Fishery because there is a strong relationship between sonar passage and cumulative CPUE at the test fishery. However, Kuskokwim Sonar data are only available for a limited number of years (2018 to present). ADF&G has used a linear regression-based method to hindcast sonar values prior to 2018; these estimates are provided in Table 2-15.

Norton Sound chum salmon returns would be measured by a standardized index and total Norton Sound harvest for Option 1. The standardized index of escapements is based on the Snake, Nome, Eldorado, Kwiniuk, and North Rivers. Escapements are consistently enumerated each year through weirs or counting towers. This standardized index is representative of chum salmon returns across several management districts in the region. Under this approach, the tributary escapements, commercial, sport, and subsistence harvest would be preliminary (not the final) estimates used to accommodate the Council's fall specification cycle. Preliminary escapement would be based on the total estimated chum salmon passage at each tributary assessment project, and the very small annual harvest that occurs upriver from the assessment locations would be ignored. Preliminary harvest would be informed by commercial fish tickets and ADF&G management staff expectation of subsistence and sport harvest based, in part, on historical trends, amounts of fishing opportunity provided, and observations of fishery participation. These preliminary data are available shortly after the salmon season, with final estimates for all components published in Annual Management Reports.

The thresholds that would be used to determine whether returns are at low abundance for both indices are based on the 25th and 50th percentile (Suboption 1 and 2, respectively) of historical abundance. Only one value could be selected for implementation. The threshold values are based on data from 1992–2022. This period reflects the years common to all indices where achievements of amounts reasonably necessary for subsistence (ANS) and escapement goals could be evaluated. More recent years' data are not included because 2022 was the year of most recent and finalized data available in 2023 when the Council recommended an initial set of alternatives for impact analysis at its October 2023 meeting.

Table 2-15 Historical inriver chum salmon abundance based on Alternative 3 indices data sources, 1992–2022

Year	Yukon Summer Chum Salmon	Yukon Fall Chum Salmon	Kuskokwim Sonar	Norton Sound Minimum Standardized Index and Total Harvest
1992	2,833,600	556,852	169,416	
1993	1,891,700	462,735	140,051	
1994	3,871,700	1,114,772	278,148	
1995	4,300,100	1,614,534	227,336	
1996	4,401,300	1,140,415	493,555	
1997	1,654,300	705,179	101,334	101,934
1998	1,012,700	350,457	124,527	80,966
1999	1,146,500	416,480	13,051	39,217
2000	552,820	250,242	140,861	55,153
2001	542,190	372,385	190,551	66,123
2002	1,275,200	426,469	402,654	73,710
2003	1,262,200	792,375	279,270	43,407
2004	1,463,000	652,616	306,017	41,270
2005	2,761,400	2,188,488	1,113,028	53,034
2006	4,019,500	1,213,273	847,121	113,350
2007	2,157,800	1,161,101	643,124	107,719
2008	2,067,500	857,819	399,599	63,806
2009	1,703,700	591,077	493,617	69,906
2010	1,668,300	585,791	456,085	277,401
2011	2,406,000	1,244,141	604,032	202,421
2012	2,479,900	1,089,200	408,639	107,359
2013	3,349,600	1,215,809	336,618	188,104
2014	2,467,600	956,669	374,395	215,382
2015	1,978,400	828,453	162,410	259,441
2016	2,581,500	1,390,329	228,055	124,397
2017	3,635,100	2,315,883	401,853	324,148
2018	2,074,700	1,114,684	555,589	363,939
2019	1,689,400	802,964	385,409	234,270
2020	763,200	184,233	76,369	49,762
2021	156,130	95,249	25,689	21,735
2022	478,690	242,465	103,864	70,702
25 th Percentile	1,268,700	444,602	151,636	57,316
50 th Percentile	1,978,400	802,964	306,017	91,450

Source: ADF&G.

2.5.2 Option 1: Three-area Index

Option 1 would implement a Three-area chum salmon index based on returns to the Yukon, Kuskokwim, and Norton Sound areas. The **Yukon Area** needs to have more than 1,713,300 or 2,718,400 combined summer and fall chum salmon return based on each stock's respective run reconstruction. The **Kuskokwim Area** needs to have more than 151,636 or 306,017 chum salmon return and be counted based on the Kuskokwim Sonar. The **Norton Sound Area** needs to have more than 57,300 or 91,500 chum salmon return based on the sum of the Snake, Nome, Eldorado, Kwiniuk, and North River escapements plus total chum salmon harvests for the region.

If all areas (3 of 3) have returns above their thresholds, a chum salmon PSC limit **would not** be in effect the following year. If two areas (2 of 3) have returns above their thresholds, a chum salmon PSC limit **would** be in place the following year. The amount would be between 100,000 and 550,000 chum salmon. If 1 or 0 areas (1 of 3 or 0 of 3) have returns above their thresholds, a chum salmon PSC limit **would** be in effect the following year and the amount would be set at 75% of the level selected for when two areas (2 of 3) have returns above their thresholds.

Each area's threshold would function as an independent test to determine whether the area is at a state of low or high chum salmon abundance. This approach is preferable to summing the thresholds for each area

together under a single index for Western Alaska Chinook salmon for several reasons. First, there are limited run reconstructions for chum salmon returning to Western Alaska river systems. Second, the units of measurement for appropriate estimates of abundance differ between the areas (*e.g.*, full run reconstruction, test fishery, weir count, among others), and this approach provides some proportionality among the river systems as their run sizes vary substantially.³⁹

Under Option 1 of Alternative 3, it is possible for a 75,000-chum salmon PSC limit to be in effect if 1 or 0 areas have returns above their thresholds and the PSC limit set when 2 of 3 areas have returns above their thresholds is 100,000 chum salmon.

Table 2-16 through Table 2-18 provide the number of chum salmon that would be apportioned to each sector, CDQ group, and inshore cooperative under all cap amounts that are 75% of caps set between 100,000 and 550,000 chum salmon.

Table 2-16 Number of chum salmon that would be apportioned to each sector under all PSC limit amounts when two or more areas fail to meet their abundance thresholds under Alternative 3, Option 1

PSC Limit	Apportionment	CDQ	CP	Mothership	Inshore
75,000	Option 1: 3-year avg.	4,575	16,425	6,825	47,175
	Option 2: 5-year avg.	5,325	18,900	7,125	43,650
	Option 3: Pro rata	5,325	19,050	6,825	43,800
	Option 4: AFA	7,500	27,000	6,750	33,750
150,000	Option 1: 3-year avg.	9,150	32,850	13,650	94,350
	Option 2: 5-year avg.	10,650	37,800	14,250	87,300
	Option 3: Pro rata	10,650	38,100	13,650	87,600
	Option 4: AFA	15,000	54,000	13,500	67,500
225,000	Option 1: 3-year avg.	13,725	49,275	20,475	141,525
	Option 2: 5-year avg.	15,975	56,700	21,375	130,950
	Option 3: Pro rata	15,975	57,150	20,475	131,400
	Option 4: AFA	22,500	81,000	20,250	101,250
262,500	Option 1: 3-year avg.	16,013	57,488	23,888	165,113
	Option 2: 5-year avg.	18,638	66,150	24,938	152,775
	Option 3: Pro rata	18,638	66,675	23,888	153,300
	Option 4: AFA	26,250	94,500	23,625	118,125
300,000	Option 1: 3-year avg.	18,300	65,700	27,300	188,700
	Option 2: 5-year avg.	21,300	75,600	28,500	174,600
	Option 3: Pro rata	21,300	76,200	27,300	175,200
	Option 4: AFA	30,000	108,000	27,000	135,000
337,500	Option 1: 3-year avg.	20,588	73,913	30,713	212,288
	Option 2: 5-year avg.	23,963	85,050	32,063	196,425
	Option 3: Pro rata	23,963	85,725	30,713	197,100
	Option 4: AFA	33,750	121,500	30,375	151,875
412,500	Option 1: 3-year avg.	25,163	90,338	37,538	259,463
	Option 2: 5-year avg.	29,288	103,950	39,188	240,075
	Option 3: Pro rata	29,288	104,775	37,538	240,900
	Option 4: AFA	41,250	148,500	37,125	185,625

Source: NMFS catch accounting system, data compiled by AKFIN.

³⁹ In October 2023, the SSC recommended treating each area as an independent test for low abundance; the SSC's final report from October 2023 is available at the archived meeting agenda for the October 2023 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3003>), agenda item B11.

Table 2-17 Number of chum salmon that would be apportioned to each CDQ group under all PSC limits when two or more areas fail to meet abundance thresholds under Alternative 3, Option 1

PSC Limit	Apportionment	CDQ	14% APICDA	21% BBEDC	5% CBSFA	24% CVRF	22% NSEDG	14% YDFDA
75,000	Option 1: 3-yr avg. (6.1%)	4,575	641	961	229	1,098	1,007	641
	Option 2: 5-yr avg. (7.1%)	5,325	746	1,118	266	1,278	1,172	746
	Option 3: Pro rata (7.1%)	5,325	746	1,118	266	1,278	1,172	746
	Option 4: AFA (10%)	7,500	1,050	1,575	375	1,800	1,650	1,050
150,000	Option 1: 3-yr avg. (6.1%)	9,150	1,281	1,922	458	2,196	2,013	1,281
	Option 2: 5-yr avg. (7.1%)	10,650	1,491	2,237	533	2,556	2,343	1,491
	Option 3: Pro rata (7.1%)	10,650	1,491	2,237	533	2,556	2,343	1,491
	Option 4: AFA (10%)	15,000	2,100	3,150	750	3,600	3,300	2,100
225,000	Option 1: 3-yr avg. (6.1%)	13,725	1,922	2,882	686	3,294	3,020	1,922
	Option 2: 5-yr avg. (7.1%)	15,975	2,237	3,355	799	3,834	3,515	2,237
	Option 3: Pro rata (7.1%)	15,975	2,237	3,355	799	3,834	3,515	2,237
	Option 4: AFA (10%)	22,500	3,150	4,725	1,125	5,400	4,950	3,150
262,500	Option 1: 3-yr avg. (6.1%)	16,013	2,242	3,363	801	3,843	3,523	2,242
	Option 2: 5-yr avg. (7.1%)	18,638	2,609	3,914	932	4,473	4,100	2,609
	Option 3: Pro rata (7.1%)	18,638	2,609	3,914	932	4,473	4,100	2,609
	Option 4: AFA (10%)	26,250	3,675	5,513	1,313	6,300	5,775	3,675
300,000	Option 1: 3-yr avg. (6.1%)	18,300	2,562	3,843	915	4,392	4,026	2,562
	Option 2: 5-yr avg. (7.1%)	21,300	2,982	4,473	1,065	5,112	4,686	2,982
	Option 3: Pro rata (7.1%)	21,300	2,982	4,473	1,065	5,112	4,686	2,982
	Option 4: AFA (10%)	30,000	4,200	6,300	1,500	7,200	6,600	4,200
337,500	Option 1: 3-yr avg. (6.1%)	20,588	2,882	4,323	1,029	4,941	4,529	2,882
	Option 2: 5-yr avg. (7.1%)	23,963	3,355	5,032	1,198	5,751	5,272	3,355
	Option 3: Pro rata (7.1%)	23,963	3,355	5,032	1,198	5,751	5,272	3,355
	Option 4: AFA (10%)	33,750	4,725	7,088	1,688	8,100	7,425	4,725
412,500	Option 1: 3-yr avg. (6.1%)	25,163	3,523	5,284	1,258	6,039	5,536	3,523
	Option 2: 5-yr avg. (7.1%)	29,288	4,100	6,150	1,464	7,029	6,443	4,100
	Option 3: Pro rata (7.1%)	29,288	4,100	6,150	1,464	7,029	6,443	4,100
	Option 4: AFA (10%)	41,250	5,775	8,663	2,063	9,900	9,075	5,775

Source: NMFS catch accounting system, data compiled by AKFIN.

Table 2-18 Number of chum salmon that would be apportioned to each inshore cooperative and the inshore open access fishery when two or more areas fail to meet their abundance thresholds under Alternative 3, Option 1

PSC Limit	Apportionment	Inshore Sector	(33.788%) Akutan CV Assoc.	(0.000%) Arctic Enterprise Assoc.	(10.773%) Northern Victor Fleet Coop	(2.512%) Peter Pan Fleet Coop.	(11.454%) Unalaska Fleet Coop.	(22.094%) UniSea Fleet Coop.	(19.380%) Westward Fleet Coop.	(0.000%) Inshore Open Access
75,000	Option 1: 3-yr avg. (62.9%)	47,175	15,939	0	5,082	1,185	5,403	10,423	9,143	0
	Option 2: 5-yr avg. (58.2%)	43,650	14,748	0	4,702	1,096	5,000	9,644	8,459	0
	Option 3: Pro rata (58.4%)	43,800	14,799	0	4,719	1,100	5,017	9,677	8,488	0
	Option 4: AFA (45%)	33,750	11,403	0	3,636	848	3,866	7,457	6,541	0
150,000	Option 1: 3-yr avg. (62.9%)	94,350	31,879	0	10,164	2,370	10,807	20,846	18,285	0
	Option 2: 5-yr avg. (58.2%)	87,300	29,497	0	9,405	2,193	9,999	19,288	16,919	0
	Option 3: Pro rata (58.4%)	87,600	29,598	0	9,437	2,201	10,034	19,354	16,977	0
	Option 4: AFA (45%)	67,500	22,807	0	7,272	1,696	7,731	14,913	13,082	0
225,000	Option 1: 3-yr avg. (62.9%)	141,525	47,818	0	15,246	3,555	16,210	31,269	27,428	0
	Option 2: 5-yr avg. (58.2%)	130,950	44,245	0	14,107	3,289	14,999	28,932	25,378	0
	Option 3: Pro rata (58.4%)	131,400	44,397	0	14,156	3,301	15,051	29,032	25,465	0
	Option 4: AFA (45%)	101,250	34,210	0	10,908	2,543	11,597	22,370	19,622	0
262,500	Option 1: 3-yr avg. (62.9%)	165,113	55,788	0	17,788	4,148	18,912	36,480	31,999	0
	Option 2: 5-yr avg. (58.2%)	152,775	51,620	0	16,458	3,838	17,499	33,754	29,608	0
	Option 3: Pro rata (58.4%)	153,300	51,797	0	16,515	3,851	17,559	33,870	29,710	0
	Option 4: AFA (45%)	118,125	39,912	0	12,726	2,967	13,530	26,099	22,893	0
300,000	Option 1: 3-yr avg. (62.9%)	188,700	63,758	0	20,329	4,740	21,614	41,691	36,570	0
	Option 2: 5-yr avg. (58.2%)	174,600	58,994	0	18,810	4,386	19,999	38,576	33,837	0
	Option 3: Pro rata (58.4%)	175,200	59,197	0	18,874	4,401	20,067	38,709	33,954	0
	Option 4: AFA (45%)	135,000	45,614	0	14,544	3,391	15,463	29,827	26,163	0
337,500	Option 1: 3-yr avg. (62.9%)	212,288	71,728	0	22,870	5,333	24,315	46,903	41,141	0
	Option 2: 5-yr avg. (58.2%)	196,425	66,368	0	21,161	4,934	22,499	43,398	38,067	0
	Option 3: Pro rata (58.4%)	197,100	66,596	0	21,234	4,951	22,576	43,547	38,198	0
	Option 4: AFA (45%)	151,875	51,316	0	16,361	3,815	17,396	33,555	29,433	0
412,500	Option 1: 3-yr avg. (62.9%)	259,463	87,667	0	27,952	6,518	29,719	57,326	50,284	0
	Option 2: 5-yr avg. (58.2%)	240,075	81,117	0	25,863	6,031	27,498	53,042	46,527	0
	Option 3: Pro rata (58.4%)	240,900	81,395	0	25,952	6,051	27,593	53,224	46,686	0
	Option 4: AFA (45%)	185,625	62,719	0	19,997	4,663	21,261	41,012	35,974	0

Source: NMFS catch accounting system, data compiled by AKFIN. [2022 Inshore cooperative apportionments.](#)

2.5.3 Option 2: Yukon Area Index

Option 2 would include an abundance index based on Yukon summer and fall chum salmon returns. The **Yukon summer chum salmon run** would need to have more than 1,268,700 or 1,978,400 fish return based on the summer chum run reconstruction. The **Yukon fall chum salmon run** would need to have more than 444,600 or 803,000 fish return based on the Yukon fall chum run reconstruction.

If both stocks (2 of 2) have returns above their threshold, an overall chum salmon PSC limit **would not** be in effect during the B season of the following year. If one or neither stock (1 of 2 or 0 of 2) have returns above their threshold, an overall chum salmon PSC limit **would** be in effect for the year. The overall chum salmon PSC limit would be set at an amount between 100,000 and 550,000 chum salmon (i.e., the same range as Alternative 2).

Analytical staff prepared a dynamic factor analysis (DFA) and a cross-correlation analysis for the April 2024 meeting in response to the Council's request for an evaluation of potentially simplifying the index options being considered. The DFA and cross-correlation analysis demonstrated the Yukon summer and fall chum salmon runs likely provide a reliable index of the aggregate dynamics of Western Alaska chum salmon, where the aggregate abundance dynamics are measured by the areas and data sources composing the Three-area index. The [SSC's April 2024 minutes](#) noted the DFA and cross-correlation analyses were reasonable and the results suggested the Yukon River summer chum index could be used as a proxy for all of the indices because they seem to follow similar temporal patterns.⁴⁰

2.6 Alternative 4: Additional Regulatory Requirements for Incentive Plan Agreements

Alternative 4 would modify regulations at 50 CFR 679.21(f)(12)(iii)(E) to include six provisions the IPAs would be required to design measures to respond to. The provisions would apply equally across the IPAs, but the explicit manner in which they are addressed within IPAs is not specified. The annual reporting requirements for the IPAs at 50 CFR 679.21(f)(13) would not be modified. Just as it is with the current IPA regulations, the IPA submitted to NMFS for approval would be required to include a description of how these provisions are met by the IPA. The six proposed provisions provided directly below may be recommended individually or as a complete package.

1. require the pollock sectors to describe in their IPA how genetic stock composition data are included in chum salmon avoidance measures.
2. require the pollock sectors to describe in their IPAs how they monitor for potential chum salmon avoidance closures more than once per week.
3. require the use of salmon excluders for the duration of A and B season.
4. require the pollock sectors to develop chum salmon vessel outlier provisions and implement within their IPA.
5. Require IPAs to provide weekly salmon bycatch reports to Western and Interior Alaska salmon users to allow for more transparency in reporting.
6. require the pollock sector IPAs to prohibit fishing in bycatch avoidance areas for all vessels regardless of performance when ADFG weekly stat area bycatch rates exceed 5 chum per ton of pollock (CP) and 3 times base rate (CV and MS).

Note that the Council requested industry to take immediate steps to avoid chum salmon in the 2022 B season following the high chum salmon bycatch year in 2021. In response, members of the CP IPA formally amended the contract with new chum salmon avoidance measures. The Inshore SSIP and MSSIP

⁴⁰ Accessible at the Council's archived meeting page for the April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), under agenda item B10 (SSC Report April 2024_FINAL)

were amended to incorporate new avoidance measures prior to the 2024 B season. The six provisions under Alternative 4 align closely with the fleet's current operational strategies under the recently amended IPAs. Even so, Alternative 4 modifies the regulations at 50 CFR 679.21(f)(12)(iii)(E). Without this regulatory change, the IPAs could be amended in the future such that the recent and additional measures are no longer taken.

2.7 Alternative 5: Inseason Corridor Cap

Alternative 5 would implement an inseason corridor with closure provisions. This management measure is a functionally a time/area closure. Three different inseason corridor options (Option 1, Suboption 1, and Option 2) are being considered, but only one could be selected for implementation. **Throughout the DEIS “inseason corridor” is used to refer to the combined area of genetic cluster areas 1 and 2 and represents the perimeter of this area.** The inseason corridor encompasses 40 ADF&G groundfish stat areas where 84% of the WAK chum salmon were taken as bycatch from 2011–2023 (Figure 2-3).⁴¹

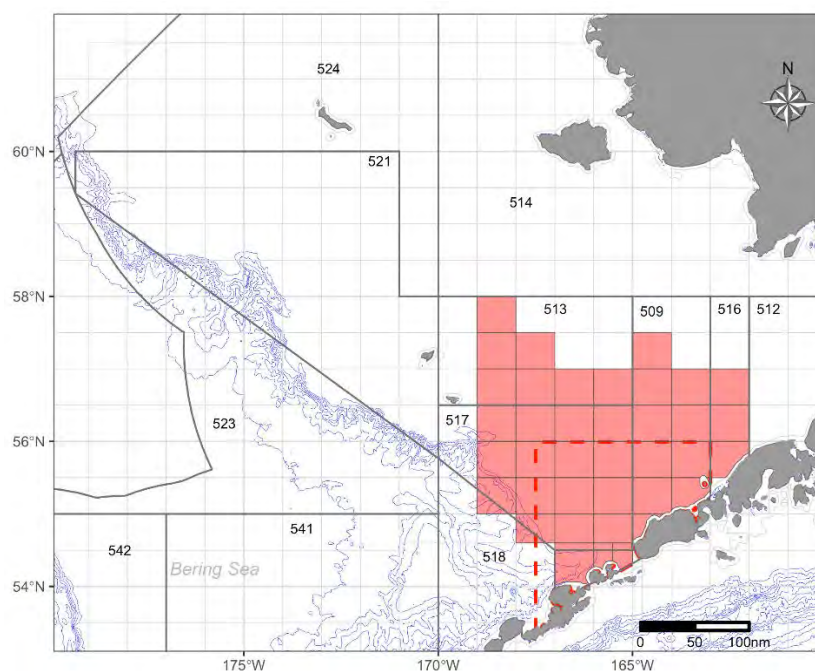


Figure 2-3 Inseason corridor under consideration for Alternative 5 that represents the combined area of genetic clusters 1 and 2 and encompasses 40 ADF&G groundfish stat areas

Notes: The CVOA is shown by the dashed line.

The inseason corridor is the same across all three options under consideration. Option 1, Suboption 1, and Option 2 differ based on the number of stat areas inside the corridor that would close, the location of the stat areas inside the corridor that would close, and the entity that would implement the closure if the corridor's non-Chinook salmon (i.e., chum salmon) PSC limit is met. The corridor PSC limit under Alternative 5 is different from the overall PSC limits considered under Alternative 2 and 3. The range of corridor chum salmon PSC limits is 50,000–350,000 chum salmon. The PSC limit would be apportioned among the pollock sectors. The apportionment options, suboption, and transferability provisions are the same as Alternative 2 and 3.

⁴¹ The inseason corridor is the combined area of genetic clusters 1 and 2, and it encompasses the following 40 ADF&G statistical areas: 685730, 685700, 685630, 685600, 685530, 685500, 675700, 675630, 675600, 675530, 675500, 675430, 665630, 665600, 665530, 665500, 665430, 665401, 655630, 655600, 655530, 655500, 655430, 655409, 655410, 655412, 645700, 645630, 645600, 645530, 645501, 645434, 635700, 635630, 635600, 635530, 635504, 625630, 625600, and 625531.

Under Alternative 5, only the non-Chinook salmon taken as bycatch inside the corridor from June 10 – August 31 accrues to this limit. **Throughout the DEIS “closure window” refers to June 10 – August 31 which is when all non-Chinook salmon PSC taken inside the inseason corridor would accrue to the corridor’s PSC limit.** This closure window was selected because it reflects the period when the majority of chum salmon bycatch has been encountered on the pollock fishing grounds and when Western Alaska chum salmon are typically encountered in higher proportions. The corridor would close to a cooperative and/or sector that met the PSC limit from that date through August 31. Fishing may continue outside the corridor after the PSC limit is met under all three options, as well as inside a select number of stat areas exempted from closure under Suboption 1 and Option 2. From September 1 – November 1, all sectors would be allowed to target pollock inside the corridor.

If the Council would like to include Alternative 5 within the PA, NMFS is recommending the Council clarify its intent for how the inseason corridor closure should be managed. NMFS suggests a regulatory prohibition for a cooperative or CDQ group that met its apportionment of the corridor chum salmon PSC limit under Option 1 and Suboption 1 (see Section 5.1.5). NMFS would manage the corridor PSC limit similar to how it manages the Chinook salmon PSC limit. That is, cooperatives and CDQ groups will monitor their non-Chinook PSC (as does NMFS) caught within genetic clusters 1 and 2 between June 10 and August 31 and must ensure that their vessels stop fishing prior to exceeding their non-Chinook PSC limit within that period. Under Option 2, an inseason corridor closure would be managed by the IPAs.

2.7.1 Option 1

All 40 stat areas inside the inseason corridor would close to a cooperative or sector that met the inseason corridor chum salmon PSC limit at any point during the closure window (June 10 – August 31). Vessels impacted by the corridor closure would be allowed to continue fishing outside the inseason corridor through August 31, and those vessels could return to fish inside the corridor on September 1. Figure 2-4 shows the areas that would close in red (i.e., 100% of the inseason corridor) alongside other areas that would remain open and where fishing has historically occurred.

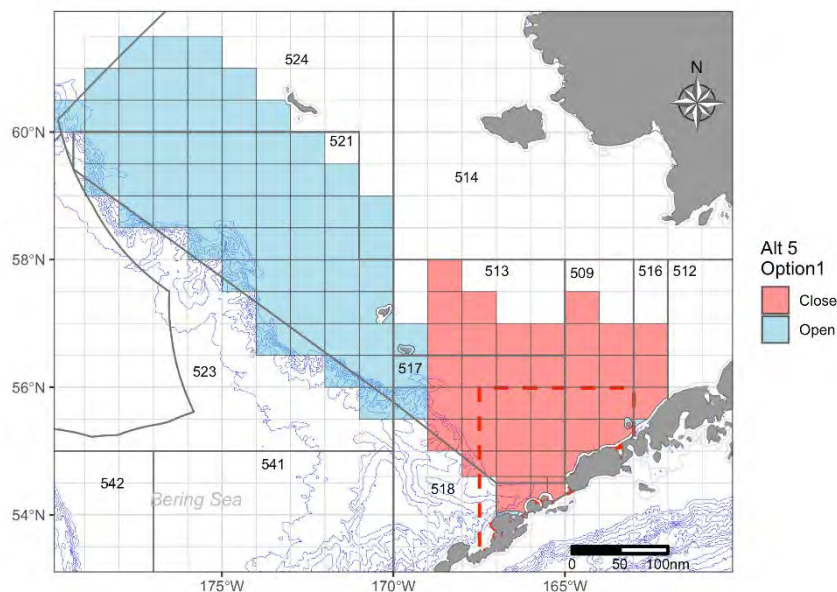


Figure 2-4 Inseason corridor closure under Alternative 5, Option 1 where ADF&G groundfish stat areas to close are shown in red and historic fishing areas exempt from closure are shown in blue

Notes: The CVOA is shown by the dashed line

2.7.2 Suboption 1

Suboption 1 would close 29 of the stat areas inside the inseason corridor to a cooperative or sector that met the inseason corridor chum salmon PCS limit at any point during the closure window (June 10 – August 31). The remaining 11 stat areas inside the corridor would be exempted from closure.⁴² Vessels impacted by the corridor closure would be allowed to continue fishing outside the corridor similar to Option 1, and they would also be allowed to continue fishing inside the 11 exempted stat areas through August 31. The impacted vessels could return to fish inside all 40 stat areas inside the corridor on September 1. Figure 2-5 shows the stat areas that would close in red (29 of 40 inside the corridor) alongside the areas that would be exempt from closure and remain open in blue.

The 11 stat areas exempt from closure are based upon the AP's recommendation for Suboption 1, which the Council recommended for analysis without modifications. Suboption 1 would leave approximately 25% of the fishing grounds inside the corridor open from the date the PSC limit was met through August 31. The 11 stat areas selected to remain open have historically been important fishing grounds for the pollock fleet. More specifically, seven stat areas near the Alaska Peninsula in genetic cluster 1 have historically had excellent pollock fishing and low chum salmon bycatch rates due to oceanographic conditions (*e.g.*, depth and contours). This area is referred to as "the horseshoe." The four stat areas recommended to stay open in genetic cluster 2 were included due to some concerns over congestion and reduced pollock CPUE in the horseshoe. These four stat areas also provide an opportunity for the fleet to spread out and avoid areas with a greater risk of high chum salmon PSC, historically in fishing grounds along the shelf edge in genetic cluster 2 and areas north of the horseshoe in genetic cluster 1.⁴³

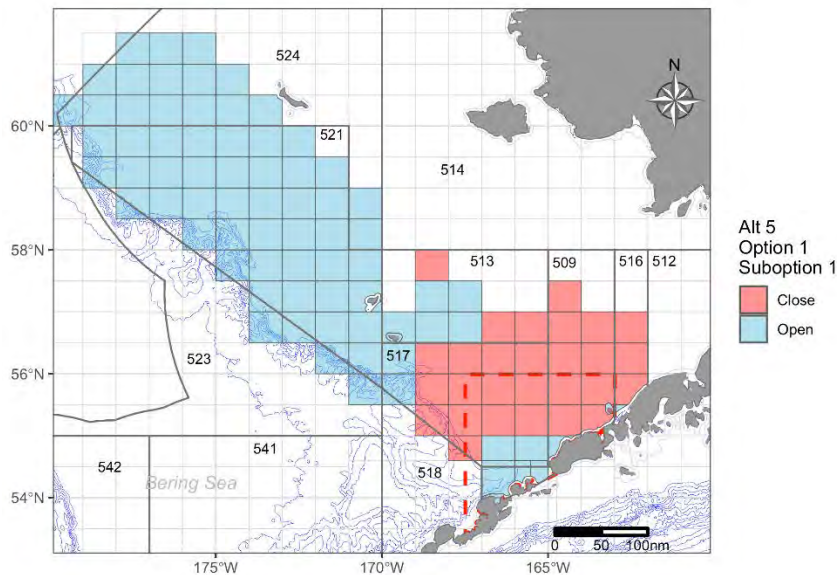


Figure 2-5 Inseason corridor closure under Alternative 5, Suboption 1 where ADF&G groundfish stat areas to close are shown in red and areas exempted from closure are shown in blue

Notes: The CVOA is shown by the dashed line.

2.7.3 Option 2

Option 2 would allow the IPAs to select between 19 and 29 stat areas to close to a cooperative or sector that met the inseason corridor chum salmon PCS limit at any point during the closure window (June 10 – August 31). The remaining stat areas inside the corridor would be exempted from closure. Vessels

⁴² The corridor closure would apply to the following 29 statistical areas: 685730, 685600, 685530, 685500, 675600, 675530, 675500, 675430, 665630, 665600, 665530, 665500, 655630, 655600, 655530, 655500, 645700, 645630, 645600, 645530, 645501, 635700, 635630, 635600, 635530, 635504, 625630, 625600, and 625531.

⁴³ The AP provided rationale during its deliberations and within its [C2 motion](#) on February 8, 2025.

impacted by the corridor closure would be allowed to continue fishing outside the corridor similar to Option 1 and Suboption 1, and they would also be allowed to continue fishing inside the stat areas the IPAs select to remain open areas through August 31. The impacted vessels could return to fish inside all 40 stat areas inside the corridor on September 1. Federal regulations would require the IPAs to select stat areas based on historical chum salmon bycatch, pollock CPUE, and relevant salmon bycatch genetics data.

Briefly, NMFS has outlined several suggestions and recommendations for the Council's consideration regarding Alternative 5, Option 2 if it is included in a preferred alternative in Section 5.1.5. In particular, **NMFS recommends** the Council consider clarifying its intent for how the IPAs would use historical chum salmon bycatch, pollock CPUE, and relevant genetics data are used to select stat areas. **NMFS also suggests** the Council consider a provision for vessels that choose not to join an IPA, such as prohibiting vessels not in an IPA from fishing in the inseason corridor during the B season.

2.7.4 Apportionment Options

Alternative 5 includes the same four apportionment options and one suboption as Alternative 2 and 3. Only one option may be selected, and the apportionment suboption that would establish a CDQ Reserve Pool may be selected in conjunction with any option. Each sectors apportionment percentage was calculated based on the sector's chum salmon PSC inside the corridor from June 10 through August 31 (2011–2022).⁴⁴

Table 2-19 Chum salmon PSC used to calculate the apportionment percentages for Alternative 5, based on the number of chum salmon taken as bycatch inside the corridor (40 of 40 statistical areas) and during the closure window of June 10 – August 31, 2011–2022

Year	CDQ	CP	Mothership	Inshore	Total
2011	829	4,826	9,552	83,721	98,928
2012	18	619	828	7,716	9,181
2013	1	3,033	2,779	80,397	86,210
2014	458	5,411	1,667	102,984	110,520
2015	242	5,114	1,296	118,047	124,699
2016	14,875	74,314	28,943	103,779	221,911
2017	84,800	150,480	15,026	144,359	394,665
2018	13,547	33,739	13,080	130,057	190,423
2019	76	25,917	1,811	91,149	118,953
2020	0	4,821	298	52,259	57,378
2021	49,407	54,498	50,268	329,851	484,024
2022	2,529	24,705	24,037	128,755	180,026
3-Year Avg.	17,312	28,008	24,868	170,288	240,476
3-Year Avg. as %	7.2%	11.7%	10.3%	70.8%	100.0%
5-Year avg.	13,112	28,736	17,899	146,414	206,161
5-Year Avg. as %	6.4%	13.9%	8.7%	71.0%	100.0%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 2-20 Each pollock sector's apportionment percentage by option under Alternative 5

Apportionment Options	CDQ	CP	Mothership	Inshore
Option 1: 3-Year Average	7.2%	11.7%	10.3%	70.8%
Option 2: 5-Year Average	6.4%	13.9%	8.7%	71.0%
Option 3: Pro Rata	7.9%	17.7%	10.0%	64.4%
Option 4: AFA	10%	36%	9%	45%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

⁴⁴ Salmon PSC counts for the inshore sector are lagged as vessels make deliveries to shoreside plants where all salmon are counted by NMFS certified observers. The inshore sector's apportionments were calculated using the catch activity date in CAS. To provide the best historical information for what occurred from June 10 – August 31 to calculate apportionments, but the actual delivery date when a trip's PSC is known might occur after August 31.

Table 2-21 Number of chum salmon that would be apportioned to each pollock sector for all corridor PSC limits and apportionment options under Alternative 5

PSC Limit	Apportionment	CDQ	CP	Mothership	Inshore
50,000	Option 1: 3-Year Average	3,600	5,850	5,150	35,400
	Option 2: 5-Year Average	3,200	6,950	4,350	35,500
	Option 3: Pro Rata	3,950	8,850	5,000	32,200
	Option 4: AFA	5,000	18,000	4,500	22,500
100,000	Option 1: 3-year avg.	7,200	11,700	10,300	70,800
	Option 1: 3-Year Average	6,400	13,900	8,700	71,000
	Option 2: 5-Year Average	7,900	17,700	10,000	64,400
	Option 3: Pro Rata	10,000	36,000	9,000	45,000
150,000	Option 1: 3-Year Average	10,800	17,550	15,450	106,200
	Option 2: 5-Year Average	9,600	20,850	13,050	106,500
	Option 3: Pro Rata	11,850	26,550	15,000	96,600
	Option 4: AFA	15,000	54,000	13,500	67,500
200,000	Option 1: 3-Year Average	14,400	23,400	20,600	141,600
	Option 2: 5-Year Average	12,800	27,800	17,400	142,000
	Option 3: Pro Rata	15,800	35,400	20,000	128,800
	Option 4: AFA	20,000	72,000	18,000	90,000
250,000	Option 1: 3-Year Average	18,000	29,250	25,750	177,000
	Option 2: 5-Year Average	16,000	34,750	21,750	177,500
	Option 3: Pro Rata	19,750	44,250	25,000	161,000
	Option 4: AFA	25,000	90,000	22,500	112,500
300,000	Option 1: 3-Year Average	21,600	35,100	30,900	212,400
	Option 2: 5-Year Average	19,200	41,700	26,100	213,000
	Option 3: Pro Rata	23,700	53,100	30,000	193,200
	Option 4: AFA	30,000	108,000	27,000	135,000
350,000	Option 1: 3-Year Average	25,200	40,950	36,050	247,800
	Option 2: 5-Year Average	22,400	48,650	30,450	248,500
	Option 3: Pro Rata	27,650	61,950	35,000	225,400
	Option 4: AFA	35,000	126,000	31,500	157,500

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 2-22 Number of chum salmon that would be apportioned to each CDQ group under all corridor PSC limits and apportionment options under Alternative 5

PSC Limit	Apportionment	CDQ	14% APICDA	21% BBEDC	5% CBSFA	24% CVRF	22% NSEDG	14% YDFDA
50,000	Option 1: 3-Year Average 7.2%)	3,600	504	756	180	864	792	504
	Option 2: 5-Year Average (6.4%)	3,200	448	672	160	768	704	448
	Option 3: Pro Rata (7.9%)	3,950	553	830	198	948	869	553
	Option 4: AFA (10.0%)	5,000	700	1,050	250	1,200	1,100	700
100,000	Option 1: 3-Year Average 7.2%)	7,200	1,008	1,512	360	1,728	1,584	1,008
	Option 2: 5-Year Average (6.4%)	6,400	896	1,344	320	1,536	1,408	896
	Option 3: Pro Rata (7.9%)	7,900	1,106	1,659	395	1,896	1,738	1,106
	Option 4: AFA (10.0%)	10,000	1,400	2,100	500	2,400	2,200	1,400
250,000	Option 1: 3-Year Average 7.2%)	10,800	1,512	2,268	540	2,592	2,376	1,512
	Option 2: 5-Year Average (6.4%)	9,600	1,344	2,016	480	2,304	2,112	1,344
	Option 3: Pro Rata (7.9%)	11,850	1,659	2,489	593	2,844	2,607	1,659
	Option 4: AFA (10.0%)	15,000	2,100	3,150	750	3,600	3,300	2,100
200,000	Option 1: 3-Year Average 7.2%)	14,400	2,016	3,024	720	3,456	3,168	2,016
	Option 2: 5-Year Average (6.4%)	12,800	1,792	2,688	640	3,072	2,816	1,792
	Option 3: Pro Rata (7.9%)	15,800	2,212	3,318	790	3,792	3,476	2,212
	Option 4: AFA (10.0%)	20,000	2,800	4,200	1,000	4,800	4,400	2,800
250,000	Option 1: 3-Year Average 7.2%)	18,000	2,520	3,780	900	4,320	3,960	2,520
	Option 2: 5-Year Average (6.4%)	16,000	2,240	3,360	800	3,840	3,520	2,240
	Option 3: Pro Rata (7.9%)	19,750	2,765	4,148	988	4,740	4,345	2,765
	Option 4: AFA (10.0%)	25,000	3,500	5,250	1,250	6,000	5,500	3,500
300,000	Option 1: 3-Year Average 7.2%)	21,600	3,024	4,536	1,080	5,184	4,752	3,024
	Option 2: 5-Year Average (6.4%)	19,200	2,688	4,032	960	4,608	4,224	2,688
	Option 3: Pro Rata (7.9%)	23,700	3,318	4,977	1,185	5,688	5,214	3,318
	Option 4: AFA (10.0%)	30,000	4,200	6,300	1,500	7,200	6,600	4,200
350,000	Option 1: 3-Year Average 7.2%)	25,200	3,528	5,292	1,260	6,048	5,544	3,528
	Option 2: 5-Year Average (6.4%)	22,400	3,136	4,704	1,120	5,376	4,928	3,136
	Option 3: Pro Rata (7.9%)	27,650	3,871	5,807	1,383	6,636	6,083	3,871
	Option 4: AFA (10.0%)	35,000	4,900	7,350	1,750	8,400	7,700	4,900

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 2-23 Number of chum salmon that would be apportioned to each inshore cooperative and the inshore open access fishery in applicable years for all corridor PSC limits and apportionment options under Alternative 5

PSC Limit	Apportionment	Inshore	33.788% Akutan CV Assoc	0% Arctic Enterprise	10.773% Northern Victor Fleet Coop	2.512% Peter Pan Fleet Coop	11.454% Unalaska Fleet Coop	22.093% UniSea Fleet Coop	19.380% Westward Fleet Coop	0% Inshore Open Access
50,000	Option 1: 3-yr avg. (70.8%)	35,400	11,961	0	3,814	889	4,055	7,821	6,861	0
	Option 2: 5-yr avg. (71.0%)	35,500	11,995	0	3,824	892	4,066	7,843	6,880	0
	Option 3: Pro rata (64.4%)	32,200	10,880	0	3,469	809	3,688	7,114	6,240	0
	Option 4: AFA (45.0%)	22,500	7,602	0	2,424	565	2,577	4,971	4,361	0
100,000	Option 1: 3-yr avg. (70.8%)	70,800	23,922	0	7,627	1,778	8,109	15,642	13,721	0
	Option 2: 5-yr avg. (71.0%)	71,000	23,989	0	7,649	1,784	8,132	15,686	13,760	0
	Option 3: Pro rata (64.4%)	64,400	21,759	0	6,938	1,618	7,376	14,228	12,481	0
	Option 4: AFA (45.0%)	45,000	15,205	0	4,848	1,130	5,154	9,942	8,721	0
150,000	Option 1: 3-yr avg. (70.8%)	106,200	35,883	0	11,441	2,668	12,164	23,463	20,582	0
	Option 2: 5-yr avg. (71.0%)	106,500	35,984	0	11,473	2,675	12,199	23,529	20,640	0
	Option 3: Pro rata (64.4%)	96,600	32,639	0	10,407	2,427	11,065	21,342	18,721	0
	Option 4: AFA (45.0%)	67,500	22,807	0	7,272	1,696	7,731	14,913	13,082	0
200,000	Option 1: 3-yr avg. (70.8%)	141,600	47,844	0	15,255	3,557	16,219	31,284	27,442	0
	Option 2: 5-yr avg. (71.0%)	142,000	47,979	0	15,298	3,567	16,265	31,372	27,520	0
	Option 3: Pro rata (64.4%)	128,800	43,519	0	13,876	3,235	14,753	28,456	24,961	0
	Option 4: AFA (45.0%)	90,000	30,409	0	9,696	2,261	10,309	19,884	17,442	0
250,000	Option 1: 3-yr avg. (70.8%)	177,000	59,805	0	19,068	4,446	20,274	39,105	34,303	0
	Option 2: 5-yr avg. (71.0%)	177,500	59,974	0	19,122	4,459	20,331	39,215	34,400	0
	Option 3: Pro rata (64.4%)	161,000	54,399	0	17,345	4,044	18,441	35,570	31,202	0
	Option 4: AFA (45.0%)	112,500	38,012	0	12,120	2,826	12,886	24,855	21,803	0
300,000	Option 1: 3-yr avg. (70.8%)	212,400	71,766	0	22,882	5,335	24,328	46,926	41,163	0
	Option 2: 5-yr avg. (71.0%)	213,000	71,968	0	22,946	5,351	24,397	47,058	41,279	0
	Option 3: Pro rata (64.4%)	193,200	65,278	0	20,813	4,853	22,129	42,684	37,442	0
	Option 4: AFA (45.0%)	135,000	45,614	0	14,544	3,391	15,463	29,826	26,163	0
350,000	Option 1: 3-yr avg. (70.8%)	247,800	83,727	0	26,695	6,225	28,383	54,746	48,024	0
	Option 2: 5-yr avg. (71.0%)	248,500	83,963	0	26,771	6,242	28,463	54,901	48,159	0
	Option 3: Pro rata (64.4%)	225,400	76,158	0	24,282	5,662	25,817	49,798	43,683	0
	Option 4: AFA (45.0%)	157,500	53,216	0	16,967	3,956	18,040	34,796	30,524	0

Source: NMFS Alaska Region CAS, data compiled by AKFIN. 2022 Inshore cooperative apportionments available at: <https://media.fisheries.noaa.gov/2022-01/afa-inshore-allocations-2022.pdf>.

2.7.4.1 Apportionment Suboption: CDQ Reserve Pool Apportionment

Description of the CDQ Reserve Pool for Alternative 5

A CDQ Reserve Pool suboption is included for consideration under Alternative 5, and the process and requirements match what is described in Section 2.4.1.1 under an overall chum salmon PSC limit. This CDQ Reserve Pool would exist outside of the overall chum salmon PSC limit, and it may only be accessed by a CDQ group if it informs NMFS in writing by November 15 of any year of a plan to associate their CDQ pollock with the inshore or mothership sector. Upon such notification, NMFS will apportion an additional amount of chum salmon PSC to the group(s) from the CDQ chum salmon PSC reserve pool that matches the sector with which it is associating (mothership or inshore). If a CDQ group is accessing this reserve pool, all CDQ pollock from that group must be associated with the same sector, and sector associations cannot be changed mid-season.

Similar to Alternative 2 and 3, the rationale for consideration of a CDQ Reserve Pool is to provide the CDQ groups with the flexibility to harvest their CDQ pollock differently than they have in the past if they should choose. In other words, this provision would provide CDQ groups with a greater ability to harvest their CDQ pollock with the inshore or mothership sectors rather than on a CP, which has been typical in the historical years considered in this analysis.

Calculation of the CDQ Reserve Pool for Alternative 5

The methods for calculating the CDQ Reserve Pool for an inseason corridor closure match those demonstrated under an overall cap (Alternative 2 or 3). **This suboption considers applying an inshore or mothership sector chum PSC ‘adjustment’ to a CDQ group’s inseason corridor chum salmon PSC limit that matches the chum salmon PSC limit apportionment for the sector they are fishing with and then is scaled to the amount of pollock the CDQ group receives.**

Table 2-24 provides the ratios of the chum salmon PSC apportionment under each apportionment option for the inseason corridor caps versus the total pollock allocation for each sector. For example, the inshore CV sector has a ratio of 1.573 for the 3-yr average apportionment because it was allocated 45% of the pollock but caught 70.8% of the chum salmon in the inseason corridor on average between 2020-2022. Conversely, the CDQ sector was allocated 10% of the pollock overall but caught 7.2% of the chum salmon in the inseason corridor on average between 2020-2022, resulting in a ratio <1. The AFA apportionment produces ratios of 1 as this apportionment is not based on chum salmon catch history but would apportion chum salmon PSC equally to each sector’s pollock allocation. Although the Council’s motion suggests that this suboption could be chosen along with any of the four apportionments for Alternative 5, functionally, the reserve pool would not need to apply if the chum salmon PSC limit apportionment matches the pollock apportionment. If the AFA apportionment was selected, the CDQ groups would not be affected based on which sector they had fished with in the past.

Table 2-25 uses the ratios produced for the mothership and inshore sector under the different proposed apportionments and scales them to the amount of pollock the CDQ groups are allocated to demonstrate an adjusted chum salmon PSC proportion. In practice, this would be done on an individual group level based on each group’s pollock apportionment. If *all* CDQ groups associated with either the mothership or inshore sectors in a given year, Table 2-26 demonstrates the amount that would be apportioned over the chum salmon PSC limit based on the adjusted apportionments.

Based on the percentage over the limit, Table 2-27 demonstrates the maximum amount of chum salmon that would exist in the CDQ reserve pool for chum salmon PSC limit in Alternative 5. These numbers represent the total additional amount of chum salmon that would be added across CDQ groups’ apportionments in a scenario where *all* CDQ groups notified NMFS of an intent to harvest their CDQ pollock on an inshore CV(s) in the upcoming year.

Table 2-24 Each sector's chum salmon apportionment, pollock allocation, and ratio of chum to pollock for an inseason corridor chum salmon PSC limit under Alternative 5. The colors demonstrate progression of this calculation from this table through Table 2-27.

CDQ				Mothership			
Apportionment	Chum %	Pollock %	Ratio	Apportionment	Chum %	Pollock %	Ratio
3-yr avg.	7.20%	10.00%	0.720	3-yr avg.	10.30%	9.00%	1.144
5-yr avg.	6.40%	10.00%	0.640	5-yr avg.	8.70%	9.00%	0.967
Pro rata	7.90%	10.00%	0.790	Pro rata	10.00%	9.00%	1.111
AFA	10.00%	10.00%	1.000	AFA	9.00%	9.00%	1.000
CP				Inshore			
Apportionment	Chum %	Pollock %	Ratio	Apportionment	Chum %	Pollock %	Ratio
3-yr avg.	11.70%	36.00%	0.325	3-yr avg.	70.80%	45.00%	1.573
5-yr avg.	13.90%	36.00%	0.386	5-yr avg.	71.00%	45.00%	1.578
Pro rata	17.70%	36.00%	0.492	Pro rata	64.40%	45.00%	1.431
AFA	36.00%	36.00%	1.000	AFA	45.00%	45.00%	1.000

Table 2-25 CDQ apportionments for an inseason corridor chum salmon PSC limit adjusted by applying the mothership and inshore ratios under Alternative 5

CDQ – with Mothership Adjustment			
Apportionment	Adjusted Chum %	Pollock %	Ratio (from mothership)
3-yr avg.	11.44%	10.00%	1.144
5-yr avg.	9.67%	10.00%	0.967
Pro rata	11.11%	10.00%	1.111
AFA	10.00%	10.00%	1.000
CDQ – with Inshore Adjustment			
Apportionment	Adjusted Chum %	Pollock %	Ratio (from inshore)
3-yr avg.	15.73%	10.00%	1.573
5-yr avg.	15.78%	10.00%	1.578
Pro rata	14.31%	10.00%	1.431
AFA	10.00%	10.00%	1.000

Table 2-26 Proportion over the total inseason corridor chum salmon PSC limit if all CDQ groups receive an inshore or mothership PSC limit adjustment under Alternative 5

If all CDQ Groups Receive a Mothership Adjustment						
Apportionment	Adjusted CDQ	CP	Mothership	Inshore	Sum	% Over the PSC Limit
3-yr avg.	11.44%	11.7%	10.3%	70.8%	104.24%	4.24%
5-yr avg.	9.67%	13.9%	8.7%	71.0%	103.27%	3.27%
Pro rata	11.11%	17.7%	10.0%	64.4%	103.21%	3.21%
AFA	10.00%	36.0%	9.0%	45.0%	100.00%	0.00%
If all CDQ Groups Receive an Inshore Adjustment						
Apportionment	Adjusted CDQ	CP	Mothership	Inshore	Sum	% Over the PSC Limit
3-yr avg.	15.73%	11.7%	10.3%	70.8%	108.53%	8.53%
5-yr avg.	15.78%	13.9%	8.7%	71.0%	109.38%	9.38%
Pro rata	14.31%	17.7%	10.0%	64.4%	106.41%	6.41%
AFA	10.00%	36.0%	9.0%	45.0%	100.00%	0.00%

Table 2-27 Maximum CDQ Reserve Pool (number of fish) based on all CDQ groups receiving an inshore sector adjustment for an inseason corridor cap under Alternative 5

Apportionment	3-yr avg.	5-yr avg.	Pro rata	AFA
% Over the Limit	8.53%	9.38%	6.41%	0.00%
PSC limit	Maximum Number of Chum Salmon Over the Limit			
50,000	4,267	4,689	3,206	0
100,000	8,533	9,378	6,411	0
150,000	12,800	14,067	9,617	0
200,000	17,067	18,756	12,822	0
250,000	21,333	23,444	16,028	0
300,000	25,600	28,133	19,233	0
350,000	29,867	32,822	22,439	0

Pre-season notification from individual CDQ groups would determine how much (if any) of the CDQ Reserve Pool is made available to each group. Table 2-28 below provides chum salmon PSC apportionments for each CDQ group based on the original PSC limit for Alternative 5 (*i.e.*, matching Table 2-22), with an ‘mothership adjustment’ that accounts for the group accessing the CDQ Reserve Pool with an intent to harvest CDQ pollock with the mothership sector, and the difference between the two chum salmon PSC sub-apportionment values. Table 2-29 provides the same metrics with a ‘inshore adjustment’ for Alternative 5.

Table 2-28 Number of chum salmon apportioned to each CDQ group under Alternative 5, with and without a mothership adjustment from the CDQ Reserve Pool

APICDA (14% CDQ Pollock)					BBEDC (21% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference
50,000	3-yr avg.	504	801	297	50,000	3-yr avg.	756	1,202	446
	5-yr avg.	448	677	229		5-yr avg.	672	1,015	343
	Pro rata	553	778	225		Pro rata	830	1,167	337
	AFA	700	700	0		AFA	1,050	1,050	0
200,000	3-yr avg.	2,016	3,204	1,188	200,000	3-yr avg.	3,024	4,807	1,783
	5-yr avg.	1,792	2,707	915		5-yr avg.	2,688	4,060	1,372
	Pro rata	2,212	3,111	899		Pro rata	3,318	4,667	1,349
	AFA	2,800	2,800	0		AFA	4,200	4,200	0
350,000	3-yr avg.	3,528	5,608	2,080	350,000	3-yr avg.	5,292	8,412	3,120
	5-yr avg.	3,136	5,608	2,472		5-yr avg.	4,704	8,412	3,708
	Pro rata	3,871	5,444	1,573		Pro rata	5,807	8,167	2,360
	AFA	4,900	4,900	0		AFA	7,350	7,350	0
CBSFA (5% CDQ Pollock)					CVRF (24% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference
50,000	3-yr avg.	180	286	106	50,000	3-yr avg.	864	1,373	509
	5-yr avg.	160	242	82		5-yr avg.	768	1,160	392
	Pro rata	198	278	80		Pro rata	948	1,333	385
	AFA	250	250	0		AFA	1,200	1,200	0
200,000	3-yr avg.	720	1,144	424	200,000	3-yr avg.	3,456	5,493	2,037
	5-yr avg.	640	967	327		5-yr avg.	3,072	4,640	1,568
	Pro rata	790	1,111	321		Pro rata	3,792	5,333	1,541
	AFA	1,000	1,000	0		AFA	4,800	4,800	0
350,000	3-yr avg.	1,260	2,003	743	350,000	3-yr avg.	6,048	9,613	3,565
	5-yr avg.	1,120	2,003	883		5-yr avg.	5,376	9,613	4,237
	Pro rata	1,383	1,944	562		Pro rata	6,636	9,333	2,697
	AFA	1,750	1,750	0		AFA	8,400	8,400	0
NSEDC (22% CDQ Pollock)					YDFDA (14% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with mothership adjustment	Difference
50,000	3-yr avg.	792	1,259	467	50,000	3-yr avg.	504	801	297
	5-yr avg.	704	1,063	359		5-yr avg.	448	677	229
	Pro rata	869	1,222	353		Pro rata	553	778	225
	AFA	1,100	1,100	0		AFA	700	700	0
200,000	3-yr avg.	3,168	5,036	1,868	200,000	3-yr avg.	2,016	3,204	1,188
	5-yr avg.	2,816	4,253	1,437		5-yr avg.	1,792	2,707	915
	Pro rata	3,476	4,889	1,413		Pro rata	2,212	3,111	899
	AFA	4,400	4,400	0		AFA	2,800	2,800	0
350,000	3-yr avg.	5,544	8,812	3,268	350,000	3-yr avg.	3,528	5,608	2,080
	5-yr avg.	4,928	8,812	3,884		5-yr avg.	3,136	5,608	2,472
	Pro rata	6,083	8,556	2,473		Pro rata	3,871	5,444	1,573
	AFA	7,700	7,700	0		AFA	4,900	4,900	0

Table 2-29 Number of chum salmon apportioned to each CDQ group under Alternative 5, with and without an inshore adjustment from the CDQ Reserve Pool

APICDA (14% CDQ Pollock)					BBEDC (21% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference
50,000	3-yr avg.	504	1,101	597	50,000	3-yr avg.	756	1,652	896
	5-yr avg.	448	1,104	656		5-yr avg.	672	1,657	985
	Pro rata	553	1,002	449		Pro rata	830	1,503	673
	AFA	700	700	0		AFA	1,050	1,050	0
200,000	3-yr avg.	2,016	4,405	2,389	200,000	3-yr avg.	3,024	6,608	3,584
	5-yr avg.	1,792	4,418	2,626		5-yr avg.	2,688	6,627	3,939
	Pro rata	2,212	4,007	1,795		Pro rata	3,318	6,011	2,693
	AFA	2,800	2,800	0		AFA	4,200	4,200	0
350,000	3-yr avg.	3,528	7,709	4,181	350,000	3-yr avg.	5,292	11,564	6,272
	5-yr avg.	3,136	7,731	4,595		5-yr avg.	4,704	11,597	6,893
	Pro rata	3,871	7,012	3,141		Pro rata	5,807	10,519	4,712
	AFA	4,900	4,900	0		AFA	7,350	7,350	0
CBSFA (5% CDQ Pollock)					CVRF (24% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference
50,000	3-yr avg.	180	393	213	50,000	3-yr avg.	864	1,888	1,024
	5-yr avg.	160	394	234		5-yr avg.	768	1,893	1,125
	Pro rata	198	358	160		Pro rata	948	1,717	769
	AFA	250	250	0		AFA	1,200	1,200	0
200,000	3-yr avg.	720	1,573	853	200,000	3-yr avg.	3,456	7,552	4,096
	5-yr avg.	640	1,578	938		5-yr avg.	3,072	7,573	4,501
	Pro rata	790	1,431	641		Pro rata	3,792	6,869	3,077
	AFA	1,000	1,000	0		AFA	4,800	4,800	0
350,000	3-yr avg.	1,260	2,753	1,493	350,000	3-yr avg.	6,048	13,216	7,168
	5-yr avg.	1,120	2,761	1,641		5-yr avg.	5,376	13,253	7,877
	Pro rata	1,383	2,504	1,122		Pro rata	6,636	12,021	5,385
	AFA	1,750	1,750	0		AFA	8,400	8,400	0
NSEDG (22% CDQ Pollock)					YDFDA (14% CDQ Pollock)				
Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference	Overall PSC limit	Option	Original limit	Limit with inshore adjustment	Difference
50,000	3-yr avg.	792	1,731	939	50,000	3-yr avg.	504	1,101	597
	5-yr avg.	704	1,736	1,032		5-yr avg.	448	1,104	656
	Pro rata	869	1,574	705		Pro rata	553	1,002	449
	AFA	1,100	1,100	0		AFA	700	700	0
200,000	3-yr avg.	3,168	6,923	3,755	200,000	3-yr avg.	2,016	4,405	2,389
	5-yr avg.	2,816	6,942	4,126		5-yr avg.	1,792	4,418	2,626
	Pro rata	3,476	6,297	2,821		Pro rata	2,212	4,007	1,795
	AFA	4,400	4,400	0		AFA	2,800	2,800	0
350,000	3-yr avg.	5,544	12,115	6,571	350,000	3-yr avg.	3,528	7,709	4,181
	5-yr avg.	4,928	12,149	7,221		5-yr avg.	3,136	7,731	4,595
	Pro rata	6,083	11,020	4,937		Pro rata	3,871	7,012	3,141
	AFA	7,700	7,700	0		AFA	4,900	4,900	0

2.7.5 Additional Considerations Related to the Inseason Corridor Boundary

In preparing the impact analysis for Alternative 5, the analysts identified 10 State waters stat areas⁴⁵ that are proximate to the southern boundary of the inseason corridor, and had some amount of recorded pollock catch 2011–2022, but were excluded from the inseason corridor. As stated above, a sector or cooperative that met the corridor PSC limit may fish in all outside areas during the closure window and/or

⁴⁵ The 10 state-waters stat areas are 635501, 655407, 665335, 665336, 665403, 665404, 645502, 655406, 655408, and 645433.

in a limited number of stat areas inside the corridor exempted from closure under Suboption 1 and Option 2. An implication of the current inseason corridor boundary is that directed fishing could occur inside these 10 state-waters stat areas near the Alaska Peninsula after the corridor closed. **The analysts are raising this issue so the Council can consider whether or not allowing directed fishing for pollock to continue inside these state-waters areas is consistent with the Council's intent for Alternative 5. Appendix 2 provides more detailed information to aid decision-makers and the public in considering this issue.**

2.7.6 Option 3: Abundance-based Threshold

Option 3 would include an abundance-based threshold that would suspend the inseason corridor and closure provisions, if the Yukon River summer and fall chum salmon run reconstructions are at or above index values.⁴⁶ Option 3 of Alternative 5 may be selected in conjunction with any Option or Suboption under Alternative 5. It may not be selected as a standalone option in combination with Alternatives 2, 3 or 4.

There are two suboptions being considered to determine thresholds. Under **Suboption 1**, the Yukon River summer and fall chum salmon runs would need to be at or above 2,671,450 and 1,150,758 fish respectively. These values represent the 75th percentile of historical abundance using data from 1992–2022. Under **Suboption 2**, the Yukon River summer and fall chum salmon runs need to be at or above 3,871,700 and 1,390,329 fish respectively. These values represent the 90th percentile of historical abundance using data from 1992–2022.

2.7.7 Option 4: Adjust the Winter Herring Savings Area Start Date

Pacific herring PSC is managed with an annual PSC limit and three herring savings areas (HSAs) in the BSAI groundfish trawl fisheries. If a trawl fishery attains its apportionment of the herring PSC limit, the Summer HSA1 closes from June 15 – July 1, the Summer HSA2 closes from July 1 – August 15, and the Winter HSA closes from September 1 – March 1 the following year (see 50 CFR 679.21(e)(3)(iv)(B) through (F)).

Option 4 of Alternative 5 would adjust the start date for when the Winter HSA (HSA) closure takes effect from September 1 to September 30 for the midwater pollock trawl fishery. It is intended to provide the pollock fleet some additional flexibility to complete the B season as it would be required to avoid multiple PSC catches that are spatially and temporally dispersed across the fishing grounds. No other element of the Pacific herring PSC management framework specified in regulation at 50 CFR 679.21(e)(3)(iv)(B) through (F)) would be changed. Option 4 may only be selected as a component of Alternative 5 and may be selected as an element of Alternative 5 in conjunction with Options 1 and 2.

2.8 Comparison of Alternatives

As described previously, the proposed alternatives include PSC limits (or caps) on the number of chum salmon that may be caught as bycatch and closure of all or part of the Bering Sea during the B season if those caps were met. The proposed alternatives also include modifications to the salmon bycatch IPAs and RHS program for chum salmon avoidance. At final action, the Council may recommend a preferred alternative (PA) which requires an explicit consideration of addressing the purpose and need statement (i.e., the problem statement) and the National Standards. The MSA requires that every fishery management plan and every regulation implementing those plans be consistent with the National Standards (see Section 6.1), such as:

- minimize chum and Chinook salmon bycatch to the extent practicable under National Standard 9;

⁴⁶ This suspension of a PSC limit contrasts with how abundance indices are used under Alternative 3. There, if one or more is not exceeded, a PSC limit applies the following year.

- take into account the importance of fishery resources to fishing communities including those that are dependent on Bering Sea pollock and subsistence salmon fisheries as required under National Standard 8; and
- to achieve optimum yield in the BSAI groundfish fisheries on a continuing basis, in the groundfish fisheries as required under National Standard 1.

However, for any Council action, one or more of those standards may be in tension with another (*i.e.*, different alternatives may have tradeoffs among the National Standards). Therefore, in recommending a PA, the Council must consider how to balance the National Standards. For instance, some alternatives may be more likely to reduce bycatch but may also be more likely to adversely impact pollock-dependent communities.

If the Council chooses to develop a PA, this section may be of assistance as it reviews the over-arching management measures in each proposed alternative. This information assists decision-makers and the public in comparing and contrasting the proposed alternatives, whether different options and elements of the alternatives may be selected in combination with one another, and the implications of combining different management measures.

2.8.1 Selection of a Management Approach to Address the Purpose and Need Statement

Section 1.1 contains the Council's recommended purpose and need statement which is not repeated here, but the analysts have summarized what appear to be the Council's objectives within the problem statement:

- Develop actions to minimize bycatch of Western Alaska origin chum salmon in the Bering Sea pollock fishery.
- Create a management program that balances the National Standards and is consistent with all applicable law, particularly to minimize salmon bycatch to the extent practicable under National Standard 9.
 - Use the best scientific information available including Local Knowledge and Traditional Knowledge, as required by National Standard 2;
 - Take into account the importance of fishery resources to fishing communities including those that are dependent on Bering Sea pollock, and subsistence salmon fisheries as required under National Standard 8;
 - Achieve optimum yield in the BSAI groundfish fisheries on a continuing basis, in the groundfish fisheries as required under National Standard 1.
- Maintain the priority objectives of the Chinook salmon bycatch management program established under amendments 91 and 110 to the BSAI Groundfish FMP.

In its rationale, the Council should address how the preferred alternative accomplishes the objectives identified in the problem statement for its action. To aid the Council in its consideration of the alternatives, Table 2-30 provides a high-level overview of the potential advantages and disadvantages of each alternative relative to chum/WAK chum salmon PSC and Chinook salmon PSC.

Table 2-30 Comparison of the potential advantages and disadvantages for each alternative related to chum salmon, WAK chum salmon, and Chinook salmon PSC

Alternative	Advantages to Chum/WAK Chum Salmon	Disadvantages to Chum/WAK Chum Salmon	Other Considerations to Chinook Salmon
Alternative 1	- No change relative to status quo. - Status quo includes: - incentive plan agreements that require vessels to try to avoid WAK chum salmon; - rolling hot spot program; - salmon excluders; - comprehensive bycatch monitoring; and - Chum Salmon Savings Area (vessels in IPAs are exempt)	- No change relative to status quo. - No chum salmon bycatch limit for vessels in IPAs. - Voluntary chum salmon avoidance provisions incorporated in 2022 would not be subject to regulatory requirements to be included in IPAs.	No change relative to status quo.
Alternative 2	- Provides a ceiling for the number of chum salmon that could be incidentally caught each B season. - Creates incentives for fishermen to stay below the PSC limit set in regulation. - A PSC limit set at the lower end of the range is more likely to reduce WAK chum PSC.	Does not create a clear/specific incentive for WAK chum salmon avoidance.	- An early closure because the chum PSC limit is met could reduce Chinook PSC. - In contrast, Chinook PSC could be neutral if vessels are able to balance their operations against catches of both species. - Chinook PSC could increase if the B season is extended.
Alternative 3	Similar to Alternative 2 when an overall PSC limit is in effect.	- Similar to Alternative 2 when an overall PSC limit is in effect. - PSC limit would be suspended in periods of high abundance which decrease the potential positive impacts to chum/WAK chum PSC.	- Impacts would be neutral in years the PSC limit is suspended and the same as Alternative 2 in years the PSC limit is in effect. - Uncertain outcome for Chinook similar to Alternative 2.
Alternative 4	- IPAs could create tailored incentives/penalties. - RHS program would have a greater emphasis on WAK chum avoidance using genetic data. - Closure of whole stat areas with very high PSC rates.	- Does not include a PSC limit for total bycatch or limit the PSC that could be taken in a specific time/area. - May not have a greater impact than changes in fishing behavior since 2022.	Close to neutral impacts to Chinook salmon PSC.
Alternative 5, Option 1	- Management measure captures time/area of greater chum/WAK chum encounters. - Creates a strong incentive for preemptive changes in fishing behavior to constrain PSC while fishing inside the corridor. - Requires vessels move out of corridor if the PSC limit is met to areas with lower chum/WAK chum PSC rates (in most years).	- Does not include a PSC limit for total bycatch. - Could redistribute large amounts of fishing effort/catch to outside areas with unknown PSC rates, creating the potential for unintended impacts.	- Not expected to reduce Chinook PSC but outcomes could be neutral if vessels are able to balance their operations against catches of both species. - Could have negative consequences for Chinook PSC if displaced pollock catch cannot be recovered in areas with equally good CPUE.
Alternative 5, Suboption 1	- Similar to Option 1. - The chum/WAK chum PSC rates could be lower inside 11 stat areas exempted from closure but it would provide greater flexibility for vessels to move to optimal fishing locations.	- Does not include a PSC limit for total bycatch. - By ensuring access to parts of historic fishing rounds within the closure corridor, it may diminish the incentive for vessels to preemptively change their fishing behavior. - PSC rates could be greater inside the 11 exempted stat areas (but provides greater flexibility for vessels to move to optimal fishing locations).	Similar to Option 1, but the risk of creating negative consequences for Chinook salmon is less.
Alternative 5, Option 2	- Similar to Option 1/Suboption 1. - IPAs could issue a closure more quickly than NMFS. - Areas to close could be modified without a regulatory amendment if the conditions change. - Provides greater flexibility for fleet movement to optimal fishing locations.	- Does not include a PSC limit for total bycatch. - By ensuring access to parts of historic fishing rounds within the closure corridor, it may diminish the incentive for vessels to preemptively change their fishing behavior.	Holds the lowest risk of creating negative consequences for Chinook salmon.

2.8.2 Similarities and Differences in the Proposed Alternatives and Management Actions

Table 2-31 summarizes the management features in each proposed alternative relative to a chum salmon PSC Limit, IPA requirements, and WAK chum salmon PSC avoidance. As noted previously, all proposed action alternatives would only apply to the B season pollock fishery (June 10 – November 1).

Secondly, the alternatives are not mutually exclusive, so some measures for one alternative may be combined with measures in another to form the PA. For example, a hard cap under Alternative 2 could be combined with an inseason corridor (Alternative 5, Option 1, Suboption 1, or Option 2. Table 2-32 summarizes which of the proposed action alternatives (*i.e.*, Alternatives 2–5) and options may be combined or are mutually exclusive.

Table 2-31 Comparison of the similarities and differences of the alternatives

Alternative	Chum Salmon PSC Limit	IPA Requirements	Western Alaska Chum Avoidance
1	Cap of 42,000 non-Chinook closes the Chum Salmon Savings Area (August 1 –31) Vessels and CDQ groups are exempt from the closure if governed by an IPA	RHS system for chum avoidance operates in the B season	RHS closure areas are largest East of 168 degrees West Longitude (closer to Alaska Peninsula) Thresholds for implementing closures are lower in June and July when WAK chum encountered in higher proportions
2	Hard cap of 100,000–550,000 chum salmon closes the fishery if it is met All non-Chinook salmon encountered in B season count to the cap	Same as Alt 1	Same as Alt 1
3	Hard cap in place if one or more Management Areas in Western Alaska are at low abundance Cap level could decrease as more areas fail to meet abundance thresholds	Same as Alt 1	Same as Alt 1
4	Same as Alt 1	Add six provisions with more specificity to existing IPA regulations	RHS closures assessed for the likelihood of the area having higher proportions of Western Alaska chum salmon
5	Cap of 50,000–350,000 chum salmon close corridors when cap is reached	Same as Alt 1	Corridor is located where WAK chum salmon have historically been encountered in higher proportions

Table 2-32 Alternatives and options that may or may not be combined in a preferred alternative

Alternative	Option	Summary Description	Potential to Combine with Other Alt./Opt.
2		Overall Chum Salmon PSC limit	For all but Alternative 3.
	1	3-year average apportionment	Yes. Apportionment options are mutually exclusive to one another and the same for Alt 3 and 5.
	2	5-year average apportionment	
	3	Pro rata apportionment	
	4	AFA apportionment	
	<u>Suboption</u>	CDQ Reserve Pool	Yes. Must be combined with one of the four apportionment options. May also be selected for Alt 3 and 5.
3		Overall Chum Salmon PSC limit based on chum salmon abundance	For all but Alternative 2, or Alternative 5, Option 3.
	1	3-Area Index	Suboptions are mutually exclusive to one another.
	2	Yukon Area Index	
4		Additional IPA provisions	All alternatives and options.
5		Inseason corridor PSC limit	All alternatives and options.
	1	If cap is met, the entire corridor closes (100%) through August 31.	Mutually exclusive to Suboption 1 and Option 2.
	<u>Suboption</u>		
	<u>1</u>	If cap is met, 29 stat areas (~75%) inside the corridor close through August 31	Mutually exclusive to Option 1 and 2.
	2	If cap is met, IPA's pre-approved stat areas close for remainder of time period.	Mutually exclusive to Option 1 and Suboption 1.
	3	Abundance-based threshold. Corridor not in effect if Yukon summer and fall chum abundance exceeds thresholds.	May be selected with any corridor option/suboption, Alt 2 and Alt 4. May not be selected with Alt 3.
	<u>Suboption</u>		
	<u>1</u>	75th percentile of Yukon summer and fall chum salmon abundance	Suboptions are mutually exclusive to one another.
	<u>2</u>	90th percentile of Yukon summer and fall chum salmon abundance	
	4	Adjust Winter Herring Savings Area start date	May only be included in Alternative 5.

2.8.3 Policy-Level Tradeoffs

The analysts have summarized some of the policy-level tradeoffs, uncertainties, and risks that are apparent across the alternatives. When comparing the alternatives against each other, the Council may find it useful to bear in mind the alternatives are different management approaches that use different tools to incentivize chum/WAK chum salmon PSC reductions (*i.e.*, a hard cap, a time/area closure, or changes to IPA requirements). If the Council would like to use one or more of the management approaches contained in the alternatives, it may then be more useful to compare the options/suboptions within the alternative against each other rather than comparing those impacts across the alternatives.

Alternatives 2 and 3

Alternative 2 and 3 are mutually exclusive. **If the Council would like to recommend an overall chum salmon PSC limit, the first policy decision is whether it would like to link the PSC limit with abundance under Alternative 3.** Doing so would provide the pollock fishery greater flexibility in periods (or years) with greater WAK chum salmon abundance but the impacts to chum/WAK chum salmon PSC in years the hard cap does not apply would be close to neutral.

A second policy decision is the amount at which to set the overall chum salmon PSC limit. The quantitative estimates from the retrospective analysis for Alternatives 2 and 3 shows a stark tradeoff between the costs (forgone pollock) and benefits (chum and WAK chum salmon PSC saved). Table 2-33, Table 2-34, Table 2-35, and Table 2-36 help to illustrate these dynamics. However, these values do not account for changes in fishing behavior in the future.

In order to be reasonably confident that an overall chum salmon PSC limit would reduce WAK chum salmon bycatch relative to no action, the PSC limit would need to be set at a lower amount within the range being considered. There is greater uncertainty in whether an overall chum salmon PSC limit would reduce WAK chum salmon PSC (and/or the AEQ bycatch) relative to no action under a PSC limit set at the middle or upper end of the range. Although Table 2-33 shows AEQ bycatch reductions for each reporting group under all analyzed PSC limits, this outcome is not certain. Rather, and contrary to the values reported in Table 2-33, the impacts to WAK chum salmon are contingent upon the fleet's harvest strategies in the future.

However, if the Council were to recommend an overall chum salmon PSC limit set at an amount at the lower end of the range being considered, this would pose a direct tradeoff in that the economic impacts to the pollock industry and associated communities could be greater. Based on historical catch and bycatch data, a 100,000-chum salmon PSC limit would likely result in an early B season closure for all sectors unless they can substantially change fishing behavior/harvest strategies. Given the significant interannual variability in historical PSC encounters, the sectors would need to be able to sustain these changes in fishing behavior/harvest strategies year-over-year to avoid erratic closures.

Related to this point, and setting aside the apportionment option used, an overall chum salmon PSC limit set at an amount marginally greater than 100,000 chum salmon would provide the fleet some greater operational flexibility. The interannual variability in historical PSC levels suggests the fleet's future bycatch performance will likely be dictated by harvest strategies and efforts to avoid chum salmon as well as variations in future environmental and fishing conditions. Thus, in considering the amount at which to set an overall chum salmon PSC limit, there is a direct tradeoff in the potential for the alternative to reduce chum and WAK chum salmon PSC and providing the fleet sufficient flexibility to respond to variable conditions.

Finally, the choice of apportionment is a policy decision that must weigh a sector's historical and expected future chum salmon encounters, along with the objective of reducing WAK chum salmon. The apportionment option chosen was shown to have a marginal effect on the AEQ bycatch reductions and a direct distributional impact across the sectors with the starkest tradeoff being posed by the CP and inshore sectors.

Table 2-33 Comparison of the average mean AEQ reductions for the CWAK and Upper/Middle Yukon reporting groups, average chum salmon PSC reductions, and potentially forgone pollock (mt) under the analyzed chum salmon PSC limits and apportionment options. A stochastic model was used for AEQ estimation.

PSC Limit	Apportionment	AEQ CWAK (# of fish)	AEQ Up/Mid Yukon (# of fish)	Chum PSC (# of fish)	Forgone Pollock (mt)
100,000	Option 1: 3-Year Avg.	21,519	3,391	150,355	272,620
	Option 2: 5-year Avg.	21,612	3,437	150,937	271,872
	Option 3: Pro Rata	21,652	3,448	151,009	271,777
	Option 4: AFA	21,303	3,308	149,945	266,531
325,000	Option 1: 3-Year Avg.	4,780	821	33,223	79,252
	Option 2: 5-year Avg.	4,504	798	32,614	61,735
	Option 3: Pro Rata	4,529	807	60,568	114,651
	Option 4: AFA	3,341	568	28,348	54,811
550,000	Option 1: 3-Year Avg.	1,700	357	9,564	21,116
	Option 2: 5-year Avg.	1,172	233	7,315	27,663
	Option 3: Pro Rata	1,154	235	7,330	28,503
	Option 4: AFA	292	48	2,210	15,741

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Estimated reductions in the AEQ bycatch are based on the average for each reporting group using data from 2011–2022 while total chum PSC reductions and forgone pollock are based on data from 2011–2023.

Table 2-34 Comparison of the mean AEQ reductions for the CWAK and Upper/Middle Yukon reporting groups, total chum salmon PSC, and potentially forgone pollock (mt) as a percentage of B season total for the analyzed PSC limits and apportionment options. A stochastic model was used for AEQ estimation.

PSC Limit	Apportionment	AEQ CWAK	AEQ Up/Mid Yukon	Chum PSC	Forgone Pollock
100,000	Option 1: 3-Year Avg.	56.39%	55.70%	56.16%	37.46%
	Option 2: 5-year Avg.	56.64%	56.31%	56.38%	37.36%
	Option 3: Pro Rata	56.74%	56.56%	56.41%	37.34%
	Option 4: AFA	55.83%	54.24%	56.01%	36.63%
325,000	Option 1: 3-Year Avg.	12.53%	13.60%	12.41%	10.89%
	Option 2: 5-year Avg.	11.80%	13.02%	12.18%	8.48%
	Option 3: Pro Rata	11.87%	13.02%	12.18%	8.48%
	Option 4: AFA	8.76%	9.42%	10.59%	7.53%
550,000	Option 1: 3-Year Avg.	4.45%	5.52%	3.57%	2.90%
	Option 2: 5-year Avg.	3.07%	3.69%	2.73%	3.80%
	Option 3: Pro Rata	3.02%	3.70%	2.74%	3.92%
	Option 4: AFA	0.76%	0.83%	0.83%	2.16%

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Notes: Estimated percent reductions in the AEQ bycatch are based on data from 2011–2022 while total chum PSC reductions and forgone pollock are based on data from 2011–2023.

Table 2-35 Comparison of annual average gross first wholesale revenue forgone (millions of 2022 \$) based on hypothetical B season closures, 2011-2023

PSC Limit	Apportionment	CDQ	CP	Inshore	Mothership
100,000	Option 1: 3-Year Avg.	\$21.61	\$121.40	\$153.45	\$33.57
	Option 2: 5-year Avg.	\$21.28	\$116.99	\$158.64	\$32.17
	Option 3: Pro Rata	\$21.28	\$115.26	\$158.64	\$33.57
	Option 4: AFA	\$18.32	\$85.69	\$181.81	\$33.57
325,000	Option 1: 3-Year Avg.	\$13.95	\$60.49	\$15.92	\$5.79
	Option 2: 5-year Avg.	\$13.53	\$38.09	\$17.10	\$5.79
	Option 3: Pro Rata	\$13.53	\$38.09	\$17.10	\$5.79
	Option 4: AFA	\$13.53	\$17.31	\$31.51	\$5.79
550,000	Option 1: 3-Year Avg.	\$8.56	\$17.31	\$0.00	\$0.99
	Option 2: 5-year Avg.	\$7.24	\$13.39	\$11.83	\$0.00
	Option 3: Pro Rata	\$7.24	\$13.39	\$11.83	\$0.99
	Option 4: AFA	\$3.02	\$0.22	\$11.83	\$2.09

Source: NMFS catch accounting system, data compiled by AKFIN.

Table 2-36 Percent reduction in B season gross first wholesale revenue across sectors, based on hypothetical B season closures, 2011-2023

PSC Limit	Apportionment	CDQ	CP	Inshore	Mothership
100,000	Option 1: 3-Year Avg.	16.5%	26.0%	33.7%	28.4%
	Option 2: 5-year Avg.	16.2%	24.7%	34.7%	27.2%
	Option 3: Pro Rata	16.2%	24.4%	34.7%	28.4%
	Option 4: AFA	13.9%	18.4%	40.3%	28.4%
325,000	Option 1: 3-Year Avg.	10.8%	12.9%	6.2%	5.0%
	Option 2: 5-year Avg.	10.5%	7.9%	6.5%	5.0%
	Option 3: Pro Rata	10.5%	7.9%	6.5%	5.0%
	Option 4: AFA	6.6%	3.6%	9.9%	5.0%
550,000	Option 1: 3-Year Avg.	6.6%	3.6%	0.0%	0.9%
	Option 2: 5-year Avg.	5.6%	2.8%	2.4%	0.0%
	Option 3: Pro Rata	5.6%	2.8%	2.4%	0.9%
	Option 4: AFA	2.3%	0.0%	5.0%	1.9%

Source: NMFS catch accounting system, data compiled by AKFIN.

Alternative 4

Alternative 4 aims to strengthen the effectiveness of the salmon bycatch IPAs by modifying existing regulations to require more stringent avoidance measures for chum/WAK chum salmon PSC. The IPAs would craft incentives and penalties specific to the vessels governed by the contract and balance their measures with the goal of fully utilizing the B season TAC and mitigating the risk of increasing Chinook salmon PSC in September and October. Compared to other alternatives, Alternative 4 is expected to provide greater flexibility for the fleet to reduce its chum/WAK chum salmon PSC without risking large amounts of potentially unharvested pollock. However, the analysis does not have a way to scale the magnitude of the potential conservation benefits in terms of AEQ reductions that Alternative 4 could provide in the future, and it is not clear whether Alternative 4 would provide additional conservation benefits beyond what has occurred in recent years if it is selected in isolation.

Alternative 5

Compared to no action (Alternative 1), all three inseason corridor options under Alternative 5 (Option 1, Suboption 1, and Option 2) could further reduce chum and WAK chum salmon PSC. All inseason corridor options under Alternative 5 are expected to result in either neutral or negative economic impacts to the pollock industry. However, Option 1, Suboption 1, and Option 2 are mutually exclusive and so only one may be selected. **If the Council wishes to include Alternative 5 as part of a PA, the primary policy tradeoff is in choosing the inseason corridor option that would be implemented.** The options

differ from one another based on the areas (amount and location) that would close to vessels that attained the PSC limit.

The analysts have highlighted this tradeoff because the date that a sector would have met a combination of the corridor PSC limit and apportionment is the same across all three options because the area that chum salmon PSC accrues from (*i.e.*, the inseason corridor) is the same. Similar to Alternative 2 or 3, corridor chum salmon PSC limits set at a lower amount within the range are more likely to be met and result in a corridor closure. **When comparing the three inseason corridor options against each other, the positive impact that may be achieved in terms of chum salmon bycatch reductions, based on the consequence the option holds (*i.e.*, how motivating the option will be in terms of preemptive changes in fishing behavior) should be weighed against the economic impacts to the fleet if a closure does occur, as well as the potential impacts to chum and WAK chum salmon PSC after fishing effort is redistributed.**

Option 1 presents the greatest consequence for the pollock fishery because it would close the entire inseason corridor if the PSC limit is met and is especially impactful for inshore CVs and/or smaller capacity vessels. The greater consequence for reaching the inseason corridor PSC limit under Option 1 means vessels are more likely to be motivated to incur the costs associated with preemptive changes in fishing behavior, to the extent practicable. Option 1 is expected to reduce chum and WAK chum salmon PSC by redistributing fishing effort to outside areas once a cooperative or sector reaches the corridor chum salmon PSC limit. However, Option 1 has considerable economic risk for harvesters, processors, and communities if the closure occurs, given the level of potentially displaced pollock catch from an early B season closure.

Compared to no action, Suboption 1 and Option 2 would create an incentive for vessels to change their fishing behavior in response to the corridor chum salmon PSC limit. However, Suboption 1 and Option 2 appear to reduce the consequence of an inseason corridor closure by exempting some stat areas inside the corridor from closure, noting the fishing and environmental conditions vary each year. As a result, these options may also reduce some of the motivation for proactive changes in fishing behavior when they are compared to Option 1. To illustrate this, Table 2-37 compares the annual average amount of pollock catch (mt) that would have been displaced from the inseason corridor under Option 1 (40 of 40 stat areas) and Suboption 1 (29 of 40 stat areas), as well as the sum total of the pollock catch that would have been displaced under each option as a percentage of total pollock catch that occurred within the corridor. Note that similar a similar comparison cannot be provided for Option 2 because the stat areas that the IPAs may select to close are as of yet unknown. **The difference in the estimates of displaced pollock catch between Option 1 and Suboption 1 provides a sense of the extent to which Suboption 1 may scale back the incentive for preemptive changes in fishing behavior relative to Option 1.**

The direct tradeoff would be in mitigating some of the adverse economic impacts that would likely manifest from an early B season closure. Additionally, this suboption also reduces the risk of unintended consequences for Chinook salmon relative to Option 1 that may occur with a large amount of displaced pollock catch that requires fishing later in the fall to catch. Option 2 provides the most operational flexibility but may further reduce the consequences of a closure, depending on which and how many stat areas are chosen to close by the IPAs. Option 3 further mitigates potential economic burden by suspending corridor closures in high abundance years. Option 4 would also provide additional operational flexibility if the herring PSC limit is met in a given year. If the distribution of the fishery in September in the future is similar to what has occurred in the past, the CP and CDQ sectors would primarily benefit from Option 4 with relatively neutral chum salmon, Chinook salmon, or herring bycatch implications.

Table 2-37 Comparison of the average pollock catch (mt) that would have been displaced from the inseason corridor under Alternative 5, Option 1 and Suboption 1, as well as the total pollock catch that would have been displaced under each option as a percentage of the total pollock harvested inside the corridor during the closure window of June 10 – August 31, 2011–2023

PSC Limit	Apportionment	Option 1		Suboption 1	
		Pollock Catch Displaced	As a % of Corridor Total	Pollock Catch Displaced	As a % of Corridor Total
50,000	Option 1: 3-Year Avg.	130,168	43.9%	54,138	18.2%
	Option 2: 5-year Avg.	130,904	44.1%	53,476	18.2%
	Option 3: Pro Rata	133,433	45.0%	54,131	18.2%
	Option 4: AFA	139,621	46.9%	55,868	18.7%
200,000	Option 1: 3-Year Avg.	26,306	9.0%	17,692	6.0%
	Option 2: 5-year Avg.	26,649	9.1%	18,914	6.0%
	Option 3: Pro Rata	25,547	8.7%	14,132	4.8%
	Option 4: AFA	48,513	16.5%	17,005	5.8%
350,000	Option 1: 3-Year Avg.	16,490	5.6%	11,095	4.1%
	Option 2: 5-year Avg.	16,490	5.6%	12,944	4.1%
	Option 3: Pro Rata	17,721	6.0%	12,661	4.3%
	Option 4: AFA	14,082	4.8%	9,022	3.1%

Source: NMFS catch accounting system, data compiled by AKFIN.

Option 3 would suspend the inseason corridor and closure provisions in years following high Yukon summer and fall chum returns. This would offer relief to the pollock fleet during periods of high abundance, but it would not be expected to provide a conservation benefit beyond status quo in years the management measure would be suspended. Option 4 would shift the start of the Winter HSA from September 1 to September 30, allowing continued pollock fishing in that area during September if the herring PSC limit is met. This would mainly provide a benefit to the CDQ and CP sectors which have historically fished in the area (2011–2023) with relatively neutral impacts to chum and WAK chum salmon bycatch.

2.8.4 Considerations Related to Fleet Responses and Interactions with Multiple PSC Species

The Bering Sea pollock fishery currently operates under a Chinook salmon hard cap that is in effect during the A and B seasons (see 50 CFR 679.21(f)(2)), as well as the annual herring PSC limit that triggers a series of time/area closures if it is met (see 50 CFR 679.21(e)(7)(vi) and 50 CFR 679.21(e)(7)(vi)(B)(1)). Selection of Alternatives 2 or 3 and/or 5 would add one or two additional chum salmon PSC limits to this mix. If the pollock fishery is required to operate under one or more chum salmon PSC limits in the future, vessels will work to avoid all PSC species to the extent practicable. However, operating under multiple constraining PSC limits for spatially and temporally distributed PSC species would inherently limit the ability to balance and optimize its operations for all PSC species. Alternative 4 is not expected to hold similar constraints or tradeoffs for the fleet because it has operated under the IPAs since 2010 and has largely operated under the provisions in Alternative 4 since 2022.

Chinook Salmon PSC

An objective of the proposed action is to maintain the priority of the current Chinook salmon bycatch avoidance program (see Section 1.1). The salmon bycatch IPA regulations require the IPAs to create incentives to ensure the Chinook salmon PSC rates in October are not significantly higher than those achieved in preceding months (50 CFR 679.21(f)(12)(iii)(E)(13)). As such, policy decisions for alternative management measure for chum salmon bycatch must also consider the potential impact on Chinook salmon PSC.

The pollock fishery encounters both Chinook and chum salmon during the B season but the timing of these encounters is different. Figure 2-6 demonstrates this trend by showing the average weekly WAK chum salmon and Chinook salmon PSC rates compared to the average weekly pollock catch for the most recent five years. The WAK chum salmon PSC rates were higher from June through August (statistical weeks 22–34 in most years) while the Chinook PSC rates were greater in October (statistical weeks 41–44

in most years). Although the average Chinook PSC rate shows a slight peak in mid-August (statistical week 32), that rate is 0.02 Chinook/mt of pollock compared to 0.19 WAK chum/mt of pollock in the same week.

Given the timing of the chum/WAK chum salmon bycatch it is expected vessels would anticipate needing to reduce their PSC from June through August, and they would react inseason to a PSC limit that is more likely to be met and impose a constraint. Vessels may target pollock in areas with the lowest known chum salmon PSC rates, test fish more often, slow their pace of fishing to account for each haul or delivery, and/or cooperatives may issue a stand down to avoid reaching a chum salmon PSC limit under Alternatives 2, 3, or 5, vessels. All of these behavior changes have the potential to divert pollock catch to later weeks in the B season when Chinook salmon are more prevalent on the pollock fishing grounds. Chinook salmon PSC would likely increase compared to status quo in these scenarios, although total Chinook salmon PSC would still be constrained by the existing hard cap. Based on historical data, this scenario would be more likely under the lowest overall chum salmon PSC limits for Alternatives 2 and 3 and Option 1 of Alternative 5.

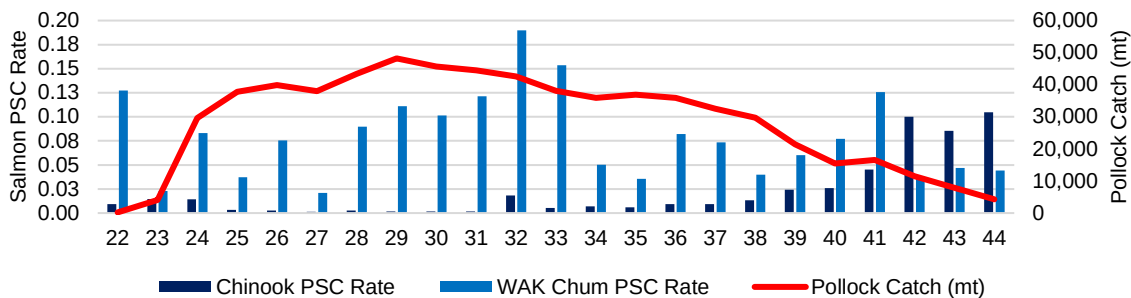


Figure 2-6 Average weekly WAK chum salmon and Chinook salmon PSC rate compared to the average weekly pollock catch (mt), 2019–2023

Source: NMFS catch accounting system, data compiled by AKFIN.

Herring PSC

Chum salmon, WAK chum salmon, and herring are encountered by the pollock fishery at relatively similar times during the B season. The location of these PSC encounters varies year-to-year but sometimes presented the fleet with sub-optimal choices because the areas with the lowest chum salmon PSC rates had greater herring PSC rates and vice versa. Table 2-38 illustrates these possible tradeoffs by showing the herring and chum salmon PSC rates inside the Summer HSA1, Summer HSA2, Winter HSA, and all outside areas (“remainder”) to chum salmon PSC rates in the same areas in June, July, and August over the most recent five years.

The impact of Alternatives 2, 3 and/or 5 on herring PSC is expected to be driven by how the fleet changes its fishing behavior inseason to respond to a chum salmon PSC limit set in regulation. If vessels are able to carefully balance their operations while operating under a chum salmon PSC limit in Alternatives 2 or 3 and/or 5, the impact to herring PSC could be relatively neutral. However, the similar timing of encounters but somewhat dissimilar locations of bycatch “hot spots” for each species suggests fleet movement to and from different areas would be a driving factor for herring. The alternatives and options that are most likely to have a negative consequence for Chinook by extending the B season are also the most likely to have a negative consequence for herring PSC, should the alternatives and options motivate more frequent movement or constrain the fishing area available to vessels.

Table 2-38 Comparison of herring PSC and chum salmon PSC rates inside Summer HSA1, Summer HSA2, Winter HSA, and all outside areas during June, July, and August 2019–2023

		Herring PSC Rate				Chum Salmon PSC Rate			
		Summer HSA1	Summer HSA2	Winter HSA	Other Areas	Summer HSA1	Summer HSA2	Winter HSA	Other Areas
June	2019	0.001843	0.009364	0.000016	0.000684	0.843	0.885	0.007	0.143
	2020	0.00448	0.003169	-	0.000185	0.022	0.036	-	0.015
	2021	0.015027	0.003165	0.000092	0.000122	0.097	0.295	0.001	0.065
	2022		0.002581	-	0.000001		0.007	0.014	0.052
	2023	-	0.005596	0.000009	0.000026	-	0.006	0.001	0.004
July	2019	0.000001	0.002021	-	0.000154	2.511	0.267	0.008	0.402
	2020	0.000122	0.015396	0.000734	0.000493	0.219	0.162	0.048	0.134
	2021		0.004691	0.000002	0.000021		1.505	0.008	3.292
	2022		0.003508	0.000028	0.001619		0.417	0.015	0.076
	2023	0.000449	0.009621	0.00018	0.000934	0.256	0.225	0.07	0.114
August	2019		0.000608	0.000001	0.000007		0.14	0.055	0.787
	2020	0.004445	0.00532	0.000047	0.000326	0.124	0.252	0.33	0.99
	2021		0.002608	0.000012	0.000041		0.068	0.105	1.479
	2022	0.000019	0.003976	0.000013	0.000009	1.747	1.294	0.857	0.759
	2023		0.025547	0.000821	0.00266		0.841	0.06	0.345

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate pollock catch was not observed inside that area, month, and year. Hyphens denote pollock catch was observed in that area, month, and year but the relevant PSC species was not observed. Greater PSC rates are in darker red shading. Lower PSC rates are indicated in lighter red shading or lack any color.

2.9 Alternatives Considered but not Analyzed Further

The following section discusses the alternatives previously considered by the Council but have not been analyzed further.

Consideration of overall chum salmon PSC limits below 100,000

The Council has previously considered chum salmon PSC limits below 100,000 chum salmon through recommendations from the Salmon Bycatch Committee⁴⁷ and a supplement prepared by NMFS. The NMFS supplement was prepared for the Council's April 2024 meeting and provided estimates of forgone pollock (mt), gross ex-vessel and first wholesale revenues, and chum salmon PSC reductions for caps of 150,000, 100,000, 50,000, and 0 chum salmon. In April 2024, the Council lowered the range of PSC limits in response to public testimony and the supplement to include a cap level of 100,000 chum salmon.⁴⁸ However, the Council is not considering caps below 100,000 chum salmon under Alternative 2 in light of its consideration of the National Standards. The Council is required to balance all National Standards when selecting and recommending a management alternative to the Secretary, including National Standard 9 which requires conservation and management measures shall, to the extent practicable, minimize bycatch.

Western Alaska Chum Salmon Performance Threshold

The Council previously considered an alternative to establish a performance threshold for WAK chum salmon. The threshold would have been implemented in conjunction with an overall PSC limit. A fishing sector would have been required to balance its performance against an overall cap as well as the WAK chum salmon performance threshold. Only those salmon caught as bycatch during the B season *and* identified as being of Western Alaska origin would accrue towards the threshold. If a sector exceeded its apportionment of the threshold three times in any seven-year period, it would be required to operate under a lower chum salmon PSC limit.

⁴⁷ See also the SBC's March 2023 report, available at archived agenda for April 2023 Council meeting (<https://meetings.npfmc.org/Meeting/Details/2983>), agenda item C2.

⁴⁸ See also NMFS's March 2024 letter, available at archived agenda for April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

The Council concluded the WAK chum salmon performance threshold was not a feasible management alternative to analyze further, because it intended to use each fishing sector's actual WAK chum salmon bycatch to compare against the threshold. Real-time genetic data for the salmon caught as bycatch in the pollock fishery are currently not available. Further, the percentage of chum bycatch consisting of WAK chum fluctuates significantly each year. Therefore, neither individual vessels nor sectors of the pollock fleet would know if they had exceeded the threshold, which could result in lower caps in future years. This raised equity concerns.

This determination was reached after considering different ways of setting the threshold including using a rolling average as well as the prior year's estimated proportion of WAK chum salmon. Both of these approaches would allow each fishing sector to know their apportionment of the threshold prior to the fishing season so their performance could be assessed against it in real time. However, these approaches provided a perverse incentive for the pollock fleet to attempt to increase their WAK chum bycatch, either over a period of years or in the prior year, to achieve a higher proportion against which their future performance would be measured. Additionally, the staff presentation in April 2024 clarified that it was not clear what management action would occur if a sector appeared to stay below the threshold inseason, but it later became known that the sector's bycatch was in fact above the threshold.

Cluster 1, Unimak, and Cluster 2 Inseason Corridors

In April 2024, the Council directed analytical staff to analyze the potential impacts of three inseason corridor options. The impact analysis presented at the Council's February 2025 meeting indicated there was a high risk that a Cluster 1 or Unimak corridor closure would adversely impact chum and WAK chum salmon PSC (*i.e.*, increased PSC). Chum salmon PSC rates were shown to be higher inside the Cluster 2 corridor compared to Cluster 1 and Unimak, but pollock harvests were greater inside Cluster 1 and Unimak. Moving a large amount of pollock catch from Cluster 1 or Unimak into Cluster 2 which is immediately west and the most likely movement scenario for most inshore CVs could result in higher total chum salmon PSC (and potentially WAK chum salmon PSC). The Council recommended a combined Cluster 1 and 2 corridor because this larger area *may* prevent this type of unintended consequence.

3 Environmental Consequences

Chapter 3 evaluates the potentially affected environment and the degree of impacts of the alternatives and options on the various resource components. Recent and relevant information necessary to understand the affected environment for each resource component is summarized in the corresponding section below. Note the social and economic impacts of the alternatives are addressed in Chapter 4 (see also Section 4.1).

3.1 Methods Used for the Impact Analysis

This DEIS characterizes the environmental, economic, and social conditions that have coincided with the existing chum salmon bycatch regulations which are referred to as the “baseline” or “status quo.” The analytical baseline informs decision-makers of the state-of-the-world as it is today, and what could be expected to continue if Alternative 1, No Action is selected. The reader should not take these terms to mean “static” because the conditions that characterize the status quo can always change in the future.

The baseline is also the benchmark used to compare the relative differences in the alternatives, as well as their implications as either positive or negative and their magnitude, against. The analysis must discuss the reasonably foreseeable environmental effects of the agency action (42 U.S.C. 4332(2)(C)).

The remainder of this section describes the methods used to quantitatively analyze the potential impacts of the proposed alternatives on the eastern Bering Sea pollock stock, chum salmon, Chinook salmon, and herring. The remaining resource categories considered in this analysis, marine mammals, seabirds, habitat, and ecosystem relationships, were largely evaluated qualitatively based on the results and trends from the quantitative analysis.

At the April 2024 Council meeting, the analysts considered crab PSC encountered by the Bering Sea pollock fishery at the species level with a particular focus on Tanner crab, snow crab and red king crab (all red king crab combined, not specific to Bristol Bay) from 2011–2023. Estimates on red king crab PSC ranged between 0–23 animals per year over that time frame while Tanner crab PSC ranged from approximately 92–4,900 and snow crab PSC ranged from 21–4,700. These numbers are low at the aggregated species level and the alternatives included under consideration are not anticipated to have any impact on the relative crab PSC taken in the pollock fishery.⁴⁹ Therefore, crab PSC will not be further analyzed in the DEIS, but a discussion of the impacts of this action on crab habitat can be found in Section 3.8.

Given the limited harvest of other groundfish species in the Bering Sea pollock fishery and the continuation of applicable regulations, none of the alternatives are expected to have an appreciable impact on other groundfish species caught in the pollock fishery.

⁴⁹ These crab PSC numbers were obtained from NMFS Alaska Region Catch Accounting System and compiled by the Alaska Fisheries Information Network.

Table 3-1 Resources potentially affected by the proposed action and alternatives

Eastern Bering Sea Pollock	Potentially Affected Resource Component							
	Salmon	Herring PSC	Marine Mammals	Seabirds	Habitat	Crab PSC	Ecosystem	Economic, Community, and Tribal
Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes

N = no impact anticipated by each alternative on the component.

Y = an impact is possible if each alternative is implemented.

3.1.1 Chum Salmon Bycatch in the Bering Sea Pollock Fishery

Counts of chum salmon caught as bycatch in the Bering Sea pollock fishery are based on comprehensive data collected by NMFS-certified observers onboard pollock vessels or at shoreside processing facilities. Observer data are uploaded directly into the Catch Accounting System (CAS) daily. The CAS was developed to receive catch reports from multiple sources, evaluate data for duplication errors, estimate the total catch by species or species category, and determine the appropriate account to attribute the catch. Since 2011, observers have counted all salmon caught as bycatch in this fishery and each salmon is identified at the species-level. This information allows for accurate estimation of the total bycatch. Salmon bycatch data collected by NMFS observers, and imputed into the CAS, was provided by AKFIN for this analysis. More information on the observer and monitoring requirements for salmon bycatch in the pollock fishery is available in Chapter 5.

3.1.2 Estimating the Genetic Stock Composition of Chum Salmon Bycatch

Since 2011, the Observer Program has counted all salmon caught as bycatch in the Bering Sea pollock fishery and has undertaken systematic genetic sampling of all salmon bycatch (1 in 10 Chinook and 1 in 30 chum salmon). These observer data are used to determine the genetic stock of origin of the bycatch. Briefly, the Auke Bay Labs genetics program under the Alaska Fisheries Science Center receives shipments of individually labelled paired genetic and scale samples from the Fisheries Monitoring and Analysis division. These samples are inventoried against observers' records within AKFIN's database. If the number of samples exceeds the labs capacity, a subsampling strategy is determined to maintain representative sampling. Tissue samples are then cut, DNA is extracted and amplified for the genetic marker panel used for genetic stock identification (prior to 2020, 11 microsatellite markers were used, since 2020 84-single nucleotide polymorphisms have been used). Genotyped fish are then arranged into spatial and temporal mixtures of interest to analyze the stock composition of the bycatch. Genetic stock identification is performed with software that implement a Bayesian mixture model to estimate the proportion of six regional groupings (SE Asia, NE Asia, Coastal Western Alaska, Upper/Middle Yukon, Southwest Alaska, Eastern Gulf of Alaska/Pacific Northwest). Final estimates of genetic stock composition of chum salmon are generally available in April following the end of the pollock season.

3.1.3 Estimating Adult Equivalent Chum Salmon Bycatch

To understand the impact of bycatch of chum salmon on WAK chum salmon stocks, a method was developed to estimate how different bycatch numbers may translate to a decrease in adult chum salmon available for spawning escapement and harvests. The reason for pursuing this type of analysis is that some of the bycatch in the pollock fishery are juveniles that would not have otherwise survived to return to their natal systems as adults. An estimate of adult equivalents (AEQ) is designed to account for oceanic natural mortality and provides a more comprehensive representation of pollock fishery effects. The overall goal of this AEQ analysis is to estimate the impact that bycatch may have on WAK chum salmon populations by determining removals of adult equivalent fish as a proportion of total run size. This analysis provides a means of answering, "how many, and in what year, may the salmon have returned had they not been taken as bycatch?"

There are many sources of uncertainty in an AEQ model related to estimates of the stock of origin, oceanic mortality and survival, and in-river age composition (which affects estimates of age-specific maturity). The analysts developed a “simplified AEQ” model for chum salmon in response to the SSC’s April 2024 Minutes,⁵⁰ as well as requests from the Council and public. Given the considerable uncertainties associated with all relevant parameters for estimating adult equivalent chum salmon, this naming convention is used to distinguish it from the AEQ estimates produced for Chinook salmon bycatch. However, “AEQ” is also used for shorthand, particularly in subsequent tables and figures, to reduce confusion. What follows is a general description of the information needed to complete an AEQ analysis for chum salmon and the associated uncertainties. This is important context for any subsequent discussion on the impacts of the alternatives, because the estimates presented should be taken within the context of the levels of associated uncertainty with the calculations and assumptions. More information on the AEQ model is available in Appendix 3.

Information Needed to Estimate Adult Equivalents in the Overall Bycatch

Estimating the AEQ bycatch requires 1) the genetic composition of the bycaught salmon, 2) the unspecified oceanic natural mortality from predation, starvation, disease, etc., 3) the age composition of chum salmon bycatch and the number of fish for each age, and 4) the relative maturation by age class to the age composition of the mature population that enters natal rivers and may be subject to in-river mortality (natural or by fishery) or contribute to escapement. Each component is discussed directly below.

Genetic Composition of Chum Salmon Bycatch

An AEQ analysis requires information on the genetic stock composition of the bycatch, but for the purposes of this analysis and in light of the purpose and need statement, the simplified analysis focuses solely on estimating adult equivalent WAK chum salmon in the overall bycatch. A new aggregation of populations in the chum salmon genetic baseline was used for this AEQ analysis, based on the reporting groups used by US Fish and Wildlife Service and ADF&G for management and include the “Coastal Western Alaska – Summer” and “Yukon River – Fall Run” groupings.

These two aggregate groupings are nearly identical to the CWAK and Upper/Middle Yukon reporting groups used in historical genetic analyses of bycatch. The primary difference is that five populations typically classified in the Upper/Middle Yukon reporting group in bycatch analyses were reclassified (*i.e.*, regrouped) with the Summer run. These include populations from Henshaw Creek Late, S. Fork Koyukuk River, Jim River, Chena River, and the Salcha River. For each dataset, the baseline that has been used in the past was reorganized to match the run timing groups prior to estimating the age-specific stock compositions. The analysis continues to use “CWAK” and “Upper/Middle Yukon” for ease of the reader and to minimize public confusion with two different naming conventions for relatively similar reporting group analyses.⁵¹

Ages of Chum Salmon Caught as Bycatch

Although the proposed action is focused on regulatory changes for chum salmon bycatch management in the pollock fishery, the Council, its advisory bodies, NMFS, and the public regularly receive reports on the genetic stock composition of Chinook salmon bycatch and periodically receive updated AEQ and impact analyses (see Appendix 3). There are, however, important differences in the proportion of the ages of Chinook salmon caught as bycatch compared to chum salmon.

The Chinook salmon caught in the pollock fishery primarily range in age from 3- to 6-years and a small component of age-2 and age-7 fish bycaught in any given year. By comparison, a small proportion of the

⁵⁰ Accessible at the eAgenda for the Council’s April 2024 meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), under agenda item B10 (SSC Report April 2024_Final).

⁵¹ Current research underway at AFSC in collaboration with ADF&G (PI: Dr. Wes Larson) is developing a new genetic marker panel with low coverage whole genome sequencing for WAK chum salmon to improve the resolution of stock structure. This project could allow for more precise estimation of the relative effect of bycatch on WAK chum salmon populations, but results are not yet available for this DEIS.

chum salmon caught as bycatch in the pollock fishery are 2-, 6-, or 7-years old. The majority of chum salmon caught as bycatch range in age from 3–5 years old, with age-4 fish typically representing the highest proportion (Figure 3-1). Because chum salmon caught in the pollock fishery generally range in age from 3- to 5-years, and chum salmon mature and return to the rivers at multiple ages, the effect of bycatch in a given calendar year is spread over multiple return years. For example, a 3-year-old chum salmon caught as bycatch in 2020 may have returned in 2020 as age-3 fish, in 2021 as age-4 fish, 2022 as age-5 fish, 2023 as age-6 fish, or 2024 as age-7 fish. This example assumes the fish survived each year in the ocean year-to-year. Note, all age-7 fish mature in that given year. As such, a bycatch year with a high number and proportion of age-3 fish can affect the AEQ estimates in subsequent years.

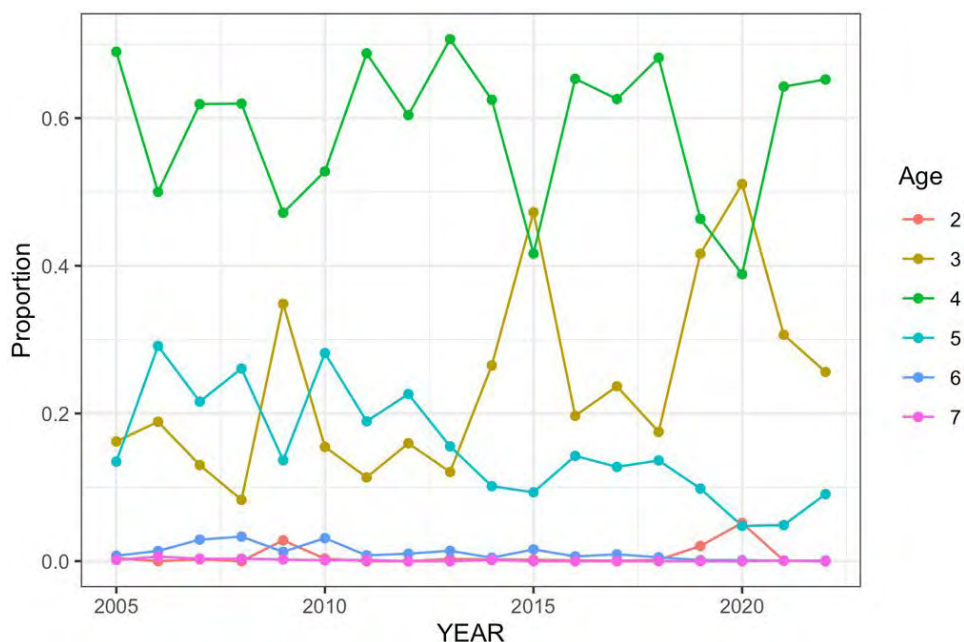


Figure 3-1 Proportion of each age in the total (all genetic stock composition reporting groups) chum salmon bycatch from 2005–2022

Source: NMFS Alaska Region CAS, data compiled by ABL.

Unspecified Oceanic Mortality, Natural Mortality, and Age at Maturation

An AEQ analysis first estimates a maturation rate from in-river age composition data (averaged over years and/or populations) and assumed age-specific oceanic mortality. These estimated rates are then applied to stock specific estimates of bycatch at age (*e.g.*, total number of WAK chum salmon ages 2-7) to determine how many chum salmon in a given year were likely to mature versus remaining in the ocean another year where those fish would be subject to oceanic mortality or live to mature in the subsequent year(s).

The age at which chum salmon reach sexual maturity and are ready to spawn varies by natal stream, and the available data on the in-river age composition of salmon in natal streams varies widely by species and region. Stock composition estimates for WAK chum salmon bycatch are estimated at the aggregate level due to limitations in finer scale genetics, except for the Yukon fall chum salmon run. Even when age-specific maturation may be well estimated by river for runs where a full run reconstruction is available, maturation data must be aggregated to some degree to account for a range of possible ages across river systems. While a large proportion of the variance in age at maturity can be explained by genetics, it is still affected by the environment such that maturity can vary among years within the same stream.

The natural mortality of salmon in the marine environment varies by age, but it is extremely difficult to quantify age- and species-specific natural mortality in the ocean for these species. In each year, some salmon remain in the ocean, some mature and return to rivers, and some are caught as bycatch. For the

AEQ estimate, in the absence of bycatch mortality some proportion of the chum salmon bycatch would have died of natural causes and to account for this, estimates of oceanic mortality are applied to the fraction of fish that delayed maturation in a given year and survive to the next.

Figure 3-2 shows a generic model of the various aspects of salmon demography in the ocean. In the open ocean salmon are subject to oceanic natural mortality from predation, disease, starvation, and other factors (M_s , orange). Some fish would otherwise mature and return at multiple ages (γ , green). Bycatch in the pollock fishery is also accounted for (bottom panel). These factors influence the proportion of the mature population that may return to their river system and be subject to in-river mortality, natural or directed harvest, or may otherwise contribute to escapement. Note, the AEQ model does not account for bycatch or harvest that may occur in other marine fisheries, such as state-water or international fisheries. Additionally, it only accounts for removals from a single year and does not try to estimate the potential compounding loss of production in future years.

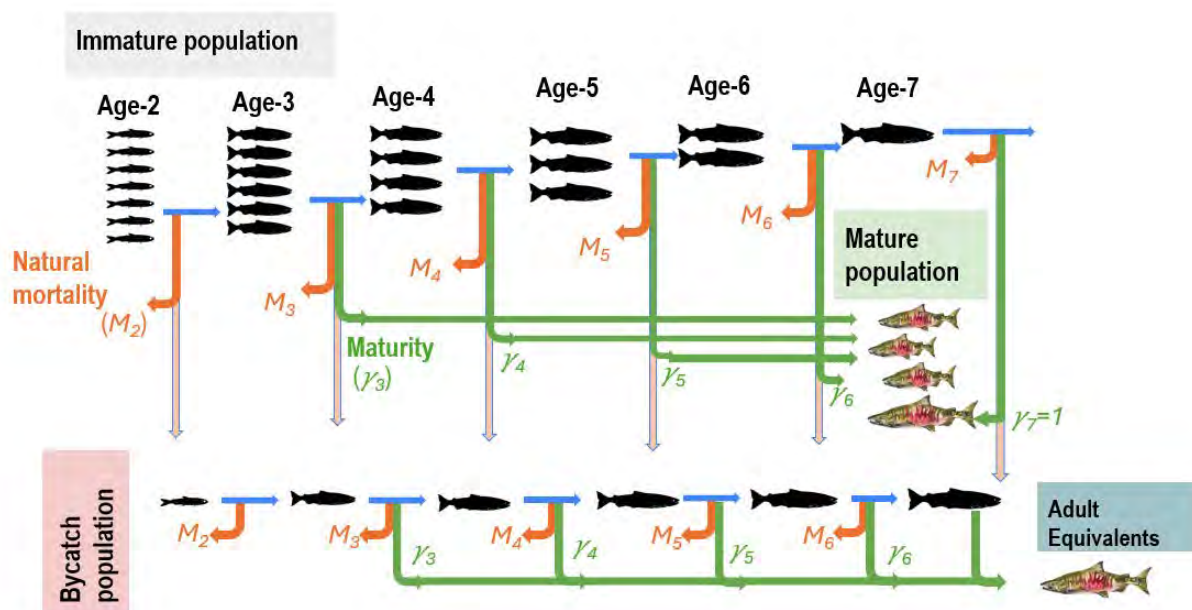


Figure 3-2 Generalized model of the relative relationship of oceanic growth of salmon by age, compared to mortality and to maturation by age, used to calculate an adult equivalent estimate for the relative proportion of adult equivalent fish caught as bycatch

Source: Adapted from Lukas DeFilippo (AFSC).

3.1.3.1 Sources of Uncertainty When Calculating a Chum Salmon Adult Equivalency Analysis

Some of the major considerations leading to **high uncertainty** in the calculation of a WAK chum salmon bycatch AEQ or an impact rate analysis are summarized below.⁵² As context for the reader, briefly, the AEQ calculation is as follows.

First, an estimate of the annual age-specific stock composition of the chum salmon caught as bycatch from 2005–2022⁵³ is made for the frequent age classes. This year set encompasses removals of infrequent age classes (e.g., age-2, age-6, and age-7 fish), for which stock composition estimates could not be made. In these instances, an estimate of the closest age class was applied, so age-3 estimates were applied to age-2, and age-5 estimates applied to age-6 and age-7 fish. **Second**, the total number of chum salmon at

⁵² See Appendix 3 for specific details on the calculations employed and parameter estimates involved in this calculation.

⁵³ Note that prior to 2011, bycatch samples were not sampled systematically and biases in the age-specific stock compositions from non-representative spatial and temporal sampling.

each age is calculated by multiplying the annual age composition of the bycatch by the total bycatch.

Third, the number of each age of chum salmon for each genetic group is calculated by multiplying the total number of each age (step 2) by the age-specific stock compositions (step 1). The **final step** is to calculate the AEQ estimates using the stock specific estimate for each age, with some assumptions about natural mortality and oceanic maturity. This is done iteratively by calculating for each age the proportion of fish that die, the proportion of fish of each age that mature to return to their natal rivers, and the proportion of remaining fish that will survive to the next year (Figure 3-2 and Appendix 3).

Uncertainty Related to Natural Mortality

Few estimates of chum salmon oceanic mortality exist for populations across the Pacific Rim. Fukuwaka and Suzuki (2002) produced some estimates based on work from 1992–1997 summarizing a mark-recapture study on hatchery released chum. Their results indicate that early sea mortality during coastal life (~ 99.1%) was much higher than successive mortality during offshore life (~0.6%).

No mortality estimates are available for WAK chum stocks, so the annual age-specific natural mortality rate for WAK chum salmon at the age that they are caught as bycatch in the pollock fishery is currently unknown. Because an AEQ analysis requires an estimate of the annual natural mortality for the stock or stock grouping, for this analysis, a mortality estimate by age was assumed to be varying from 0.3 for age 2 to 0.0 to age 7. These estimates are based on the limited data available for chum salmon oceanic mortality and are consistent with the estimates used in the 2012 Bering Sea draft EA/RIR.

Uncertainty Related to Age at Maturity

An AEQ analysis also requires unbiased estimates of ages at maturity for each run year because different salmon stocks have different maturity patterns and trends, as mentioned above. Unbiased estimates of ages at maturity are provided by run reconstructions, which are not available for all WAK chum salmon stocks. Run reconstruction data are available for the Yukon Fall run stock and the most recent 5 years of available data (2014–2018)⁵⁴ were used to calculate an average estimate of the age at maturity for this stock.

Similar age at maturity data were not available for other CWAK stocks, therefore information from six river systems within the Kuskokwim Drainage⁵⁵ was used to estimate an average in-river age composition that was then applied to the entire CWAK reporting group. The following river systems were used: Goodnews (middle fork), Kanekotok, Salmon River Aniak, George River, Tatlawiksuk, Kogrukluuk. To be most reflective of recent maturity estimates, the most recent five years (2014–2018) were used, except for the Kanekotok when data from 2002–2015 were selected. As shown in Table 3-2, not all Kuskokwim weirs were operational or had sampling issues which precluded the estimation of age, sex, and length for all years, and are annotated appropriately. With caveats on the data sources and sampling issues, these data may be appropriate for estimation of the in-river ages of the Kuskokwim stocks. Considerable uncertainty can occur from assuming ages at maturity for one stock and applying them to the CWAK stock group as a whole.

⁵⁴ Yukon JTC, 2024, Yukon River Salmon 2023 Season Summary and 2024 Season Outlook.

⁵⁵ ADF&G 2021, Regional Information Report 3A21-03.

Table 3-2 In-river data sources from six systems along the Kuskokwim used to estimate in-river age composition data for the chum salmon AEQ analysis

Source	Years	Issues noted with data available
Goodnews (middle fork)	2014–2018	In 2018 the weir did not operate
Kanektok	2002–2015	Sampling issues in 2014; weir did not operate from 2016 on
Salmon River Aniak	2014–2018	Sampling issues in 2014, 2016
George River	2014–2018	
Tatlawiksuk	2014–2018	2018 weir did not operate for most of season; data from observed escapement counts
Kogrukluuk	2014–2018	Sampling issue in 2017

Source: ADF&G.

Uncertainty Related to Bycaught Chum Salmon Ages

The stock specific ages at which WAK chum salmon are caught as bycatch in the pollock fishery have considerable uncertainty associated with them. Salmon are aged by reading scale patterns. While chum salmon scale samples are individually aged, genetic samples are run in batches by primary age class. For this analysis, the proportion of each stock group by age group is provided but not the age composition for each stock group.

If all individuals of known age could be assigned to a stock group with high accuracy (individual assignment), the age composition of each stock group could be estimated by dividing the number of fish in each age class by the sum over age classes. For instance, the proportion age-2 individuals within a WAK reporting group would be:

$$\#Age2/(\#Age2+\#Age3+\#Age4+\#Age5+\#Age6+\#Age7)$$

To infer the total number of each age from a given reporting group, these proportions would then be multiplied by the B season estimate of total number of fish for the reporting group (with its uncertainty). This would provide more accurate estimates for infrequent age class proportions (ages 2, 6, and 7), as they would be analyzed and assigned to a reporting group, and likely more precise estimates because the B season estimates have substantially more samples than each age-specific analysis.

Additional error is associated with aging salmon scales from a wide variety of stocks spanning North America and Asia absent information indicating the stock or stock grouping of origin for the scales. Marks on salmon scales are developed throughout the life of the fish and can vary depending on genetic variation of populations, life history patterns, and environmental variables. Scale age readers are often trained with stock specific scales to account for these differences. Although there are few studies comparing the accuracy of chum salmon scale aging, one recent study found that accuracy and precision was variable among experienced age readers trained on scales from specific chum salmon stocks (Anderson et al., 2023). Additionally, scales collected from trawl caught samples are rarely from the preferred area on a salmon.

Lack of Run Size Reconstructions for Impact Rate Estimation

An AEQ estimate does not account for any associated in-river mortalities (natural mortality or direct or indirect fishing mortality). An AEQ is only an estimate of those fish that, had they not been caught as bycatch in the ocean, may have made it to their regions of origin. Because reconstructions for all major chum salmon producing systems across WAK are not available, an impact rate cannot be provided. Run reconstructions provide an estimate of total run size and there are limited run reconstructions for chum salmon in Western Alaska that align with the genetically distinguishable stock groupings for stock-specific bycatch estimates. A scientifically defensible run reconstruction includes a thorough estimate of escapement (the number of fish returning to a river system in a given year that are not caught by fisheries and can contribute to the spawning population) and harvest. Run reconstructions are currently only available for Yukon River summer and fall run chum salmon and Kwiniuk River chum salmon. This

excludes large chum salmon populations in the Kuskokwim River, Bristol Bay, Kotzebue Sound, and Norton Sound.

Some indices of abundance are available for WAK chum salmon populations without run reconstructions (*e.g.*, aerial surveys, weirs, counting towers, sonars, harvest), but a simple summation of these indices of abundance is not equivalent to a run reconstruction and would not provide a scientifically defensible accounting of the total abundance of chum salmon for the WAK reporting group. Indices may only provide a partial accounting, with some unmeasured and uncertain components of the run missing, or they may be designed to only provide relative abundance rather than absolute abundance information. For example, aerial surveys provide a relative index of abundance or escapement because they assess a standardized portion of the in-river spawning area and not the entire spawning area; they do not provide a census or estimate of total abundance.

3.1.4 Estimating the Impacts to PSC and Forgone Pollock Under Alternatives 2 and 3

3.1.4.1 Retrospective Assessment

Alternatives 2 and 3 could close the B season pollock fishery early if the overall PSC limit is met and so the potential impacts of Alternatives 2 and 3 are evaluated by comparing the actual chum salmon bycatch that occurred in a year to the PSC limit amounts and then determining if the pollock fishery would have closed. When the PSC limit and apportionment would have closed the fishery earlier in a given year than actually occurred, an estimate is made of the pollock TAC that would have been left unharvested (“forgone pollock”) and the reduction in the amount of chum salmon PSC as a result of the closure (“salmon saved”). Estimates of the gross first wholesale and ex-vessels revenues related to forgone pollock are also provided. This method relies on retrospective fisheries-dependent data and is the same approach used in all previous iterations of this analysis. **This method does not account for expected changes in future fishing behavior. All resource categories and revenues are likely to be impacted prior to and regardless of whether an early B season closure occurs, and these nuances are addressed qualitatively (see Section 3.1.4.2).**

The retrospective analysis for all alternatives is based on catch, PSC, and revenue data from 2011–2023. This time series reflects the period in which the hard cap for Chinook salmon PSC has been in effect. The Council selected 2011 as the starting year for analysis to capture the period when the hard cap for Chinook salmon PSC has been in effect and also encapsulates the period for which best genetic information is available to estimate the stock composition of the overall bycatch. However, the environmental conditions and market conditions changed during this period. Fishing behavior also changed, especially after the 2021 B season. After a decrease in WAK chum salmon abundance and relatively high B season bycatch in 2021, the Council requested the fleet take immediate action to reduce its chum salmon bycatch. Since 2022, all sectors have voluntarily changed their fishing and PSC avoidance behavior. Although external factors may also be contributing, compared to the 2021 level of bycatch of 545,901 chum salmon, the 2022 B season bycatch was a 55% reduction, the 2023 B season an 80% reduction, and the 2024 B season was a 94% reduction. This point is being raised in light of the SSC highlighting the most recent years in the baseline period are distinctly different from years prior to 2022. This is noted in the analysis when considering impacts relative to 2022 and 2023.

Weekly data from the NMFS Alaska Region CAS were used to approximate when a sector would have met a PSC limit and apportionment combo. There were some years when a sector would not have closed early, but when a sector was estimated to have met a PSC limit and apportionment combo, the day a sector would have closed was estimated by interpolating the statistical week and the week-ending date of the statistical week that bracketed the fleet of sector-specific PSC limit. Next, the remaining PSC species and pollock caught by a sector was calculated as the sum total from that date until the end of the B season.

In scenarios when the B season would have closed earlier to a sector than what actually occurred, the pollock (mt) that would have been left unharvested and the reduction in the number of non-Chinook, Chinook, and herring (mt) PSC were calculated. Chinook salmon and herring were quantitatively analyzed because these PSC species are managed under PSC limits that constrain the pollock fleet. A calculation of potentially forgone pollock harvest is also used as the basis for estimating the potentially forgone gross first wholesale and ex-vessel revenues for the sectors.

The week-ending date for when an overall PSC limit would have been met gives an approximation of the procedure NMFS inseason management uses to notify the fleet of a potential closure resulting from reaching a PSC limit (*i.e.*, the closure would occur after a limit was reached). This approach also considers how chum salmon have historically been encountered on the pollock fishing grounds in pulses where a single high week of bycatch for a sector could exceed an apportionment and recognizes there is some uncertainty in knowing when a limit may have been exceeded. The inshore sector is affected by a data lag as the census count of salmon bycatch occurs at shoreside plants (*i.e.*, there may be differences between the day a PSC limit was met and the exact day that information would be known).

To streamline the analysis, overall PSC limits of 100,000-, 325,000-, and 550,000-chum salmon were analyzed because these values represent the lower and upper bound as well as the midpoint of the range being considered for Alternative 2 and Alternative 3, Option 2. The impact analysis was extended to include a PSC limit of 75,000 chum salmon for Alternative 3, Option 1. While the CDQ Reserve Pool apportionment Suboption could contribute a larger overall PSC limit accessible only by CDQ groups, potential effects of this suboption have been described separately from this methodology.

3.1.4.2 Interpretation of the Retrospective Estimates

The estimates on potential PSC reductions and forgone pollock provide reference points to consider what may happen in the future and are a useful tool to compare the alternatives and options. However, the methods used in this analysis do not account for future changes in fishing behavior in response to an overall chum salmon PSC limit. The possibility that the B season could close early to a sector if the overall PSC limit is met under Alternative 2 and 3 creates an incentive for vessels to avoid chum salmon as practicable. **Increased effort to avoid chum salmon prior to, and regardless of an early B season closure, could result in different impacts for different PSC species compared to the values estimated in the retrospective assessment.** Additionally, increased chum salmon avoidance that delays or prevents a closure from occurring may allow more pollock to be harvested and mitigate the potential revenue losses. This is discussed at length in Section 4.3.

It is not possible to quantify the effects from the anticipated changes in fishing behavior which creates uncertainty around the alternatives' potential impacts on all resources categories, and the retrospective estimates for different categories hold different interpretations (Table 3-3). For example, the retrospective estimates of chum salmon savings under an overall PSC limit use the methods described above which provide an estimate of the number of chum salmon saved after the cap would have been met. If fishermen change their behavior in the future, and they are successful at not avoiding the overall PSC limit, the total bycatch reductions would be greater than what can be reported in this DEIS. This means the retrospective estimates on chum salmon savings represent a lower bound on chum salmon savings.

The proposed alternatives do not create incentives for the pollock fleet to avoid Chinook salmon and herring PSC, although existing management measures do. Rather, as would be expected, the proposed alternatives create incentives for the fleet to avoid chum and WAK chum salmon PSC. This may have unintended consequences by increasing catches of Chinook and herring relative to status quo and so the retrospective values based on an early closure are likely an upper bound of Chinook or herring savings. Chinook salmon and herring PSC savings could be less or even negative as a result of the proposed action prior to a closure and even if it does not occur.

Table 3-3 Guidance for interpreting the retrospective estimates for Alternative 2 and 3

Impact Category	Interpretation of Retrospective Values
Chum Salmon	Retrospective estimates are lower bound on chum salmon savings and changes in fishing behavior to avoid meeting the PSC limit would result in chum salmon PSC below the reported values, if the PSC limit is not met.
Western Alaska Chum Salmon	Given the potential behavior changes, and the inter-annual variability in the WAK component of the total bycatch, the retrospective values are not a lower or upper bound on WAK chum salmon savings . WAK chum PSC could be higher or lower (or the same) as a result of the proposed actions.
Chinook and Herring PSC	Retrospective estimates are an upper bound on Chinook and herring PSC savings as a result of this action. The proposed alternatives would not be expected to drive reductions in Chinook salmon or herring PSC, and as vessels respond to a chum salmon PSC limit, the outcomes could be neutral or negative.
Pollock Fishery	Retrospective values are an upper bound of gross revenue impacts . Behavior changes could delay or prevent a closure, resulting in lower revenue impacts. However, avoidance may result in operational costs and distributional impacts. Additionally, a B season closure may result in broader social and economic implications beyond revenue estimates, as described qualitatively.
Western Alaska Chum Salmon Users	Given the pollock fleet behavior changes that could occur, values are not a lower or upper bound on WAK chum salmon saving in the future. WAK chum PSC could be higher or lower (or the same) as a result of this action. This analysis also provides qualitative description of broader implications of additional subsistence/ commercial harvesting opportunity for communities, mixed economies, cultural identities, ecosystem, and Indigenous ways of life that would be considered under potential benefits.

Notes: This section, and the qualitative descriptions of potential impacts using the terminology “lower bound” and/or “upper bound” respond to the SSC’s April 2024 recommendations (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item B10.

3.1.5 Estimating the Impacts of Fleet Movement Under Alternative 5

The analysis used different methods to analyze the potential impacts of the three inseason corridor options under Alternative 5 on chum and Chinook salmon PSC. These approaches are described directly below.

3.1.5.1 Description of Fleet Movement Model

A Fleet Movement Model was developed to provide decision-makers estimates on the potential impacts to chum and Chinook salmon PSC under Alternative 5. The model was exclusively built to analyze Alternative 5 because the same techniques could not be applied to any other alternative. The model displaces B season pollock catch (mt) and salmon PSC from the inseason corridor when a sector would have reached its apportionment of a corridor cap. For reasons discussed below, the Fleet Movement Model was only used to estimate the potential impacts of Suboption 1.

Proportional Approach to Redistributing Pollock Catch

The Fleet Movement Model uses a proportional approach to redistribute pollock catch (mt), chum salmon PSC, and Chinook salmon PSC from a corridor that closed to a sector to all stat areas outside the corridor that had catch, in proportion to the catch that occurred. The final results of the model include an estimated net change in salmon PSC to occur within the closure window. The total pollock catch is left unchanged by the model.⁵⁶

Estimates of pollock catch and chum and Chinook salmon PSC from 2011–2023 were obtained from NMFS’s CAS. PSC rates were calculated as the weekly number of chum salmon PSC caught per weekly catch (mt) of pollock. This model used a spatial resolution similar to how salmon are accounted for in

⁵⁶ Note the analysts considered redistributing catch based on CPUE and PSC rates in outside areas based on other approaches used in the recent Bristol Bay Red King Crab EA/RIR. Upon review of the SSC’s feedback on the Red King Crab EA/RIR from its June 2023 and February 2024 meetings, as well as a consideration of the available data, the analysts used the proportional approach. The preliminary DEIS presented at the SSC and Council meetings in February 2025 contains more detail on specific considerations and data limitations.

CAS. Haul-level PSC accounting was maintained when haul-specific data were available from at-sea observers for CPs and motherships. Inshore CV's PSC used the spatial resolution of the stat areas associated with pollock landings and census counts of salmon that occur at delivery.

The data were evaluated for each corridor-specific PSC limit and apportionment method being considered to determine when the corridor would have closed for a given sector and year. On the week-end date after a closure would have occurred, the model redistributed pollock catch and salmon bycatch on a weekly basis to the proportional areas where catch occurred outside of the corridor through August 31. Weekly runs were chosen because chum salmon PSC encounters, bycatch rates, and pollock fishing locations are variable throughout the B season.

Figure 3-3 shows the process used to estimate the new PSC based on the proportionally displaced pollock catch. For each week that a closure would have occurred, the sum of the pollock catch (mt) (blue) that occurred in a given week inside the corridor (red polygon) was proportionally dispersed to outside areas where there was fishing effort in the same week. The example given in Figure 3-3 is that there were three stat areas outside the corridor where fishing occurred, and the proportion of catch in each of the three outside areas was 0.2 (20%), 0.6 (60%), and 0.2 (20%). There was 200 mt of catch displaced from areas inside the corridor which was divided among the three outside areas in proportion to what occurred. Next, the mean PSC rates (red) were applied to the new estimated pollock catch in each outside stat area to derive the stat area's new PSC estimate. Finally, the amount of PSC that occurred in that week inside the corridor was subtracted from the sum of the new estimates of PSC catch to derive a weekly net change estimate.

Outliers and Assumptions

The analysts applied two methods to trim the dataset and remove outliers. When the model was initially run, there were issues with redistributing catch due to some instances of low catch and high PSC rates. Hauls with less than 10 mt of pollock catch were dropped because this threshold was determined to be a lower bound where a small amount of fishing or a test tow occurred. The analysts also utilized the local outlier factor (LOF) method which identifies outliers in a dataset by reviewing rate and catch for the data. This method looked at 500 nearest neighbors for each haul and assumed that 1% of the data would be an outlier. Each row was ranked based on LOF ranking and a total of seven rows were removed (these hauls represented catch rate outliers).

Several assumptions were built into the model. For instance, the processing sector was assigned as CP for all CDQ landings for coding simplicity. In reality, a small amount of CDQ pollock has been landed during the B season by Motherships as well. The model also assumed a corridor closure would redistribute impacted vessels to outside areas through August 31. Potential stand-downs or an actual early B season closure were not accounted for. Note this assumption did not apply to cases when there is no pollock harvest occurring outside of a closed corridor since the model had nowhere to move catch to. Finally, the model did not redistribute catch from September 1 to the end of the B season because vessels impacted by a corridor closure could return to fish inside the corridor from September 1 onward. If that occurred retrospectively, it was assumed that was likely due to good fishing conditions (*i.e.*, catch rates, operational efficiencies, or low catches of other PSC species). The model essentially stopped redistributing effort after August 31.

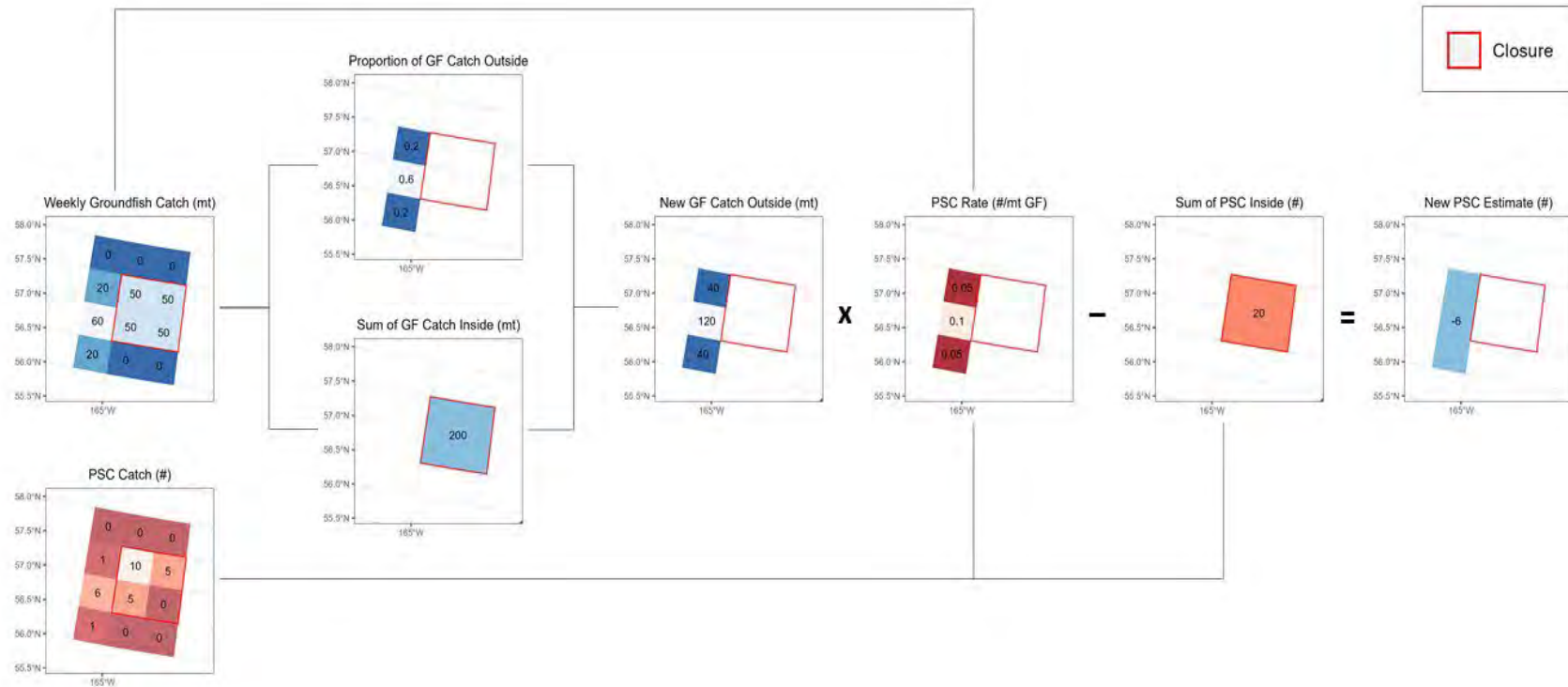


Figure 3-3 Example of the process used to estimate the net PSC change through the displacement of weekly pollock catch (groundfish, blue) to stat areas outside the closed corridor in proportion to the catch that occurred outside, which is multiplied by the weekly PSC rate in that area (red) to derive the sum of new PSC, and finally, subtracted by the actual PSC that was caught inside closed corridor.

Other Points for Consideration

An important caveat for the model is that it assumes the same total weekly amount of pollock would be caught in stat areas that catch was redistributed to. This may be a fair assumption in scenarios where relatively small amounts of catch were redistributed and/or there are enough stat areas across which catch could be proportionally distributed. Nevertheless, the model does not account for differences in pollock CPUE, congestion on the fishing grounds, or the need to avoid other species. These are realistic considerations that would affect fishing behavior and weekly catch rates.

There is an incentive for sectors to make up the catch that would be redistributed from closed areas, and with some exceptions under lower PSC limits it is expected the majority of the B season TAC would be utilized. However, if a large amount of pollock catch is redistributed to sub-optimal fishing grounds or stat areas that are further from port, this could lengthen the season and affect PSC in a way that differs from what is estimated in the model. Given that this would not mirror historical catch and bycatch patterns, the net change estimates do not account for these possible dynamics which are qualified to the extent possible in the discussion of model results.

Additionally, there were weeks when the corridor closed and there was no pollock harvest outside of the corridor. In these cases, the model had nowhere to move the displaced catch to and new PSC estimates could not be calculated for these weeks. If the model could account for these weeks, the estimates of net changes in PSC would be different from what is reported. This issue was more prevalent for Option 1 and was the determining factor to use alternative methods, as shown in Table 3-4 which provides the proportion of weeks a sector did not fish outside the corridor after a closure would have occurred historically had the PSC limit been in effect and no behavior changes occurred. These values are based on the sum of total weeks where fishing only occurred inside the corridor after a PSC limit was met, and the sum of weeks when fishing occurred after a cap was met regardless of fishing. Table 3-5 provides the same information for Suboption 1. This issue was less prevalent for Suboption 1 because it would exempt 11 stat areas inside the corridor from closure and catch was able to be redistributed in proportion to these and other outside stat areas.

Finally, the model does not account for vessel capacity (fish hold, fuel tanks) and horsepower, which are particularly important considerations for inshore CVs. Smaller vessels are more limited by speed, travel distance, and hold capacity to meet delivery requirements – while balancing operational costs and safety – than larger vessels. These dynamics are addressed qualitatively in Section 4.3.5 relative to pollock fishery impacts.

Table 3-4 Rounded percentage of weeks during the B season when a pollock sector did not fish outside the inseason corridor (40 of 40 stat areas) after a closure was estimated to occur under Alternative 5, Option 1, 2011–2023

	Apportionment Option 1: 3-Year Average				Apportionment Option 2: 5-Year Average				Apportionment Option 3: Pro Rata				Apportionment Option 4: AFA			
	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore
50,000-Chum salmon PSC limit																
2011	-	-	17%	0%	-	-	29%	0%	-	-	17%	0%	-	-	29%	0%
2013	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
2014	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
2015	-	-	-	33%	-	-	-	33%	-	-	-	25%	-	-	-	25%
2016	71%	33%	100%	20%	75%	33%	100%	20%	71%	25%	100%	20%	71%	29%	100%	33%
2017	25%	0%	43%	50%	25%	0%	43%	50%	25%	0%	43%	50%	25%	0%	43%	50%
2018	0%	0%	0%	22%	0%	0%	0%	22%	0%	0%	0%	22%	0%	0%	0%	22%
2019	-	0%	-	56%	-	0%	-	56%	-	0%	-	56%	-	-	-	50%
2020	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
2021	0%	0%	100%	13%	0%	0%	100%	13%	0%	0%	100%	13%	0%	0%	100%	22%
2022	-	0%	50%	50%	-	0%	50%	50%	-	0%	50%	50%	-	-	50%	50%
2023	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
200,000-Chum Salmon PSC Limit																
2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50%
2016	67%	50%	100%	-	50%	50%	100%	-	-	100%	100%	-	-	-	100%	33%
2017	14%	0%	-	50%	25%	0%	-	50%	14%	0%	-	50%	14%	0%	-	33%
2018	-	0%	-	-	0%	0%	-	-	-	-	-	-	-	-	-	20%
2021	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	-	100%	0%
2022	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	-	-
350,000-Chum Salmon PSC Limit																
2016	-	100%	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-
2017	14%	0%	-	-	14%	0%	-	-	14%	0%	-	-	14%	0%	-	-
2021	0%	0%	100%	0%	0%	0%	100%	0%	0%	-	100%	0%	0%	-	100%	0%

Source: NMFS Alaska Region CAS.

Notes: Cells marked with a "-" indicate there was no closure for that given year, corridor, and sector. Cells marked with a "0%" indicate that fishing in some weeks occurred both inside and outside of the corridor. Cells marked with a percentage greater than zero indicate that fishing in some weeks only occurred inside the corridor and there was no fishing outside of the corridor. For years between 2011-2023 that are excluded from the table, the cap was not met.

Table 3-5 Rounded percentage of weeks when a pollock sector did not fish outside the 29 stat areas inside the inseason corridor after a closure was estimated to occur under Alternative 5, Suboption 1, 2011–2023

	Apportionment Option 1: 3-Year Average				Apportionment Option 2: 5-Year Average				Apportionment Option 3: Pro Rata				Apportionment Option 4: AFA			
	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore
50,000-Chum salmon PSC limit																
2011	-	-	0%	0%	-	-	0%	0%	-	-	0%	0%	-	-	0%	0%
2013	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
2014	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
2015	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
2016	0%	11%	20%	0%	0%	11%	17%	0%	0%	13%	20%	0%	0%	14%	16%	0%
2017	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2018	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2019	-	0%	-	0%	-	0%	-	0%	-	0%	-	0%	-	-	-	0%
2020	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
2021	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2022	-	0%	100%	0%	-	0%	100%	0%	-	0%	100%	0%	-	-	100%	0%
2023	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%
200,000-Chum Salmon PSC Limit																
2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%
2016	-	25%	33%	-	0%	25%	25%	-	-	100%	33%	-	-	-	33%	0%
2017	0%	0%	-	0%	0%	0%	-	0%	0%	0%	-	0%	0%	0%	-	0%
2018	-	0%	-	-	0%	0%	-	-	-	-	-	-	-	-	-	0%
2021	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	0%	0%
2022	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	-	-
350,000-Chum Salmon PSC Limit																
2016	-	100%	-	-	-	100%	-	-	-	100%	-	-	-	-	-	-
2017	0%	0%	-	-	0%	0%	-	-	0%	0%	-	-	0%	0%	-	-
2021	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	0%	0%	0%	-	0%	0%

Source: NMFS Alaska Region CAS.

Notes: Cells marked with a “-” indicate there was no closure for that given year, corridor, and sector. Cells marked with a “0%” indicate that fishing in some weeks occurred both inside and outside of the corridor. Cells marked with a percentage greater than zero indicate that fishing in some weeks only occurred inside the corridor and there was no fishing outside of the corridor.

3.1.5.2 Other Approaches Used to Analyze Option 1 and Option 2

Option 1

In light of the model's limitations, the impact analysis for Option 1 focuses on the historical distribution of pollock catch, chum salmon PSC, and WAK chum salmon PSC inside and outside the corridor from 2011–2023. These data are used to infer the potential benefits and/or unintended consequences prior to a corridor closure as well as different movement scenarios after a closure occurred. The analysis also provides estimates of the catch displaced from the corridor using the same procedure as Alternatives 2 and 3, except that only a sector's historical PSC caught inside the corridor is measured against the cap.

Option 2

Option 2 would close between 19 and 29 stat areas inside the corridor to a cooperative or sector that attained its apportionment of the corridor PSC limit. The IPAs would select both the number and location of stat areas to close based on historical chum salmon bycatch, pollock CPUE, and relevant genetics data. The stat areas the IPAs select to close may change year-to-year upon review and approval by NMFS but may not change inseason. This dynamic inherently limits the scope of the analysis that can be provided for Option 2, a challenge that the Council acknowledged in its rationale for its February 2025 motion on this action. At that time, the Council requested the analysis describe the process of how areas might be identified. As such, the analysis provides data to show the historical distribution of pollock catch and chum salmon PSC among all corridor stat areas and describes the potential tradeoffs the IPAs may face when making their selections.

3.1.6 Reasonably Foreseeable Environmental Trends and Planned Actions in the Area

Based on the resource components in Table 3-1, this analysis focuses on eastern Bering Sea pollock, salmon, herring, marine mammals, seabirds, habitat, ecosystem change as well as the human dimensions. The past and present actions related to the relevant environmental components are identified and integrated in the appropriate sub-sections of Chapter 3 and 4.

When determining what trends and planned actions to evaluate, the discussion looks at actions that are more than merely possible or speculative. Actions are considered reasonably foreseeable if some concrete step has been taken toward implementation, such as a Council recommendation or the publication of a proposed rule. Actions simply “under consideration” have not generally been included because they may change substantially or may not be adopted, and so cannot be reasonably described, predicted, or foreseen.

This is not intended to be an exhaustive list of all external factors influencing each resource category but rather focus on those reasonably foreseeable trends and actions that could interact with the proposed alternatives.

Some reasonably foreseeable trends and actions that are expected to impact and interact with all resource components: the continued authorization of the Bering Sea pollock fishery through the annual harvest specifications process, prosecution of the Bering Sea pollock fishery, and ecosystem change. These trends and action are crosscutting for the resource components evaluated and therefore described here.

Authorization and Prosecution of the Bering Sea Pollock Fishery

The continued setting of controls and limits for the Bering Sea pollock fishery under the annual harvest specifications process constitutes an RFA. Annual TAC specifications limit each year's harvest within sustainable bounds. The overall OY limits on harvests in the BSAI constrain overall harvest of all species. Each year, the Council recommends, and NMFS approves OFLs, ABCs, and TACs for two years, as described in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b).

Annual Bering Sea pollock harvest is an RFA that is conducted by private actors and affects many resource categories. The ongoing effects of the pollock fishery on the sustainability of pollock is considered annually through the stock assessment process (Ianelli et al., 2024). Additionally, this draft EIS, the documents incorporated by reference, and associated appendices contain extensive information specifically focused on the current, and potential future, direct and indirect impacts and interactions of the Bering Sea pollock fishery with the human environment. In general, these levels of impact are expected to continue. Analyses of the proposed action inherently considers the continuation of the pollock fishery in combination with the proposed alternatives.

Environmental variability and ecosystem change

Rising temperatures are having ecosystem-level effects (*e.g.*, changes in habitat or prey species abundance), and the Council annually receives Ecosystem Status Reports (ESRs) as it considers recommendations for the upcoming year's catch and PSC limits during the annual groundfish harvest specifications process. The [2023 Ecosystem Status Report ESR](#) is cited and incorporated by reference throughout this DEIS (Siddon et al., 2023).

Other information capturing ecosystem dynamics is also used in the analysis of potential direct, indirect and cumulative effects, including the impacts of environmental change on the recent and ongoing declines in WAK chum salmon abundance. For example, marine heatwaves in the Bering Sea and Gulf of Alaska in 2016 and 2019 resulted in low prey quality and marine survival for juvenile WAK chum salmon (Farley et al., 2024). Similarly, increased open-water phytoplankton blooms have been observed with potential effects to the food web for chum salmon (Nielsen et al., 2024).⁵⁷

More broadly, some marine mammals, like ice seals (bearded seals, ringed seals, spotted seals, ribbon seals), are directly impacted by changing temperatures and sea ice extent, while others are indirectly affected, through prey availability (Edwards and Richardson, 2004). Prolonged increases in sea surface temperature have also resulted in a shift in prey availability resulting in a mass seabird die-off event from 2014 to 2016 (Piatt et al., 2020). Commercially managed stocks are experiencing variable impacts, as there have been recent declines in snow crab, and Bristol Bay red king crab (Siddon et al., 2023). Conversely, there has been increased recruitment in sablefish, herring, and Bristol Bay sockeye salmon and increased reproductive success and recruitment for the 2018-year class of pollock (Ianelli et al., 2024).

3.2 Overview of BSAI Groundfish Management

The Council recommends annual catch limits, allocations, and PSC limits for the Federally managed commercial groundfish fisheries in the BSAI. Those stocks that are commercially important and for which an annual catch limit is established include: walleye pollock, Pacific cod, sablefish, yellowfin sole, Greenland turbot, arrowtooth and Kamchatka flounders, northern rock sole, flathead sole, Alaska plaice, and “other flatfish”, Pacific ocean perch, northern rockfish, shortraker and rougheye rockfish, “other rockfish”, Atka mackerel, shark, octopus, sculpin, skate, and squid (see also the [BSAI Groundfish FMP](#)⁵⁸). Authorized gear types are trawls, hook-and-line, pots, jigs, and other gear as defined in regulations. Participants in the Bering Sea pollock fishery would be directly regulated by the proposed action and is managed under the BSAI Groundfish FMP.

The Council annually considers the [BSAI Groundfish Stock Assessment and Fishery Evaluation](#) (SAFE)⁵⁹ Report at its December meeting when it recommends biennial harvest specifications. The SAFE Report provides a detailed discussion on the status of individual groundfish stocks. The Council also

⁵⁷ Salmon EFH includes both the marine environment and freshwater anadromous streams used during their egg, larval, juvenile, and spawning adult life history stages (NPFMC, 2024).

⁵⁸ Available at NMFS website - <https://www.fisheries.noaa.gov/management-plan/groundfish-bering-sea-and-aleutian-islands-management-plan>

⁵⁹ Available at North Pacific Fishery Management Council website at <https://www.npfmc.org/library/safe-reports/>.

receives an [Ecosystem Status Report \(ESR\)](#)⁶⁰ on an annual basis in conjunction with setting harvest specifications. The goals of the harvest specifications process are to 1) manage fisheries based on the best scientific information available, 2) provide for adequate prior public review and comment on Council recommendations, 3) provide for additional opportunity for Secretarial review, 4) minimize unnecessary disruption to fisheries and public confusion, and 5) promote administrative efficiency.

Across all gear types and sectors, total commercial groundfish TAC levels in the BSAI are capped at 2 million mt each year. This cap corresponds to the upper limit on the optimum yield (OY) in the BSAI FMP and in Pub. L. No. 108-199. The 2 million mt cap is a harvest constraint set well below the sum of Acceptable Biological Catch (ABC) levels, which represent the overfishing level adjusted for uncertainty, for the FMP groundfish species mentioned above. For example, the sum of the 2024 groundfish FMP species' ABCs was 3,476,800 mt and the 2024 TAC was set at 2,000,000 mt. Note that Figure 3-4 below provides a summary of key terminology, such as TAC and ABC, for Federal management of groundfish fisheries in the BSAI.

BSAI TAC setting is generally driven by tradeoffs among the availability of eastern Bering Sea pollock, Bering Sea Pacific cod, key flatfish species and the 2 million mt OY cap. High value, low volume species such as sablefish and rockfish have TACs set equal to ABC while lower value flatfish stocks such as arrowtooth flounder have TACs set well below ABC for both market reasons and expected halibut bycatch rates. At lower levels of pollock ABC (*e.g.*, 2010 to 2012) the pollock TAC is set equal to the ABC. Since 2012, as the pollock ABC increased, the pollock TAC has remained relatively stable thus allowing for higher TACs to be set for other BSAI groundfish species.

FMP groundfish species TACs are allocated for the entire BSAI when the population structure indicates a single stock. Others, such as Pollock, Pacific cod and sablefish have separate allocations by the Bering Sea and Aleutian Islands subareas of the BSAI. Additionally, for some rockfish and Atka mackerel, allocations are further specified within regions to avoid localized depletion.

⁶⁰ Available at NMFS Alaska Region website--<https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands>.

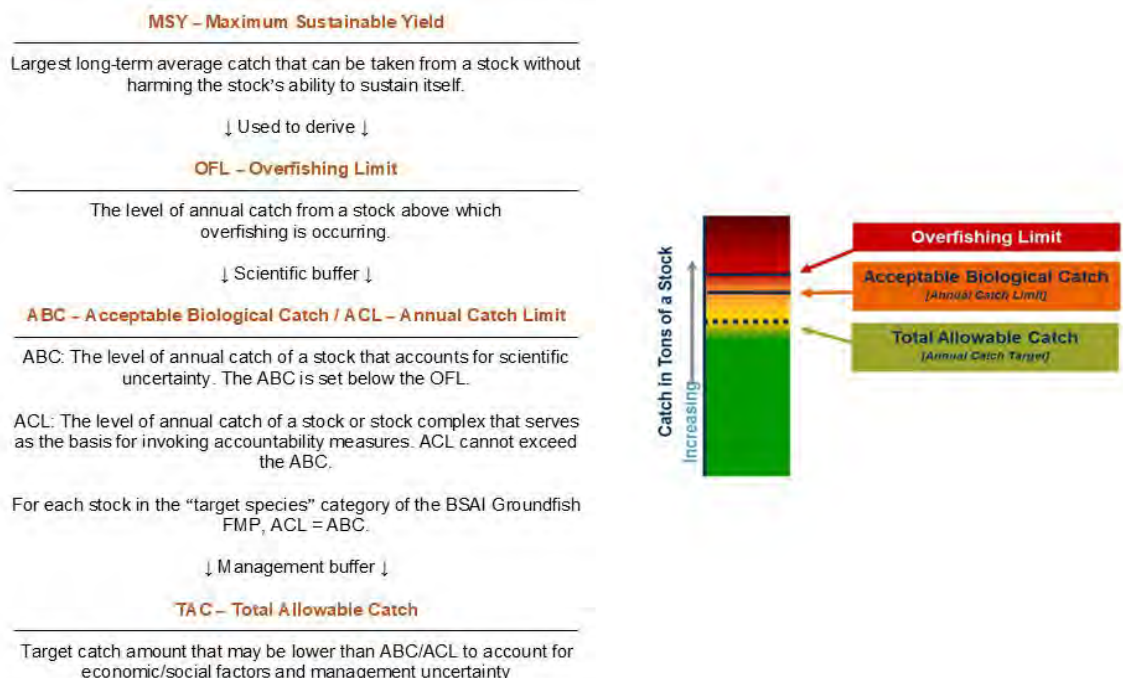


Figure 3-4 Definitions of key terminology for Federal groundfish fisheries management in the BSAI
Source: BSAI Groundfish FMP.

3.2.1 Bering Sea Pollock

Walleye pollock (*Gadus chalcogrammus*; hereafter referred to as pollock) are usually concentrated on the outer shelf and slope of coastal waters but may utilize a wide variety of habitats, and they are broadly distributed throughout the North Pacific with the largest concentrations found in the Bering Sea (Ianelli et al., 2024). General migratory movements of adult pollock on and off the eastern Bering Sea shelf tend to follow a pattern of movement to the outer shelf edge and deep water in the winter months, to spawning areas in the springtime, and to the outer and central shelf during the summer months to feed. For management purposes, pollock in the U.S. waters of the Bering Sea are divided into three stocks: the eastern Bering Sea stock, the Aleutian Islands stock, and the Central Bering Sea-Bogoslof Island stock. The participants in the Bering Sea pollock fishery would be directly regulated by any of the proposed actions.

Prosecution of the Pollock Fishery

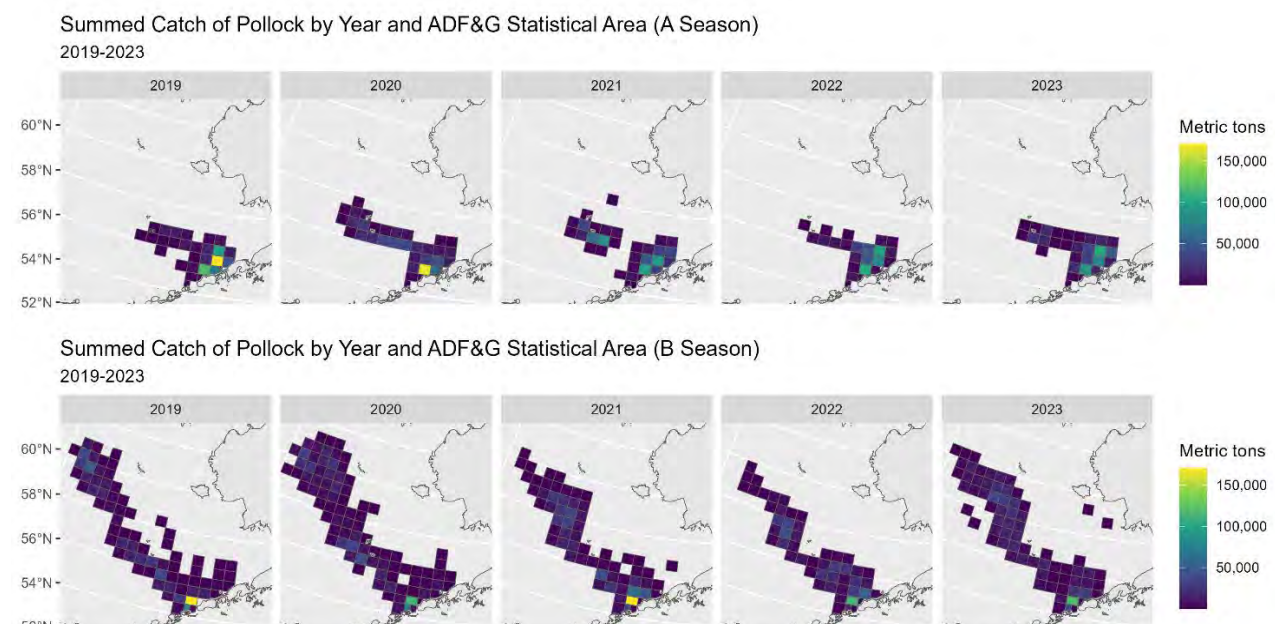
The eastern Bering Sea pollock fishery is the largest U.S. fishery by volume. The 2024 and 2025 Bering Sea subarea TAC was set at 1.30 million and 1.375 million metric tons (mt), respectively. Also marketed under the name “Alaska pollock,” this fishery represents over 40% of the global whitefish production with the market disposition split fairly evenly between fillets, whole (headed and gutted), and surimi. An important component of commercial production is the sale of roe from pre-spawning pollock, which are the focus of the A season fishery (January 20 to June 10) and can comprise over 4% of the catch in weight (Ianelli et al., 2024). The B season opens on June 10 and closes on November 1. Table 3-6 provides the amount of pollock (mt) harvested in the A and B seasons by sector from 2011–2023.

The A season fishery has primarily been concentrated north and west of Unimak Island depending on ice conditions and fish distribution. There has also been effort along the 100m depth contour (and deeper) between Unimak Island and the Pribilof Islands. The general pattern by season (and area) has varied over time with recent B season catches occurring in the southeast portion of the shelf (Figure 3-5).

Table 3-6 Bering Sea pollock harvest (mt) during the A and B seasons by sector, 2011–2023

Year	CDQ		CP		Mothership		Inshore		Total
	A season	B season	A season	B season	A season	B season	A season	B season	
2011	51,696	66,751	186,889	253,195	45,977	66,024	223,577	303,666	1,197,776
2012	49,524	73,344	182,466	254,261	43,574	63,712	215,395	318,507	1,200,783
2013	51,242	76,262	188,254	266,551	44,460	59,375	220,148	332,546	1,238,838
2014	51,739	78,073	183,390	270,487	44,636	67,088	222,395	338,419	1,256,227
2015	53,739	80,179	185,449	280,428	45,699	69,673	226,404	352,795	1,294,365
2016	54,742	81,122	187,466	287,781	46,872	70,763	232,548	355,794	1,317,089
2017	61,546	75,744	209,550	271,358	52,638	66,664	246,127	348,656	1,332,283
2018	62,446	76,581	216,540	266,933	52,869	67,370	255,375	347,858	1,345,972
2019	63,991	78,777	217,703	280,616	54,785	69,212	264,742	352,830	1,382,657
2020	65,319	63,828	226,995	250,079	56,221	68,595	276,608	333,723	1,341,368
2021	63,284	77,076	221,269	267,181	53,314	67,501	260,035	341,748	1,351,409
2022	49,597	61,283	173,085	210,331	41,735	53,705	212,020	263,595	1,065,350
2023	59,148	72,867	202,687	250,956	50,301	62,785	240,220	327,041	1,266,005

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

**Figure 3-5 Eastern Bering Sea pollock catch distribution during the A season (top panel) and B season (bottom panel), 2019–2023**

Source: NMFS Alaska Region CAS.

3.2.1.1 Effects of the Alternatives on the Pollock Stock

3.2.1.1.1 Alternative 1

The eastern Bering Sea pollock stock is currently managed based on science covering a wide variety of factors including the capacity of the stock to yield sustainable biomass on a continuing basis (see Section 3.2). Changes in the spatial and temporal distribution of the fishery are closely monitored by scientifically trained NMFS fishery observers and are reflected in the annual stock assessments and in consideration of fishing conditions. The present bycatch management system neither significantly affects the distribution of the stock spatially and temporally, nor is it reasonably expected to jeopardize the capacity of the stock productivity on a continuing basis. Thus Alternative 1 is not expected to have adverse effects on the pollock stock as evidenced by the capacity to yield sustainable biomass on a continuing basis and the ability of the stock to sustain itself.

3.2.1.1.2 Alternative 2 and 3

The effects of Alternative 2 or 3 on the eastern Bering Sea pollock stock depend on whether an overall chum salmon PSC limit results in an early B season closure and/or how fishing behavior changes prior to the PSC limit being met. The analysis identifies when a given PSC limit and apportionment would have closed the B season earlier for a sector had it been in place in prior years at which point the remaining pollock harvest is considered forgone (see Section 3.1.4).

Table 3-7 provides the week-ending date of the statistical week that bracketed when a specific PSC limit and apportionment were met. Cells without an entry indicate a sector did not meet the PSC limit in that year. **Note this method ignores the fact that the fleet would take measures to avoid reaching the PSC limit in the future and so the estimates are contextualized with a discussion on how the fleet may react to this regulatory change.**

Table 3-8 shows the amount of pollock (mt) that would have been forgone under the analyzed PSC limits and apportionments options, as if they were in place from 2011–2023 and no changes in fishing behavior occurred. The amount of forgone pollock was typically greater when the PSC limit was met earlier in the B season. For instance, the CP sector met a 100,000-chum salmon PSC limit using apportionment Option 1 (3-year average) on June 30, 2018, resulting in 236,646 mt of potentially forgone catch. In 2019, the CP sector met the same PSC limit and apportionment on August 10 and 117,701 mt of pollock were estimated to be forgone. The annual TAC and fishing conditions in that year (*e.g.*, how much pollock quota was caught by the date a cap was met) were also important factors in determining the magnitude of these estimates.

Section 3.3.4.3 discusses specific implications for Alternative 3 which are not reiterated here, but note that an overall PSC limit would not have been in effect each year under Alternative 3 (Table 3-42 and Table 3-43). Option 1 would have resulted in a hard cap being in effect in either 3 or 6 years, and Option 2 would have resulted in a hard cap being in effect in either 3 or 5 years. While a 75,000-chum salmon PSC limit is possible under Option 1 of Alternative 3, it could only have been in place in 2021, 2022, and 2023. This PSC limit would have been more constraining for the sectors that met the cap in those limited years (Table 3-11).

While the forgone pollock catch would have varied considerably over the analyzed years and combinations of PSC limits and apportionments, for the consideration of potential future impacts, they should be understood as an upper bound for impacts. Fishermen would change their behavior to the extent practicable to delay or prevent an early closure by moving more frequently, traveling further distances, using more frequent test tows to ensure low chum salmon PSC rates, or some other approach (see also Section 3.3.4.4.3). If these strategies are successful, the amount of forgone pollock would be less than what is reported here.

Alternative 2 or 3 are expected to have a relatively neutral or positive impact to the eastern Bering Sea pollock stock. The pollock fishery's movement is constrained by existing regulations and environmental conditions and so it is expected that relatively small shifts in the spatial distribution of the fishery in response to an overall chum salmon PSC limit would have a relatively neutral impact. If the B season pollock TAC is not fully harvested under Alternative 2 or 3, the fishery would have less of an impact on the stock compared to the status quo. However, the potential future impacts of reduced fishing could affect stock dynamics and density dependence processes, if there were large and consistent reductions in pollock harvest. Higher stock sizes could affect the average size of pollock due to prey limitation (and hence density-dependent reductions in somatic growth). Smaller-sized adult pollock may have lower reproductive potential yet cause higher density-dependent mortality and increased cannibalism. Higher levels of adult pollock biomass have historically resulted in lower levels of recruitment. Any changes to prosecution rates in the Bering Sea pollock fishery would be accounted for in the stock assessment as well as any impacts on the size-composition of the pollock stock that was detectable in the eastern Bering Sea trawl survey.

Table 3-7 Week-ending date of the statistical week when the overall chum salmon PSC limits and sector apportionments would have been met from 2011–2023 without any changes in fishing behavior

Cap:	100,000				325,000				550,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011		27-Aug	23-Jul	6-Aug								
2012												
2013				17-Aug								
2014		16-Aug		2-Aug								
2015		22-Aug	29-Aug	15-Aug								
2016	23-Jul	9-Jul	30-Jul	6-Aug		13-Aug	3-Sep			3-Sep		
2017	8-Jul	15-Jul	15-Jul	15-Jul	15-Jul	22-Jul			15-Jul	29-Jul		
2018	30-Jun	30-Jun	7-Jul	7-Jul	7-Jul	21-Jul						
2019	14-Sep	10-Aug	3-Aug	13-Jul		31-Aug	7-Sep					
2020	19-Sep	22-Aug	19-Sep	22-Aug		3-Oct		10-Oct				
2021	17-Jul	31-Jul	17-Jul	17-Jul	17-Jul	14-Aug	31-Jul	31-Jul	17-Jul		28-Aug	
2022	3-Sep	20-Aug	6-Aug	6-Aug			3-Sep					
2023		9-Sep	26-Aug	2-Sep								
Apportionment Option 2: 5-Year Average												
2011		27-Aug	23-Jul	30-Jul								
2012												
2013				10-Aug								
2014		16-Aug		2-Aug								
2015		29-Aug	5-Sep	15-Aug								
2016	23-Jul	16-Jul	30-Jul	6-Aug		20-Aug	3-Sep					
2017	8-Jul	15-Jul	22-Jul	15-Jul	15-Jul	22-Jul			22-Jul	29-Jul		
2018	30-Jun	30-Jun	7-Jul	7-Jul	14-Jul	1-Sep						
2019	14-Sep	10-Aug	3-Aug	13-Jul		31-Aug	7-Sep					
2020	26-Sep	22-Aug	19-Sep	22-Aug				3-Oct				
2021	17-Jul	31-Jul	24-Jul	17-Jul	17-Jul	4-Sep	31-Jul	31-Jul	17-Jul			7-Aug
2022		20-Aug	6-Aug	6-Aug			3-Sep					
2023			26-Aug	26-Aug								
Apportionment Option 3: Pro Rata												
2011		27-Aug	23-Jul	30-Jul								
2012												
2013				10-Aug								
2014		16-Aug		2-Aug								
2015		29-Aug	29-Aug	15-Aug								
2016	23-Jul	16-Jul	30-Jul	6-Aug		20-Aug	3-Sep					
2017	8-Jul	15-Jul	15-Jul	15-Jul	15-Jul	22-Jul			22-Jul	29-Jul		
2018	30-Jun	30-Jun	7-Jul	7-Jul	14-Jul	1-Sep						
2019	14-Sep	17-Aug	3-Aug	13-Jul		31-Aug	7-Sep					
2020	26-Sep	22-Aug	19-Sep	22-Aug				3-Oct				
2021	17-Jul	31-Jul	17-Jul	17-Jul	17-Jul	4-Sep	31-Jul	31-Jul	17-Jul		28-Aug	7-Aug
2022		20-Aug	6-Aug	6-Aug			3-Sep					
2023			26-Aug	26-Aug								
Apportionment Option 4: AFA												
2011		22-Oct	23-Jul	9-Jul								
2012												
2013				3-Aug								
2014		30-Aug		2-Aug								
2015		19-Sep	29-Aug	15-Aug				5-Sep				
2016	30-Jul	30-Jul	30-Jul	30-Jul		3-Sep	3-Sep					
2017	8-Jul	22-Jul	15-Jul	15-Jul	15-Jul	29-Jul		9-Sep	22-Jul	9-Sep		
2018	30-Jun	7-Jul	7-Jul	30-Jun				29-Sep				
2019	21-Sep	24-Aug	3-Aug	29-Jun			7-Sep	14-Sep				
2020		5-Sep	19-Sep	22-Aug				12-Sep				
2021	17-Jul	31-Jul	17-Jul	10-Jul	17-Jul		31-Jul	31-Jul	11-Sep		14-Aug	7-Aug
2022		20-Aug	6-Aug	30-Jul			3-Sep					
2023			26-Aug	19-Aug								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 3-8 Estimates of forgone B season pollock (mt) as if the overall chum salmon PSC limits and sector apportionments were in place from 2011–2023

Cap:	100,000				325,000				550,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011		89,307	39,459	118,722								
2012												
2013				83,516								
2014		84,042		135,459								
2015		64,924	15,877	121,829								
2016	22,468	221,815	42,404	130,249		118,751	12,787			39,607		
2017	48,998	183,204	40,749	204,500	41,515	162,802			41,515	133,877		
2018	63,534	236,646	52,088	249,756	57,635	171,330						
2019	26,313	117,701	39,597	248,376		67,037	15,157					
2020	15,662	80,883	20,163	142,044		19,504		27,450				
2021	48,589	125,523	43,980	217,587	48,589	82,016	32,775	172,796	48,589		10,914	
2022	0	18,381	15,107	55,312			138					
2023		2,272	29,787	47,240								
Apportionment Option 2: 5-Year Average												
2011		89,307	39,459	135,011								
2012												
2013				101,755								
2014		84,042		135,459								
2015		43,904	12,547	121,829								
2016	22,468	199,965	42,404	130,249		91,600	12,787					
2017	48,998	183,204	34,882	204,500	41,515	162,802			28,221	133,877		
2018	63,534	236,646	52,088	249,756	53,133	28,419						
2019	26,313	117,701	39,597	248,376		67,037	15,157					
2020	12,181	80,883	20,163	142,044				42,481				
2021	48,589	125,523	38,483	217,587	48,589	33,327	32,775	172,796	48,589			148,936
2022		18,381	15,107	55,312			138					
2023			29,787	66,304								
Apportionment Option 3: Pro Rata												
2011		89,307	39,459	135,011								
2012												
2013				101,755								
2014		84,042		135,459								
2015		43,904	15,877	121,829								
2016	22,468	199,965	42,404	130,249		91,600	12,787					
2017	49,998	183,204	40,749	204,500		162,802			28,221	133,877		
2018	63,534	236,646	52,088	249,756	41,515	28,419						
2019	26,313	100,774	39,597	248,376	53,133	67,037	15,157					
2020	12,181	80,883	20,163	142,044				42,481				
2021	48,589	125,523	43,980	217,587		33,327	32,775	172,796	48,589		10,914	148,936
2022		18,381	15,107	55,312	48,589		138					
2023			29,787	66,304								
Apportionment Option 4: AFA												
2011		7,379	39,459	196,087								
2012												
2013				125,947								
2014		38,220		135,459								
2015		5,176	15,877	121,829				59,215				
2016	17,433	165,915	42,404	157,984		39,607	12,787					
2017	48,998	162,802	40,749	204,500	41,515	133,877		26,033	28,221	2,225		
2018	63,534	218,962	52,088	272,819								
2019	13,261	82,845	39,597	291,563			15,157	36,895				
2020		53,883	20,163	142,044				93,157				
2021	48,589	125,523	43,980	242,240	48,589		32,775	172,796	2,286		22,968	148,936
2022		18,381	15,107	78,690			138					
2023			29,787	85,628								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 3-9 Estimates of forgone B season pollock harvest reported as a percentage reduction from the sector's total B season harvest as if the overall chum salmon PSC limits and sector appointments were in place from 2011–2023

Cap: 100,000					325,000				550,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011		35.7%	60.0%	39.6%								
2012												
2013				25.3%								
2014		31.4%		40.4%								
2015		23.4%	23.0%	35.1%								
2016	27.6%	78.1%	60.1%	36.8%		41.8%	18.1%			13.9%		
2017	65.0%	68.6%	61.3%	59.0%	55.0%	61.0%			55.0%	50.2%		
2018	83.3%	89.7%	77.9%	72.6%	75.5%	64.9%						
2019	33.6%	42.8%	58.2%	71.3%		24.4%	22.3%					
2020	24.8%	33.0%	30.1%	43.4%		7.9%		8.4%				
2021	63.3%	47.4%	66.0%	64.1%	63.3%	31.0%	49.2%	50.9%	63.3%		16.4%	
2022	0.0%	8.8%	28.2%	21.1%			0.3%					
2023		0.9%	47.7%	14.5%								
Apportionment Option 2: 5-Year Average												
2011		35.7%	60.0%	45.1%								
2012												
2013				30.8%								
2014		31.4%		40.4%								
2015		15.8%	18.1%	35.1%								
2016	27.6%	70.4%	60.1%	36.8%		32.2%	18.1%					
2017	65.0%	68.6%	52.5%	59.0%	55.0%	61.0%			37.4%	50.2%		
2018	83.3%	89.7%	77.9%	72.6%	69.6%	10.8%						
2019	33.6%	42.8%	58.2%	71.3%		24.4%	22.3%					
2020	19.3%	33.0%	30.1%	43.4%				13.0%				
2021	63.3%	47.4%	57.8%	64.1%	63.3%	12.6%	49.2%	50.9%	63.3%			43.9%
2022		8.8%	28.2%	21.1%			0.3%					
2023			47.7%	20.4%								
Apportionment Option 3: Pro Rata												
2011		35.7%	60.0%	45.1%								
2012												
2013				30.8%								
2014		31.4%		40.4%								
2015		15.8%	23.0%	35.1%								
2016	27.6%	70.4%	60.1%	36.8%		32.2%	18.1%					
2017	65.0%	68.6%	61.3%	59.0%	55.0%	61.0%			37.4%	50.2%		
2018	83.3%	89.7%	77.9%	72.6%	69.6%							
2019	33.6%	36.6%	58.2%	71.3%		24.4%	22.3%					
2020	19.3%	33.0%	30.1%	43.4%				13.0%				
2021	63.3%	47.4%	66.0%	64.1%	63.3%	12.6%	49.2%	50.9%	63.3%		16.4%	43.9%
2022		8.8%	28.2%	21.1%			0.3%					
2023			47.7%	20.4%								
Apportionment Option 4: AFA												
2011		3.0%	60.0%	65.5%								
2012												
2013				38.1%								
2014		14.3%		40.4%								
2015		1.9%	23.0%	35.1%				17.1%				
2016	21.4%	58.4%	60.1%	44.6%		13.9%	18.1%					
2017	65.0%	61.0%	61.3%	59.0%	55.0%	50.2%		7.5%	37.4%	0.8%		
2018	83.3%	83.0%	77.9%	79.3%								
2019	16.9%	30.1%	58.2%	83.7%			22.3%	10.6%				
2020		22.0%	30.1%	43.4%				28.5%				
2021	63.3%	47.4%	66.0%	71.3%	63.3%		49.2%	50.9%	3.0%		34.5%	43.9%
2022		8.8%	28.2%	30.0%			0.3%					
2023			47.7%	26.3%								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 3-10 Week-ending date of the statistical week when an overall chum salmon PSC limit of 75,000 fish and sector apportionments would have been met under Alternative 3, Option 1 from 2021–2023 without any changes in fishing behavior

Cap:	75,000			
Sector:	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average				
2021	10-Jul	31-Jul	17-Jul	10-Jul
2022	20-Aug	13-Aug	6-Aug	30-Jul
2023		26-Aug	19-Aug	19-Aug
Apportionment Option 2: 5-Year Average				
2021	10-Jul	31-Jul	17-Jul	10-Jul
2022	20-Aug	20-Aug	6-Aug	30-Jul
2023		2-Sep	19-Aug	19-Aug
Apportionment Option 3: Pro Rata				
2021	10-Jul	31-Jul	17-Jul	10-Jul
2022	20-Aug	20-Aug	6-Aug	30-Jul
2023		2-Sep	19-Aug	19-Aug
Apportionment Option 4: AFA				
2021	17-Jul	31-Jul	17-Jul	10-Jul
2022		20-Aug	6-Aug	23-Jul
2023			19-Aug	19-Aug

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate years when a sector did not meet the PSC limit and apportionment.

Table 3-11 Estimates of forgone B season pollock (mt) as if an overall chum salmon PSC limit of 75,000 fish and sector apportionments were in place from 2021–2023 under Alternative 3, Option 1 and those amounts as a percentage reduction of the sector's total B season harvest under status quo

	CDQ		CP		M		Inshore	
	Pollock (mt)	% of B Season	Pollock (mt)	% of B Season	Pollock (mt)	% of B Season	Pollock (mt)	% of B Season
Apportionment Option 1: 3-Year Average								
2021	59,756	77.9%	125,523	47.4	43,980	66.0%	242,240	71.3%
2022	579	0.9%	34,084	16.3%	15,107	28.2%	78,690	30.0%
2023			26,751	10.7%	33,315	53.4%	85,628	26.3%
Apportionment Option 2: 5-Year Average								
2021	59,756	77.9%	125,523	47.4%	43,980	66.0%	242,240	71.3%
2022	579	0.9%	18,381	8.8%	15,107	28.2%	78,690	30.0%
2023			13,570	5.4%	33,315	53.4%	85,628	26.3%
Apportionment Option 3: Pro Rata								
2021	59,756	77.9%	125,523	47.4%	43,980	66.0%	242,240	71.3%
2022	579	0.9%	18,381	8.8%	15,107	28.2%	78,690	8.8%
2023			13,570	5.4%	33,315	53.4%	85,628	5.4%
Apportionment Option 4: AFA								
2021	48,589	63.3%	125,523	47.4%	43,980	66.0%	242,240	71.3%
2022			18,381	8.8%	15,107	28.2%	104,821	39.9%
2023					33,315	53.4 %	85,628	26.3%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate years when a sector did not meet the PSC limit and apportionment.

3.2.1.1.3 Alternative 4

Alternative 4 would modify regulations implementing the salmon bycatch IPAs. These regulatory changes would require the IPAs to implement measures for chum and WAK chum salmon avoidance. The pollock fishery has managed its operations under the IPAs since 2010, and the fleet has operated under most of the provisions in Alternative 4 since 2022. For these reasons, the impact of Alternative 4 is expected to be neutral compared to the status quo.

3.2.1.1.4 Alternative 5

Alternative 5 would implement an inseason corridor with closure provisions. There are three different corridor options being considered (see Section 2.7) and they differ from one another based on the number and location of areas inside the corridor that would close to directed pollock fishing through August 31 and how the closure would be managed.

3.2.1.1.4.1 Option 1

Option 1 would close the entire inseason corridor (*i.e.*, all 40 stat areas) to a cooperative or sector that attained its apportionment of the corridor PSC limit from that date through August 31. This section provides historical information on the catch levels inside the corridor during the closure window of June 10 – August 31 (Table 3-12) as well as outside areas during the same period (Table 3-16). The catch levels that occurred in areas outside the corridor provide a sense of where sectors have historically fished and may target pollock in the future, either preemptively as a strategy to avoid the PSC limit or post-closure. The pollock catch (mt) that would have been displaced from the inseason corridor had a given PSC limit and apportionment combination been in place each year are also provided in Table 3-15.

The pollock sectors had variable fishing history inside the corridor from June 10 – August 31 (Table 3-12). However, the inshore sector depended heavily on the corridor, with an average of approximately 68% of its B season quota caught inside the corridor during the closure window (2011–2023). This is likely due to many factors including, where good aggregations of pollock to sustain fishing are found, vessel size and capacity, shoreside processor delivery requirements, among other factors. The mothership sector's fishing history inside the corridor during the closure window was somewhat similar. The CDQ and CP sectors were considerably less reliant upon the fishing grounds inside the corridor, averaging ~17% and ~21% respectively, although the 2016 and 2017 B seasons were notable exceptions for these sectors.

The retrospective analysis shows there were several years when sectors would not have met a given corridor PSC limit and apportionment combination regardless of the analyzed amount. An exception to this was the inshore sector which met a 50,000 chum salmon PSC limit in each year but 2012. At the upper end of the range, a corridor PSC limit of 350,000 chum salmon would have only constrained sectors in the years with the highest historical bycatch (2021, 2017, and 2016). The potential future impacts of Option 1 on the pollock stock in years the corridor PSC limit is not met are expected to be relatively neutral compared to the status quo.

If the corridor PSC limit were met under Option 1, vessels could continue fishing outside the inseason corridor prior to August 31. It is expected that vessels would do so if it is practicable for them during this window. To a large extent, any displaced harvest would occur within the historical footprint of the fishery, based upon the data presented in Table 3-16 which indicate all but the inshore sector would likely move to Cluster 4 and then Cluster 3 after the corridor closed (all other factors being equal). There may be some distributional changes in where inshore CVs would move to, given these vessels' high degree of reliance on the inseason corridor. This dynamic creates some uncertainty in where vessels would go and there is greater potential for effort to move to areas they otherwise would not target.

Even so, the directed pollock fishery is constrained by environmental conditions, regulations prohibiting directed pollock fishing in certain areas of the Bering Sea, operational capacity, among other factors. Fishing effort would be redistributed among areas outside that are available under status quo. For these reasons, Option 1 is not expected to result in adverse impacts on the pollock stock, despite the potential for redistribution of the fishery (spatially and temporally) in some years through August 31. If redistribution were to result in a shift away from the core fishing grounds such that the catches of pollock were noticeably different (*i.e.*, in size or age), these data would be incorporated into the stock assessment which forms the basis for harvest specification recommendations the following year. These data are available because the pollock fishery is extensively monitored such that catch size and age information are available at fine spatial and temporal scales (Ianelli et al., 2024)

Table 3-12 Each pollock sector's harvest (mt) inside the inseason corridor during the closure window, compared to the sector's total B season pollock harvest (mt), and the sector's corridor harvest as a percentage of its total harvest inside the corridor and B season, 2011–2023

Year	CDQ			CP			Mothership			Inshore			Total		
	Corridor	B Season	Corridor as % of B Season Total	Corridor	B Season	Corridor as % of B Season Total	Corridor	B Season	Corridor as % of B Season Total	Corridor	B Season	Corridor as % of B Season Total	Corridor	B Season	Corridor as % of B Season Total
2011	4,150	66,751	6.2%	8,164	253,195	3.2%	20,446	66,024	31.0%	165,885	303,666	54.6%	198,645	689,636	28.8%
2012	4,644	73,344	6.3%	27,669	254,261	10.9%	31,115	63,712	48.8%	125,961	318,507	39.5%	189,389	709,825	26.7%
2013	477	76,262	0.6%	14,143	266,551	5.3%	17,986	59,375	30.3%	197,691	332,546	59.4%	230,297	734,733	31.3%
2014	15,781	78,073	20.2%	28,210	270,487	10.4%	13,708	67,088	20.4%	231,996	338,419	68.6%	289,695	754,067	38.4%
2015	10,313	80,179	12.9%	30,371	280,428	10.8%	15,662	69,673	22.5%	265,035	352,795	75.1%	321,381	783,075	41.0%
2016	69,806	81,122	86.1%	141,563	287,781	49.2%	54,841	70,763	77.5%	302,246	355,794	84.9%	568,456	795,461	71.5%
2017	61,803	75,744	81.6%	141,238	271,358	52.0%	49,410	66,664	74.1%	305,018	348,656	87.5%	557,469	762,423	73.1%
2018	13,688	76,581	17.9%	38,319	266,933	14.4%	18,809	67,370	27.9%	271,690	347,858	78.1%	342,506	758,742	45.1%
2019	1,410	78,777	1.8%	23,305	280,616	8.3%	12,750	69,212	18.4%	255,268	352,830	72.3%	292,733	781,435	37.5%
2020		63,828	0.0%	6,157	250,079	2.5%	3,229	68,595	4.7%	131,828	333,723	39.5%	141,214	716,224	19.7%
2021	12,016	77,076	15.6%	11,594	267,181	4.3%	52,062	67,501	77.1%	258,001	341,748	75.5%	333,673	753,506	44.3%
2022	11,070	61,283	18.1%	77,004	210,331	36.6%	42,872	53,705	79.8%	251,526	263,595	95.4%	382,472	588,914	64.9%
2023	2,657	72,867	3.6%	19,073	250,956	7.6%	27,244	62,785	43.4%	186,238	327,041	56.9%	235,213	713,649	33.0%
Average	17,318	73,991	20.8%	43,601	262,320	16.6%	27,703	65,575	42.8%	226,799	332,091	68.3%	314,088	733,976	42.7%
Median	10,691	76,262	12.9%	27,669	266,933	10.4%	20,446	67,088	31.0%	251,526	338,419	72.3%	292,733	753,506	38.4%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: No pollock catch was observed for the CDQ sector inside the inseason corridor during the closure window of June 10 – August 31 in 2020.

Table 3-13 Week-ending date of the statistical week when the corridor chum salmon PSC limits and sector apportionments would have been met under Alternative 5 from 2011–2023 without any changes in fishing behavior

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Apportionment Option 1: 3-Year Average												
2011			2-Jul	9-Jul								
2012												
2013				27-Jul								
2014				2-Aug								
2015				15-Aug								
2016	16-Jul	2-Jul	30-Jul	30-Jul	13-Aug	6-Aug	13-Aug			27-Aug		
2017	8-Jul	8-Jul	15-Jul	8-Jul	15-Jul	15-Jul		19-Aug	15-Jul	22-Jul		
2018	30-Jun	30-Jun	30-Jun	30-Jun		21-Jul						
2019		27-Jul		29-Jun		31-Aug						
2020				22-Aug								
2021	10-Jul	31-Jul	17-Jul	10-Jul	17-Jul	31-Jul	31-Jul	31-Jul	17-Jul	31-Jul	31-Jul	7-Aug
2022		16-Jul	6-Aug	23-Jul		3-Sep	13-Aug					
2023				19-Aug								
Apportionment Option 2: 5-Year Average												
2011			25-Jun	9-Jul								
2012												
2013				27-Jul								
2014				2-Aug								
2015				15-Aug								
2016	9-Jul	2-Jul	23-Jul	30-Jul	6-Aug	6-Aug	6-Aug			27-Aug		
2017	8-Jul	8-Jul	15-Jul	8-Jul	8-Jul	22-Jul		19-Aug	15-Jul	22-Jul		
2018	30-Jun	30-Jun	30-Jun	30-Jun	21-Jul	21-Jul						
2019		27-Jul		29-Jun								
2020				22-Aug								
2021	10-Jul	31-Jul	10-Jul	10-Jul	17-Jul	31-Jul	31-Jul	31-Jul	17-Jul	31-Jul	31-Jul	7-Aug
2022		23-Jul	6-Aug	23-Jul			13-Aug					
2023				19-Aug								
Apportionment Option 3: Pro Rata												
2011			2-Jul	2-Jul								
2012												
2013				27-Jul								
2014				26-Jul								
2015				8-Aug								
2016	16-Jul	9-Jul	30-Jul	30-Jul		27-Aug	13-Aug			27-Aug		
2017	8-Jul	8-Jul	15-Jul	8-Jul	15-Jul	22-Jul		5-Aug	15-Jul	22-Jul		
2018	30-Jun	30-Jun	30-Jun	30-Jun				1-Sep				
2019		27-Jul		29-Jun								
2020				15-Aug								
2021	10-Jul	31-Jul	10-Jul	10-Jul	17-Jul	31-Jul	31-Jul	31-Jul	17-Jul		31-Jul	31-Jul
2022		27-Aug	6-Aug	23-Jul			13-Aug	3-Sep				
2023				19-Aug								
Apportionment Option 4: AFA												
2011			25-Jun	25-Jun								
2012												
2013				13-Jul								
2014				26-Jul				16-Aug				
2015				8-Aug				22-Aug				
2016	16-Jul	16-Jul	23-Jul	23-Jul		3-Sep	13-Aug	13-Aug				
2017	8-Jul	15-Jul	15-Jul	8-Jul	15-Jul	22-Jul		22-Jul	15-Jul	5-Aug		
2018	30-Jun	14-Jul	30-Jun	30-Jun				28-Jul				
2019		31-Aug		22-Jun				31-Aug				
2020				15-Aug								
2021	10-Jul	31-Jul	10-Jul	3-Jul	17-Jul		31-Jul	24-Jul	17-Jul		31-Jul	31-Jul
2022		3-Sep	6-Aug	23-Jul			13-Aug	13-Aug				
2023				12-Aug								

Table 3-14 Estimates of pollock catch (mt) displaced from the inseason corridor as if the overall chum salmon PSC limits and sector apportionments were in place from 2011–2023 under Alternative 5, Option 1

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011			9,942	75,319								
2012												
2013				73,225								
2014				45,615								
2015				46,849								
2016	36,945	111,727	26,528	105,553	5,164	53,364	14,964			16,937		
2017	36,323	90,327	23,539	190,511	28,840	77,471		30,902	28,840	64,431		
2018	5,650	32,380	9,072	200,972		7,173						
2019		7,211		203,617		0						
2020				13,130								
2021	10,729	3,139	34,362	165,052	407	3,139	23,157	96,597	407	3,139	23,157	77,463
2022		19,687	4,288	93,848		0	805					
2023				16,642								
Apportionment Option 2: 5-Year Average												
2011			12,559	75,319								
2012												
2013				73,225								
2014				45,615								
2015				46,849								
2016	46,559	111,727	31,892	105,553	7,415	53,364	22,330			16,937		
2017	36,323	90,327	23,539	190,511	36,323	64,431		30,902	28,840	64,431		
2018	5,650	32,380	9,072	200,972	395	7,173						
2019		7,211		203,617								
2020				13,130								
2021	10,729	3,139	38,882	165,052	407	3,139	23,157	96,597	407	3,139	23,157	77,463
2022		7,142	4,288	93,848			805					
2023				16,642								
Apportionment Option 3: Pro Rata												
2011			9,942	87,972								
2012												
2013				73,225								
2014				66,942								
2015				64,820								
2016	36,945	95,647	26,528	105,553		16,937	14,964			16,937		
2017	36,323	90,327	23,539	190,511	28,840	64,431		82,833	28,840	64,431		
2018	5,650	32,380	9,072	200,972				0				
2019		7,211		203,617								
2020				31,510								
2021	10,729	3,139	38,882	165,052	407	3,139	23,157	96,597	407		23,157	96,597
2022		3,366	4,288	93,848			805	0				
2023				16,642								
Apportionment Option 4: AFA												
2011			12,559	104,448								
2012												
2013				120,773								
2014				66,942				24,192				
2015				64,820				25,379				
2016	36,945	73,873	31,892	131,385		0	14,964	54,542				
2017	36,323	77,471	23,539	190,511	28,840	64,431		137,470	28,840	34,068		
2018	5,650	11,438	9,072	200,972				111,558				
2019		0		219,107								
2020				31,510								
2021	10,729	3,139	38,882	189,709	407		23,157	117,616	407		23,157	96,597
2022		0	4,288	93,848			805	27,304				
2023				25,244								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 3-15 Estimates of the displaced pollock catch (mt) under Alternative 5, Option 1 reported in Table 3-14 as a percentage of the sector's total pollock catch (mt) inside the corridor from June 10 – August 31, 2011–2023

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011			48.8%	46.0%								
2012												
2013				37.2%								
2014				19.8%								
2015				18.0%								
2016	52.6%	79.4%	48.5%	35.1%	7.3%	37.9%	27.3%			12.0%		
2017	59.0%	64.7%	47.8%	62.7%	46.9%	55.5%		10.2%	46.9%	46.1%		
2018	41.4%	85.7%	49.0%	74.9%		19.0%						
2019		32.1%		80.3%		0.0%						
2020				10.2%								
2021	89.5%	27.4%	67.1%	64.2%	3.4%	27.4%	45.2%	37.6%	3.4%	27.4%	45.2%	30.1%
2022		25.5%	10.0%	37.4%			1.9%					
2023				9.0%								
Apportionment Option 2: 5-Year Average												
2011			61.7%	46.0%								
2012												
2013				37.2%								
2014				19.8%								
2015				18.0%								
2016	66.3%	79.4%	58.3%	35.1%	10.6%	37.9%	40.8%			12.0%		
2017	59.0%	64.7%	47.8%	62.7%	59.0%	46.1%		10.2%	46.9%	46.1%		
2018	41.4%	85.7%	49.0%	74.9%	2.9%	19.0%						
2019		32.1%		80.3%		0.0%						
2020				10.2%								
2021	89.5%	27.4%	76.0%	64.2%	3.4%	27.4%	45.2%	37.6%	3.4%	27.4%	45.2%	30.1%
2022		9.3%	10.0%	37.4%			1.9%					
2023				9.0%								
Apportionment Option 3: Pro Rata												
2011			48.8%	53.7%								
2012												
2013				37.2%								
2014				29.1%								
2015				24.9%								
2016	52.6%	68.0%	48.5%	35.1%		12.0%	27.3%			12.0%		
2017	59.0%	64.7%	47.8%	62.7%	46.9%	46.1%		27.3%	46.9%	46.1%		
2018	41.4%	85.7%	49.0%	74.9%				0.0%				
2019		32.1%		80.3%								
2020				24.5%								
2021	89.5%	27.4%	76.0%	64.2%	3.4%	27.4%	45.2%	37.6%	3.4%		45.2%	37.6%
2022		4.4%	10.0%	37.4%			1.9%	0.0%				
2023				9.0%								
Apportionment Option 4: AFA												
2011			61.7%	63.8%								
2012												
2013				61.4%								
2014				29.1%				10.5%				
2015				24.9%				9.7%				
2016	52.6%	52.5%	58.3%	43.7%	0.0%	0.0%	27.3%	18.1%				
2017	59.0%	55.5%	47.8%	62.7%	46.9%	46.1%		45.3%	46.9%	24.4%		
2018	41.4%	30.3%	49.0%	74.9%				41.6%				
2019		0.0%		86.4%								
2020				24.5%								
2021	89.5%	27.4%	76.0%	73.8%	3.4%		45.2%	45.7%	3.4%		45.2%	37.6%
2022		0.0%	10.0%	37.4%			1.9%	10.9%				
2023				13.6%								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 3-16 Proportion of each sector's pollock catch harvested during the closure window of June 10 – August 31 inside the inseason corridor compared to the proportion harvested inside genetic cluster 3 and 4 during the same period, 2011–2023

Year	CDQ			CP			Mothership			Inshore		
	Corridor	Cluster 3	Cluster 4	Corridor	Cluster 3	Cluster 4	Corridor	Cluster 3	Cluster 4	Corridor	Cluster 3	Cluster 4
2011	8.4%	39.2%	52.4%	4.8%	34.0%	61.2%	44.6%	38.8%	16.6%	72.4%	21.6%	5.5%
2012	7.1%	21.3%	71.6%	12.3%	31.1%	56.6%	51.1%	16.1%	32.8%	49.3%	18.1%	32.4%
2013	0.7%	59.9%	39.4%	6.4%	26.2%	67.4%	32.1%	21.8%	46.1%	70.4%	14.0%	15.4%
2014	20.7%	16.6%	62.6%	12.0%	25.0%	63.0%	23.6%	17.7%	58.8%	79.2%	13.5%	7.0%
2015	13.5%	29.6%	56.9%	12.6%	32.4%	55.0%	28.7%	45.4%	25.9%	95.5%	4.5%	0.0%
2016	90.1%	5.4%	4.5%	60.0%	31.6%	8.3%	100.0%	0.0%	0.0%	99.5%	0.0%	0.0%
2017	85.4%	11.2%	3.4%	55.6%	30.2%	14.2%	81.7%	0.0%	18.3%	99.8%	0.0%	0.0%
2018	24.6%	16.2%	59.2%	16.2%	23.1%	60.6%	30.8%	19.4%	49.8%	93.3%	1.5%	4.6%
2019	4.1%	8.8%	87.1%	11.0%	17.6%	71.3%	26.4%	36.8%	36.9%	92.9%	6.8%	0.3%
2020	0.0%	1.9%	98.1%	3.3%	7.2%	89.5%	8.7%	29.0%	62.3%	64.5%	31.4%	3.8%
2021	18.5%	33.1%	48.4%	5.2%	42.1%	52.7%	90.0%	6.2%	3.8%	95.2%	1.9%	2.1%
2022	18.2%	81.5%	0.3%	37.3%	53.4%	9.3%	82.5%	3.9%	13.7%	98.9%	1.0%	0.0%
2023	3.7%	26.2%	70.1%	8.2%	42.7%	49.1%	80.7%	0.0%	19.2%	68.4%	7.2%	24.3%
Average	22.7%	27.0%	50.3%	18.9%	30.5%	50.6%	52.4%	18.1%	29.5%	83.0%	9.4%	7.3%
Median	13.5%	21.3%	56.9%	12.0%	31.1%	56.6%	44.6%	17.7%	25.9%	92.9%	6.8%	3.8%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.2.1.1.4.2 Suboption 1

Suboption 1 would close 29 stat areas inside the corridor to a cooperative or sector that attained its corridor PSC limit from that date through August 31 in any given year. The remaining 11 stat areas inside the corridor would be exempt from closure, and vessels impacted by the closure could continue fishing outside the corridor and/or in these 11 exempted areas.

Table 3-17 compares the sum of each sector's pollock catch inside the 11 stat areas that would be exempted from closure to its harvest inside the entire corridor (40 of 40 stat areas) during the closure window. As shown, there were several years when the CDQ sector did not target pollock inside these 11 stat areas. CPs harvested small amounts of pollock inside some of the exempted areas in each year except 2019. The trends for the CV sectors were different. Across all years, on average, ~49% of the pollock harvested inside the corridor by the mothership sector occurred inside the 11 stat areas that would be exempted with a maximum of ~99% in 2020. On average, ~53% of the pollock that the inshore sector harvested inside the corridor occurred within these 11 stat areas with a maximum of ~86% in 2019 (2011–2023). This data indicates the CV sectors were typically concentrated inside these 11 areas.

Table 3-18 provides estimates of the pollock catch that would have been displaced from the 29 stat areas that would close under Suboption 1, as if the analyzed PSC limits and appointments were from 2011–2023 and no changes in fishing behavior occurred. Table 3-19 shows these estimates as a percentage of a sector's total corridor harvest (40 stat areas) during the closure window. Table 3-20 provides the amount of pollock displaced under Suboption 1 as a percentage reduction from the catch displaced under Option 1. Specific to Table 3-20, a 0.0% reduction indicates years when that sector did not fish inside the 11 exempt stat areas after the closure would have occurred. In these cases, Suboption 1 would not have reduced the percentage of pollock displaced compared to Option 1. Values greater than 0.0% indicate the proportional reduction in the catch displaced under Suboption 1 compared to Option 1. A 100.0% reduction indicates all of a sector's catch occurred inside the 11 exempt stat areas after a closure would have occurred. In these cases, no pollock catch would have been displaced and so it represents the status quo as it is a total reduction (100.0%) from the amount displaced under Option 1.

If the inseason corridor chum salmon PSC limit is met, fishing effort would be redistributed among the historical footprint of the pollock fishery during the B season (similar to Option 1). This distribution is expected to reflect what has occurred during the analyzed period. Since vessels impacted by a corridor closure would be allowed to fish inside the 11 exempt stat areas through August 31, the analysis expects they would do so if it provided a benefit. Based upon historical data, the inshore and mothership sectors would likely fish inside the 11 exempted stat areas to some degree if they triggered a closure under Suboption 1. While it is not clear that these 11 stat areas would have the CPUE to account for all of the displaced catch, it would increase that likelihood that the full B season TAC would be harvested. This would result in impacts similar to the status quo for the pollock stock.

The purpose of Table 3-20 is to provide a comparison of the amount of pollock catch displaced from a corridor closure options, which in general “scales back” the estimated impact on displaced pollock catch. As shown in that table, there were several years when no pollock catch would have been displaced under Suboption 1 because a sector had only fished inside the 11 exempted stat areas, or the amounts displaced represented an impact that would be close to neutral. For instance, the percentage reductions for the inshore sector under a corridor PSC limit of 50,000 chum salmon were greater than 70.0% in 7 of the 12 years the sector would have met the PSC limit. However, in some scenarios, there was still a large amount of pollock displaced, such as 2017 and 2021 across all sectors.

Thus, the impact of Suboption 1 on the eastern Bering Sea pollock stock is expected to be relatively neutral compared to the status quo despite the potential for some redistribution of the fishery in some years through August 31, and the risk of creating unintended negative consequences is expected to be less than Option 1.

Table 3-17 Each sector's catch (mt) inside the 11 stat areas exempt from closure under Alternative 5, Suboption 1 during the closure window, pollock catch (mt) inside the inseason corridor during the closure window, total B season catch (mt), and the sector's pollock catch inside the 11 exempted stat areas as a percentage of its total inside the corridor and B season, 2011–2023

	CDQ					CP				
	11 Areas	Corridor	B Season	11 Areas as % of Corridor Total	11 Areas as % of B Season Total	11 Areas	Corridor	B Season	11 Areas as % of Corridor Total	11 Areas as % of B Season Total
2011	1,400	4,150	66,751	33.70%	2.10%	3,662	8,164	253,195	44.86%	1.45%
2012	2,425	4,644	73,344	52.20%	3.31%	6,206	27,669	254,261	22.43%	2.44%
2013		477	76,262	0.00%	0.00%	1,332	14,143	266,551	9.42%	0.50%
2014	10,705	15,781	78,073	67.80%	13.71%	4,115	28,210	270,487	14.59%	1.52%
2015	851	10,313	80,179	8.20%	1.06%	97	30,371	280,428	0.32%	0.03%
2016	35,315	69,806	81,122	50.60%	43.53%	26,444	141,563	287,781	18.68%	9.19%
2017	11,390	61,803	75,744	18.40%	15.04%	3,320	141,238	271,358	2.35%	1.22%
2018	2,394	13,688	76,581	17.50%	3.13%	8,554	38,319	266,933	22.32%	3.20%
2019		1,410	78,777	0.00%	0.00%		23,305	280,616	0.00%	0.00%
2020			63,828			8	6,157	250,079	0.13%	0.003%
2021	340	12,016	77,076	2.80%	0.44%	12	11,594	267,181	0.10%	0.004%
2022	351	11,070	61,283	3.20%	0.57%	1,282	77,004	210,331	1.66%	0.61%
2023		2,657	72,867	0.00%	0.00%	371	19,073	250,956	1.95%	0.15%
Average	7,241	17,318	73,991	21.20%	6.91%	4,617	43,601	262,320	10.68%	1.56%
Median	2,394	10,691	76,262	12.85%	1.58%	2,326	27,669	266,933	2.35%	0.61%

	Mothership					Inshore				
	11 Areas	Corridor	B Season	11 Areas as % of Corridor Total	11 Areas as % of B Season Total	11 Areas	Corridor	B Season	11 Areas as % of Corridor Total	11 Areas as % of B Season Total
2011	3,394	20,446	66,024	16.60%	5.14%	60,376	165,885	303,666	36.40%	19.88%
2012	6,518	31,115	63,712	20.90%	10.23%	51,978	125,961	318,507	41.30%	16.32%
2013	5,505	17,986	59,375	30.60%	9.27%	29,142	197,691	332,546	14.70%	8.76%
2014	1,655	13,708	67,088	12.10%	2.47%	109,212	231,996	338,419	47.10%	32.27%
2015	7,407	15,662	69,673	47.30%	10.63%	197,638	265,035	352,795	74.60%	56.02%
2016	26,207	54,841	70,763	47.80%	37.03%	212,099	302,246	355,794	70.20%	59.61%
2017	28,702	49,410	66,664	58.10%	43.05%	171,665	305,018	348,656	56.30%	49.24%
2018	5,899	18,809	67,370	31.40%	8.76%	168,047	271,690	347,858	61.90%	48.31%
2019	9,372	12,750	69,212	73.50%	13.54%	218,693	255,268	352,830	85.70%	61.98%
2020	3,183	3,229	68,595	98.60%	4.64%	85,094	131,828	333,723	64.50%	25.50%
2021	31,675	52,062	67,501	60.80%	46.93%	133,520	258,001	341,748	51.80%	39.07%
2022	18,817	42,872	53,705	43.90%	35.04%	112,426	251,526	263,595	44.70%	42.65%
2023	25,653	27,244	62,785	94.20%	40.86%	81,876	186,238	327,041	44.00%	25.04%
Average	13,384	27,703	65,575	48.90%	20.58%	125,520	226,799	332,091	53.30%	37.28%
Median	7,407	20,446	67,088	47.30%	10.63%	112,426	251,526	338,419	51.80%	39.07%

Notes: Cells without a value indicate a sector did not have recorded catch inside the 11 exempted stat areas. Cells with "0.0%" indicate the sector harvested pollock inside the corridor during the closure window but not inside the 11 exempted stat areas.

Table 3-18 Estimates of pollock catch (mt) displaced from 29 stat areas inside the inseason corridor as if the overall chum salmon PSC limits and sector apportionments were in place from 2011–2023 under Alternative 5, Suboption 1

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011			6,777	51,269								
2012												
2013				62,047								
2014				19,309								
2015				10,559								
2016	11,704	86,654	9,503	8,763		50,769	6,452			16,937		
2017	25,529	89,749	632	43,374	18,099	76,892		1,765	18,099	63,853		
2018	3,607	24,098	4,154	53,475		7,173						
2019		7,211		14,176								
2020				100								
2021	10,729	3,139	15,901	81,988	407	3,139	13,059	52,235	407	3,139	13,059	39,837
2022		19,024	3,483	28,154								
2023				8,682								
Apportionment Option 2: 5-Year Average												
2011			9,175	51,269								
2012												
2013				62,047								
2014				19,309								
2015				10,559								
2016	14,175	86,654	12,626	8,763	362	50,769	8,287			16,937		
2017	25,529	89,749	632	43,374	25,529	63,853		1,765	18,099	63,853		
2018	3,607	24,098	4,154	53,475	395	7,173						
2019		7,211		14,176								
2020				100								
2021	10,729	3,139	18,257	81,988	407	3,139	13,059	52,235	407	3,139	13,059	39,837
2022		7,044	3,483	28,154								
2023				8,682								
Apportionment Option 3: Pro Rata												
2011			6,777	54,546								
2012												
2013				62,047								
2014				34,617								
2015				14,536								
2016	11,704	73,730	9,503	8,763		16,937	6,452		0	16,937		
2017	25,529	89,749	632	43,374	18,099	63,853		9,532	18,099	63,853		
2018	3,607	24,098	4,154	53,475								
2019		7,211		14,176								
2020				3,679								
2021	10,729	3,139	18,257	81,988	407	3,139	13,059	52,235	407		13,059	52,235
2022		3,366	3,483	28,154								
2023				8,682								
Apportionment Option 4: AFA												
2011			9,175	58,263								
2012												
2013				103,784								
2014				34,617				4,003				
2015				14,536				2,110				
2016	11,704	62,042	12,626	16,711			6,452	3,643				
2017	25,529	76,892	632	43,374	18,099	63,853		29,522	18,099	33,490		
2018	3,607	11,438	4,154	53,475				16,503				
2019				20,182								
2020				3,679								
2021	10,729	3,139	18,257	83,324	407		13,059	62,859	407		13,059	52,235
2022			3,483	28,154				556				
2023				12,778								

Table 3-19 Estimates of the displaced pollock catch (mt) from 29 stat areas inside the inseason corridor under Alternative 5, Suboption 1 reported in Table 3-18 as a percentage of the sector's total catch inside the corridor from June 10 – August 31, 2011–2023

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011			33.3%	31.3%								
2012												
2013				31.6%								
2014				8.4%								
2015				4.1%								
2016	16.7%	61.6%	17.4%	2.9%		36.1%	11.8%			12.0%		
2017	41.5%	64.3%	1.3%	14.3%	29.4%	55.1%		0.6%	29.4%	45.7%		
2018	26.5%	63.8%	22.4%	19.9%		19.0%						
2019		32.1%		5.6%								
2020				0.1%								
2021	89.5%	27.4%	31.1%	32.0%	3.4%	27.4%	25.5%	20.4%	3.4%	27.4%	25.5%	15.6%
2022		24.7%	8.2%	11.2%								
2023				4.7%								
Apportionment Option 2: 5-Year Average												
2011			45.1%	31.3%								
2012												
2013				31.6%								
2014				8.4%								
2015				4.1%								
2016	20.2%	61.6%	23.1%	2.9%	0.5%	36.1%	15.1%			12.0%		
2017	41.5%	64.3%	1.3%	14.3%	41.5%	45.7%		0.6%	29.4%	45.7%		
2018	26.5%	63.8%	22.4%	19.9%	2.9%	19.0%						
2019		32.1%		5.6%								
2020				0.1%								
2021	89.5%	27.4%	35.7%	32.0%	3.4%	27.4%	25.5%	20.4%	3.4%	27.4%	25.5%	15.6%
2022		9.1%	8.2%	11.2%								
2023				4.7%								
Apportionment Option 3: Pro Rata												
2011			33.3%	33.3%								
2012												
2013				31.6%								
2014				15.1%								
2015				5.6%								
2016	16.7%	52.4%	17.4%	2.9%		12.0%	11.8%		0.0%	12.0%		
2017	41.5%	64.3%	1.3%	14.3%	29.4%	45.7%		3.1%	29.4%	45.7%		
2018	26.5%	63.8%	22.4%	19.9%								
2019		32.1%		5.6%								
2020				2.9%								
2021	89.5%	27.4%	35.7%	32.0%	3.4%	27.4%	25.5%	20.4%	3.4%		25.5%	20.4%
2022		4.4%	8.2%	11.2%								
2023				4.7%								
Apportionment Option 4: AFA												
2011			45.1%	35.6%								
2012												
2013				52.8%								
2014				15.1%				1.7%				
2015				5.6%				0.8%				
2016	16.7%	44.1%	23.1%	5.6%			11.8%	1.2%				
2017	41.5%	55.1%	1.3%	14.3%	29.4%	45.7%		9.7%	29.4%	24.0%		
2018	26.5%	30.3%	22.4%	19.9%				6.2%				
2019				8.0%								
2020				2.9%								
2021	89.5%	27.4%	35.7%	32.5%	3.4%		25.5%	24.5%	3.4%		25.5%	20.4%
2022			8.2%	11.2%				0.2%				
2023				6.9%								

Table 3-20 Estimates of the displaced pollock catch (mt) under Alternative 5, Suboption 1 reported in Table 3-18 as a percentage reduction from the amount displaced under Alternative 5, Option 1 reported Table 3-14, 2011–2023

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011			31.8%	31.9%								
2012												
2013				15.3%								
2014				57.7%								
2015				77.5%								
2016	68.3%	22.4%	64.2%	91.7%	100.0%	4.9%	56.9%			0.0%		
2017	29.7%	0.6%	97.3%	77.2%	37.2%	0.7%		94.3%	37.2%	0.9%		
2018	36.2%	25.6%	54.2%	73.4%		0.0%						
2019		0.0%		93.0%								
2020				99.2%								
2021	0.0%	0.0%	53.7%	50.3%	0.0%	0.0%	43.6%	45.9%	0.0%	0.0%	43.6%	48.6%
2022		3.4%	18.8%	70.0%			100.0%					
2023				47.8%								
Apportionment Option 2: 5-Year Average												
2011			26.9%	31.9%								
2012												
2013				15.3%								
2014				57.7%								
2015				77.5%								
2016	69.6%	22.4%	60.4%	91.7%	95.1%	4.9%	62.9			0.0%		
2017	29.7%	0.6%	97.3%	77.2%	29.7%	0.9%		94.3%	37.2%	0.9%		
2018	36.2%	25.6%	54.2%	73.4%	0.0%	0.0%						
2019		0.0%		93.0%								
2020				99.2%								
2021	0.0%	0.0%	53.0%	50.3%	0.0%	0.0%	43.6%	45.9%	0.0%	0.0%	43.6%	48.6%
2022		1.4%	18.8%	70.0%			100.0%					
2023				47.8%								
Apportionment Option 3: Pro Rata												
2011			31.8%	38.0%								
2012												
2013				15.3%								
2014				48.3%								
2015				77.6%								
2016	68.3%	22.9%	64.2%	91.7%		0.0%	56.9%			0.0%		
2017	29.7%	0.6%	97.3%	77.2%	37.2%	0.9%		88.5%	37.2%	0.9%		
2018	36.2%	25.6%	54.2%	73.4%								
2019		0.0%		93.0%								
2020				88.3%								
2021	0.0%	0.0%	53.0%	50.3%	0.0%	0.0%	43.6%	45.9%	0.0%		43.6%	45.9%
2022		0.0%	18.8%	70.0%			100.0%					
2023				47.8%								
Apportionment Option 4: AFA												
2011			26.9%	44.2%								
2012												
2013				14.1%								
2014				48.3%				83.5%				
2015				77.6%				91.7%				
2016	68.3%	16.0%	60.4%	87.3%			56.9%	93.3%				
2017	29.7%	0.7%	97.3%	77.2%	37.2%	0.9%		78.5%	37.2%	1.7%		
2018	36.2%	0.0%	54.2%	73.4%				85.2%				
2019				90.8%								
2020				88.3%								
2021	0.0%	0.0%	53.0%	56.1%	0.0%		43.6%	46.6%	0.0%		43.6%	45.9%
2022			18.8%	70.0%			100.0%	98.0%				
2023				49.4%								

3.2.1.1.4.3 Option 2

Option 2 would allow the IPAs to select 19 to 29 stat areas inside the corridor to close through August 31 if the corridor chum salmon PSC limit were met. The stat areas that would be in effect at the time of implementation are at present unknown and the exact areas selected could change year-to-year but not inseason. The IPAs would be required to select stat areas based on historical pollock CPUE, chum salmon bycatch, and relevant genetic data.

If the IPAs select the same 29 stat areas to close as Suboption 1, the impacts of Option 2 would be the same as Suboption 1. Compared to either Option 1 or Suboption 1, Option 2 provides the most operational flexibility and may be the least likely among the inseason corridor options to displace a substantial amount of fishing effort post closure. During the analyzed period, the pollock harvests inside the corridor (all 40 stat areas) during the closure window were typically greater than what occurred outside the corridor in the same period. However, Figure 3-7 shows the distribution of the fishery among corridor stat areas was highly varied based on the most recent five year average (2019–2023).

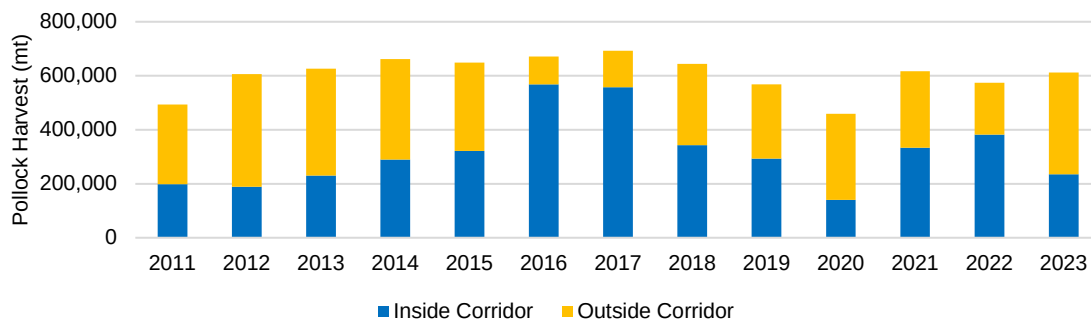


Figure 3-6 Amount of pollock harvested (mt) inside (blue) and outside (yellow) the inseason corridor from June 10 – August 31, 2011–2023

Source: NMFS Alaska Region CAS.

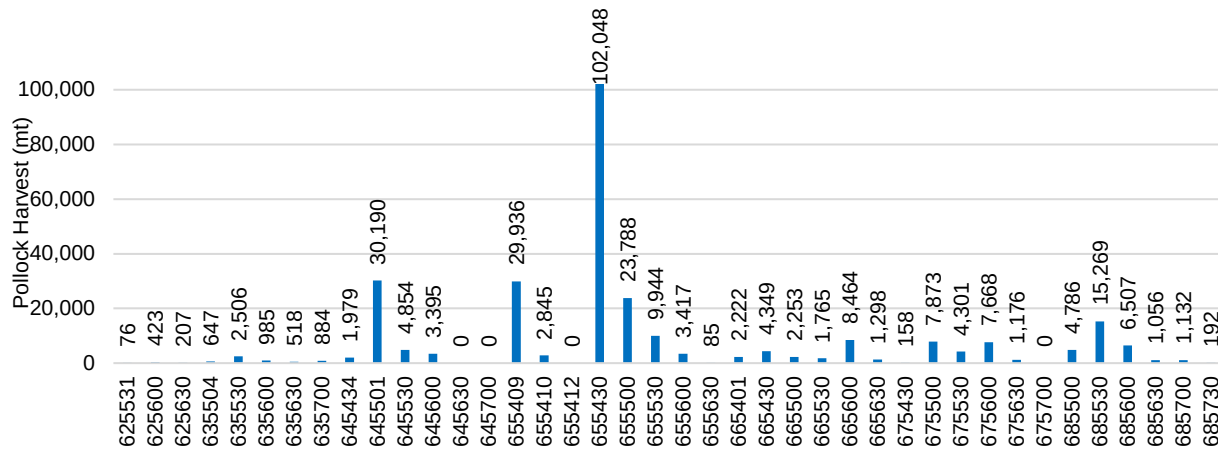


Figure 3-7 Average amount of pollock harvested (mt) inside each inseason corridor stat area, 2019–2023

Source: NMFS Alaska Region CAS.

If Option 2 were implemented, it is expected the IPAs would select stat areas to close while balancing tradeoffs like moving vessels away from stat areas with historically high pollock CPUE which would slow the pace of the fishery. Slowing the B season could result in economic inefficiencies as well as risking increased Chinook salmon PSC (see also Section 3.4.1 and the corresponding subsections). If the IPAs are able to prioritize stat areas with historically good pollock CPUE, vessels would likely stay in these areas after the corridor PSC limit were met (all other factors being equal). Although the exact stat areas (both number and location within the corridor) that the IPAs would select to close are unknown, the

impacts of Option 2 to the pollock stock are expected to be close to neutral. The stock is expected to continue to sustain itself regardless of any minor modifications in the stock distribution as a result of the fishery.

3.2.1.1.4.4 Option 3

Option 3 would include an abundance-based threshold that would suspend the inseason corridor and closure provisions in a B season following high chum salmon returns to WAK river systems (see Section 2.7.5). Section 3.3.4.6.6 provides an assessment of when the corridor and closure provisions would not have applied retrospectively (2011–2023) which is not repeated here. Including Option 3 as an element of Alternative 5 would reduce the potential impacts of the alternative on the pollock stock in years when summer and fall chum salmon returns to the Yukon River are above index thresholds. This applies to all three inseason corridor options as Option 3 may be selected in conjunction with any of them.

3.2.1.1.4.5 Option 4

Option 4 would modify the start date of the Winter HSA from September 1 to September 30 for the pollock fishery (see Section 2.7.7). The potential effects of Option 4 on the pollock stock would result from allowing directed fishing for pollock with trawl gear to continue inside the Winter HSA throughout the month of September, *if the pollock fishery had attained its apportionment of the herring PSC limit*. Directed fishing may otherwise occur inside the Winter HSA in September. Since the HSAs were implemented in 1991, the pollock fishery has been subject to five closures, three of which have occurred since 2011 (Table 3-21).

During the analyzed period, the pollock fleet had variable fishing history inside the Winter HSA during the month of September, but the harvested amounts were typically a low proportion of the total pollock harvested during the B season and/or the month of September in all other areas (Table 3-22). If Option 4 was included as an element of Alternative 5, it is not expected that allowing directed fishing for pollock to continue inside the Winter HSA throughout the month of September would have adverse consequences for the pollock stock. This is because, since 1994, directed fishing for pollock inside the Winter HSA has only been prohibited once in the month of September during the 2020 B season (Table 3-21). Option 4 would essentially allow the status quo distributions of the pollock fishery to continue, if the herring PSC limit is met.

Table 3-21 Herring Savings Area closures that applied to the midwater trawl pollock fishery, 1991–2024

Year	Closure Area	Closed Period
2020	Summer HSA2 closed	June 15 - July 1, 2020
2020	Winter HSA closed	September 1, 2020 - March 1, 2021
2012	Winter HSA closed	October 1, 2012 - March 1, 2013
1994	Winter HSA closed	November 14, 1994 - March 1994
1991	Winter HSA closed	September 21, 1991 - March 1, 1992

Table 3-22 Comparison of the Bering Sea pollock fishery's B season pollock catch (mt) to the amount of catch (mt) that occurred in the month of September (all fishing grounds) and the amount of catch (mt) harvested in September inside the Winter HSA, 2011–2023

Year	Total B Season Pollock Catch (mt)	Pollock Catch (mt) in September	September Pollock Catch (mt) in Winter HSA	Winter HSA as % of B Season Total	Winter HSA as % of September Total
2011	689,636	104,544	8,806	1.3%	8.4%
2012	709,825	77,257	372	0.1%	0.5%
2013	734,733	89,332	6,765	0.9%	7.6%
2014	754,067	90,258	624	0.1%	0.7%
2015	783,075	118,092	1,284	0.2%	1.1%
2016	795,461	114,350		0.0%	0.0%
2017	762,423	61,953	193	0.0%	0.3%
2018	758,742	110,504	4,329	0.6%	3.9%
2019	781,435	163,722	1,771	0.2%	1.1%
2020	716,224	155,836		0.0%	0.0%
2021	753,506	108,380	1,992	0.3%	1.8%
2022	588,914	14,222	652	0.1%	4.6%
2023	713,649	78,197		0.0%	0.0%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate pollock catch was not observed inside the Winter HSA in September of the given year.

3.2.1.2 Combined Effects of Environmental Trends and Planned Actions on Pollock

Past and present human action impacting EBS pollock have been highlighted in documents incorporated by reference including Chapter 4 and 5 of the Harvest Specifications EIS, the 2024 EBS pollock SAFE, and AFA Program Review (NMFS, 2007; NPFMC, 2025; Ianelli, 2024), some of which are summarized in Section 3.2.1. In particular, past and present human actions include the annual harvest specifications process, the allowance of the directed and incidental take of pollock, the implementation of AFA and associated rules and restrictions, and the assignment of seasonal apportionments. The reasonably foreseeable environmental trends and planned actions that may have an impact with the proposed actions include authorization and prosecution of the Bering Sea pollock fishery and ecosystem change, described at the beginning of Chapter 3.

Environmental Trends and Planned Actions

This section is based on the assumption that the pollock fishery and associated management structure, as well as ecosystem change impacts, would continue. The proposed action alternatives are not anticipated to substantially redistribute fishing effort in time or space outside of the range of what is possible under Alternative 1. It is possible that under a chum salmon PSC limit (Alternative 2 or 3) or potentially under a Cluster 1 corridor cap (Alternative 5) some amount of pollock TAC may be left unharvested relative to no action. However, annual harvest specifications limit each year's harvest within sustainable bounds and total removals are accounted for each year in the stock assessment. The overall optimum yield limits on harvests in the BSAI constrain harvest of all species. Each year, OFLs, ABCs, and TACs are specified for two years at a time, as described above. Thus, the potential for additional adverse effects on the eastern Bering pollock stock is expected to be minimal.

3.3 Chum Salmon

3.3.1 Biology and Distribution

Chum salmon are the most widely distributed of the Pacific salmon. In North America, chum salmon are distributed from Yaquina Bay, Oregon in the south to the Mackenzie River, Canada in the north. In Asia their distribution extends from Kyushu Island, Japan north to the Chukchi Peninsula and as far west as the Lena River, Russia (Salo, 1991).



Figure 3-8 Chum salmon distribution. Modified from Atlas of Pacific Salmon (August 2005)

Across their geographic distribution, return timing of chum salmon populations to their natal streams is variable with two distinct seasonal lineages – summer and fall runs (Salo, 1991). Within Alaska, summer run populations return to freshwater from May to September while Fall run populations return from July to November. Chum salmon use a diverse array of spawning habitat which range from the intertidal and mainstems in the lower portion of river systems (similar to pink salmon), to up to 2,800 km up large rivers such as the Yukon and Mackenzie. Fall run spawning habitat is often associated with upwelling where warmer spring water is favorable for development. In addition to spawn timing and water temperature, numerous environmental factors can influence incubation and emergence timing including stream flow, dissolved oxygen levels, gravel composition, and population specific genetic variation for development. Shortly after emergence, chum salmon fry begin their downstream migration.

Unlike coho, sockeye, and Chinook salmon which can spend up to two years rearing in freshwater habitats, chum salmon typically complete their migration to nearshore estuarine habitat, where they spend their first couple months, within 30 days. Within Alaska, movement offshore occurs by fall when schools of juvenile chum salmon move into the Bering Sea and Gulf of Alaska where they spend two or more winters. There is substantial mixing of stocks in the marine environment as they move seasonally between the Bering Sea and Gulf of Alaska. Age at maturity is typically between two and six years of age but varies by latitude where southern origin chum salmon typically mature at an earlier age.⁶¹

3.3.2 Abundance and Status Changes Across the North Pacific

Chum salmon are the second most numerically abundant salmon species in the North Pacific, after pink salmon. Abundance information for chum salmon from available catch, escapement, and return data, is provided by countries around the North Pacific including Japan, the Republic of Korea, Russia, Canada, and the United States. From severely declining to moderately increasing, trends in population abundance are diverse throughout their geographic range. Trends in chum salmon abundances from 2010–2020 were mixed in Russia and Japan, ranging from stable to decreasing. In Alaska and Canada, abundance was relatively stable from 2010–2020 but mixed in Washington (U.S.) where chum salmon abundance decreased in Puget Sound, was stable in Hood Canal, and increased in coastal areas (NPAFC, 2023). Over

⁶¹ Some prior research provides qualitative information on the distribution of WAK chum salmon. A new project is underway to develop comprehensive models for the distribution of WAK chum salmon in the marine ecosystems that integrates environmental variables (PI: Dr. Curry Cunningham).

the past three to five years, however, chum salmon populations have shown decline in all regions of the North Pacific with few exceptions (see also Appendix 3 from the February 2025 preliminary DEIS).⁶²

3.3.2.1 Hatchery Releases of Pacific Salmon from Countries Around the North Pacific

Total hatchery releases of Pacific salmon have been relatively consistent over the last decade (2014–2023), based upon publicly available data from the North Pacific Anadromous Fish Commission (2024). Total hatchery releases of salmon include Chinook, cherry, chum, coho, sockeye, pink, and steelhead. Although Russia has increased its total hatchery production in recent years, Japan has decreased its production which partially accounts for the observed stability in total releases (Figure 3-10). From 2019–2023, the majority of hatchery releases for all salmon species were attributed to the U.S. at approximately 40%, followed by Japan at 29% and Russia at 26 % of total during the same period. However, Russia’s 2023 hatchery production of Pacific salmon was ~1.639 billion fish which represented roughly a 35% increase from the most recent five-year (2018–2022) average of ~1.214 billion fish (Figure 3-10).

Hatchery releases of chum salmon have increased over time, particularly since the mid-1980s reaching a peak in 2023 at 3.44 billion chum salmon released from all countries (Figure 3-10). Over the most recent decade (2014–2023), the majority of chum salmon hatchery production has been attributed to Japan at 1.54 billion fish, followed by Russia (0.88 billion) and the United States (0.76 billion). However, Russian hatchery releases of chum salmon have increased in recent years, ranging from 1.07 and 1.28 billion fish from 2021–2023 which represents a ~51%–78% increase from the 10-year average of 0.73 billion chum salmon from 2011–2020. For 2024, Russia surpassed Japan for the largest number of hatchery chum salmon released, with 1.453 billion released during that year, compared with 1.155 billion from Japan and 0.838 billion from the United States (NPAFC 2025).

Hatchery releases of chum salmon are relevant to this impact analysis because the majority of chum caught as bycatch in the pollock fishery are commonly estimated to be of Asian origin (Southeast and Northeast Asia reporting groups). The Southeast Asia reporting group is largely composed of hatchery released fish while the Northeast Asia reporting group is composed of hatchery and wild fish in unknown proportions. From 2011–2023, approximately 30%–55% of the chum salmon bycatch caught by the pollock fishery was attributed to the Northeast Asia reporting group, except for 2011 and 2015 when lower proportions were observed. The Southeast Asia reporting group has accounted for approximately 9%–20% of the total bycatch. The highest numbers of Asia origin chum salmon occurred in 2017 and 2021 coinciding with the highest years of total chum salmon PSC.

⁶² The 2025 preliminary DEIS can be found on the Council's archived meeting page for the February 2025 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3071>), under agenda item C2.

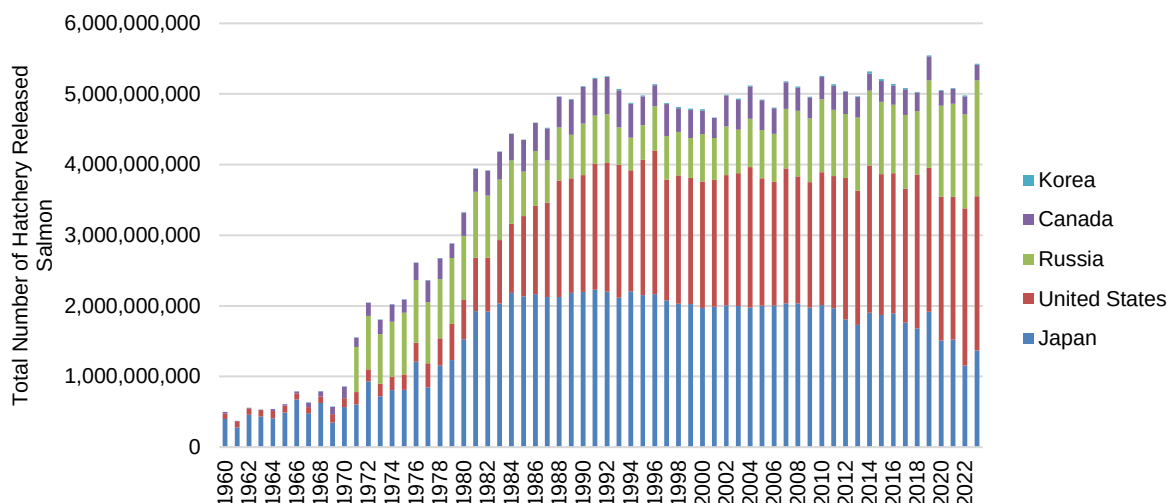


Figure 3-9 Total hatchery production for all species of salmon (Chinook, chum, coho, sockeye, cherry, pink, and steelhead) from Korea, Canada, Russia, United States, and Japan, 1960–2023

Source: NPAFC Hatchery Statistics. 2024. Accessed November 2024. Available: <https://www.npafc.org>.

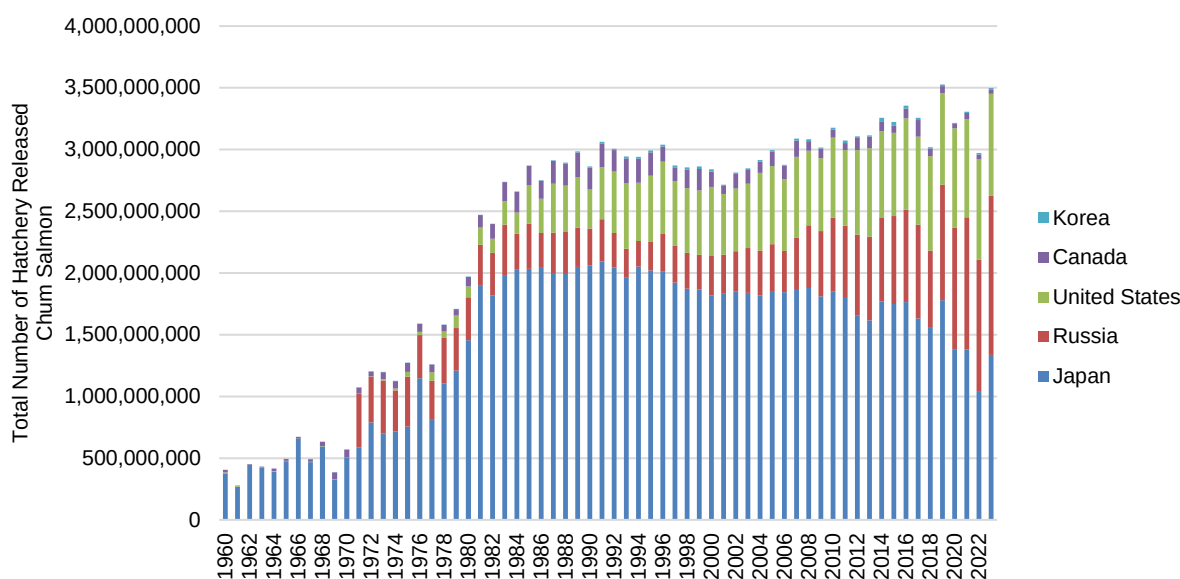


Figure 3-10 Total hatchery production of chum salmon from Korea, Canada, Russia, United States, and Japan, 1960–2023

Source: NPAFC Hatchery Statistics. 2024. Accessed November 2024. Available: <https://www.npafc.org>.

3.3.3 Alaska Salmon Fisheries Management

ADF&G, under the direction of the Alaska Board of Fisheries (BOF), manages subsistence, personal use, sport, and commercial chum salmon harvests within Alaska out to the three-mile limit. ADF&G also manages some commercial and sport fisheries for salmon in the EEZ, in accordance with the Pacific Salmon Treaty and other Federal law, where management is either delegated to the state through the Salmon FMP or fisheries are not included in the Salmon FMP. Commercial fishing for salmon in the EEZ waters of the Bering Sea is not authorized.

The first priority for management is for conservation or to meet spawning escapement goals in order to sustain salmon resources for future generations. The Alaska State Constitution, Article VII, Section 4, states that “Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to

the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial users.” In 2000, the BOF adopted the Sustainable Salmon Fisheries Policy (SSFP; 5 AAC 39.222), which defines sustained yield to mean an average annual yield that results from a level of salmon escapement that can be maintained on a continuing basis; a wide range of average annual yield levels is sustainable, and a wide range of annual escapement levels can produce sustained yields (5 AAC 39.222(f)(38)).

The SSFP contains five fundamental principles for sustainable salmon management, each with criteria that are used by ADF&G and the BOF to evaluate the health of the state’s salmon fisheries and address any conservation issues and problems as they arise (5 AAC 39.222(c)(1-5)).

A healthy salmon stock is defined as a stock of salmon that has annual runs typically of a size to meet escapement goals and a potential harvestable surplus to support optimum or maximum yield (5 AAC 39.222(f)(16)). In contrast, **a depleted salmon stock** is defined as a stock of salmon for which there is a conservation concern (5 AAC 39.222(f)(7)). Further, **a stock of concern** is defined as a stock of salmon for which there is a yield, management, or conservation concern (5 AAC 39.222(f)(35)). Yield concerns arise from a chronic inability to maintain expected yields or harvestable surpluses above escapement needs. Management concerns are precipitated by a chronic inability to maintain escapements within the bounds, or above the lower bound of an established goal. A conservation concern may arise from a chronic inability to maintain escapements above a sustained escapement threshold.

Escapement is defined as the annual estimated size of the spawning salmon stock. Quality of the escapement may be determined not only by numbers of spawners, but also by factors such as sex ratio, age composition, temporal entry into the system, and spatial distribution within salmon spawning habitat ((5 AAC 39.222(f)(10))). Scientifically defensible salmon escapement goals are a central tenet of fisheries management in Alaska. It is the responsibility of ADF&G to document, establish, and review escapement goals, prepare scientific analyses in support of goals, notify the public when goals are established or modified, and notify the BOF of allocative implications associated with escapement goals.

The key definitions contained in the SSFP with regard to scientifically defensible escapement goals and resulting management actions are biological escapement goal, an optimal escapement goal, sustainable escapement goal, and sustained escapement threshold.

3.3.3.1 Western Alaska Chum Salmon Stock Status

Chum salmon have historically been abundant throughout Western and Interior Alaska rivers, a region that encompasses populations from Kotzebue Sound in the north, south through Bristol Bay. As shared by KRITFC, in Kuskokwim Region, LK and TK holders have described historically abundant chum salmon throughout the region by their distinct “stink” as their carcasses historically exuded when decomposing by the tens of thousands in tributaries (see also Section 4 of Appendix 8, an independently-authored submission from KRITFC).

However, in 2020, chum salmon runs had dramatically declined, and nearly all river systems across Western Alaska had inriver run sizes below recent year averages with run sizes similar to those observed in the previous record poor run of 2000 (Figure 3-11). In 2021, inriver indices of chum salmon abundance in Norton Sound, the Yukon River, and the Kuskokwim River were all at their lowest abundance and only 2 of 13 escapement goals assessed in the region were met in 2021 (both in Norton Sound). In 2022, most Western Alaska chum salmon abundance indices increased slightly from 2021 but for some stocks were the second lowest in the time series (*e.g.*, Yukon River). In 2023, chum salmon abundance indices again increased slightly from the previous year in most areas but remained at very low levels. Escapement goals were met for five of the ten chum salmon stocks assessed across the region, but all stocks had below average abundance (Figure 3-11 and Table 3-23).

To illustrate the recent declines in chum salmon abundance, Figure 3-11 provides an index of chum salmon abundance for the Yukon, Kuskokwim, and Norton Sound regions. Abundance levels are standardized and shown as a percentage deviation from the historical average in each area because the units of measurement among the areas are different. Positive percentage deviations indicate years where abundance was above average abundance and negative percentage deviations indicate years that were below average abundance. As shown, chum salmon abundance was very low across all indices and areas during two distinct periods from 1997–2002 and 2020 to present (yellow).⁶³ This indicates that all areas exhibit similar trends during periods of very low abundance. From 2020–2023, Yukon summer chum salmon abundance was 63%–94% below average whereas Yukon fall chum salmon abundance was 74%–90% below average. Chum salmon abundance in the Kuskokwim area was 16%–94% below average and 44%–83% in the Norton Sound region.

Chum salmon support regionally important subsistence, commercial, personal use, and sport fisheries. However, the chum salmon run declines in recent years have resulted in some management areas not meeting some or all escapement goals as well as restrictive management actions on commercial, sport, and subsistence harvests of chum salmon (Table 3-23). Further information on subsistence and commercial chum salmon harvests is provided in Sections 4.4.3 and 4.4.3.2 in the RIR.⁶⁴

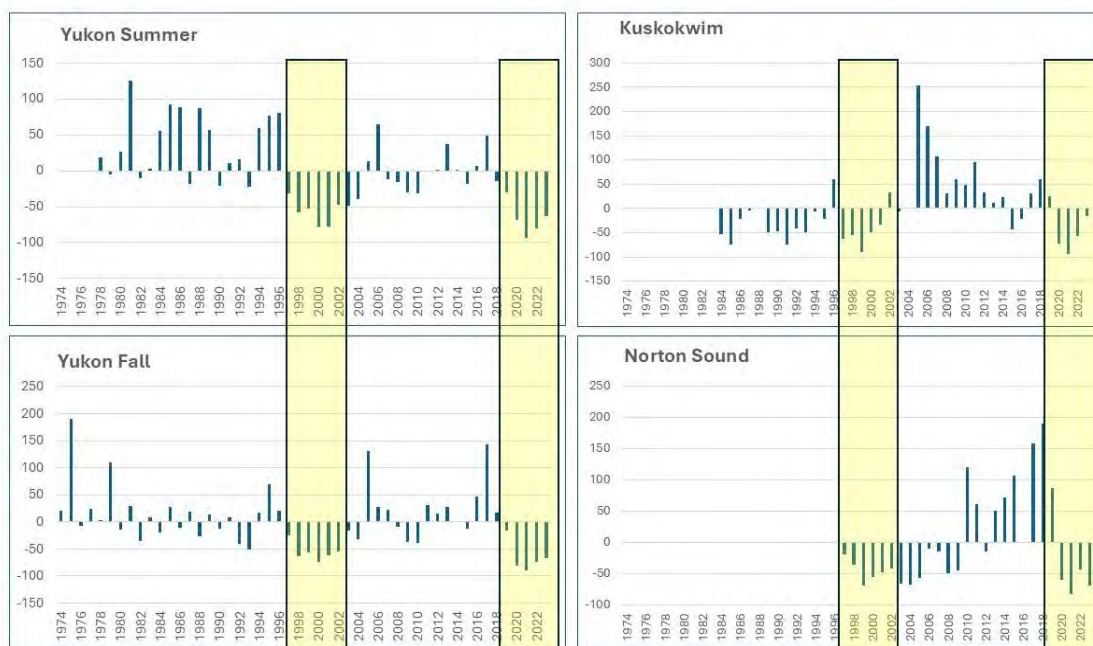


Figure 3-11 Chum salmon inriver abundance in the Yukon, Kuskokwim, and Norton Sound areas measured as a percentage deviation from the historical average level of abundance based on Yukon summer and fall chum salmon run reconstructions, the cumulative catch per unit effort (CPUE) from the Kuskokwim Bethel Test Fishery, and a standardized index of escapements in the Norton Sound region plus total harvest

Source: ADF&G.

⁶³ The causes of chum salmon decline in 1997 to 2002 are not fully known. In response to this decline, and to improve monitoring and enforcement efforts, NPAFC scientists developed the Bering-Aleutian International Survey (BASIS) during 2002. BASIS was recently expanded to include other large marine ecosystems in the North Pacific and was renamed the Bering Arctic Subarctic Integrated Survey.

⁶⁴ Additional data is not included on personal use or sport fishing for Western Alaska chum salmon because extremely limited effort occurs through these methods of harvesting; however, Table 3-23 highlights years where opportunities were provided.

Table 3-23 Summary of Western Alaska chum salmon stock status, 2020–2023

Stock	Inriver Abundance	Escapement met 2020 to 2023? ^a	Restrictions Imposed on harvests 2020 to 2023?		
			Subsistence	Commercial	Sport
Nushagak	Below average (all years)	0 of 1 (all years)	No (all years)	No (all years)	No (all years)
Kuskokwim Bay	Below average (all years)	NS (all years) ^b	No (all years)	Yes (all years)	No (except 2023)
Kuskokwim River	Below average (all years)	1 of 1 (2020) 0 of 1 (2021, 2022) NS (2023)	Yes, limited (except 2020)	Limited (2020, 2021) No (2022, 2023)	Yes (except 2020)
Yukon River Summer Run	Below average (all years)	1 of 1 (2020) 0 of 3 (2021) 0 of 2 (2022) 1 of 1 (2023)	Limited (2020, 2023); yes (2021, 2022)	Limited (2020); yes (2021, 2022, 2023)	Limited 2020, 2023; no fishery 2021, 2022
Yukon River Fall Run	Below average (all years)	1 of 4 (2020) ^c 0 of 5 (2021, 2022) 3 of 5 (2023)	Limited (2020); yes (2021, 2022, 2023)	Yes (all years)	Yes (all years)
Norton Sound	Below average (all years)	2 of 4 (2020, 2021) 4 of 4 (2022) 2 of 3 (2023)	No (all years)	Limited (all years)	No in 2020, 2021, 2022 Limited in 2023
Kotzebue	Below average (except 2022)	NS (all years) ^b	No (all years)	Limited (all years)	No (all years)

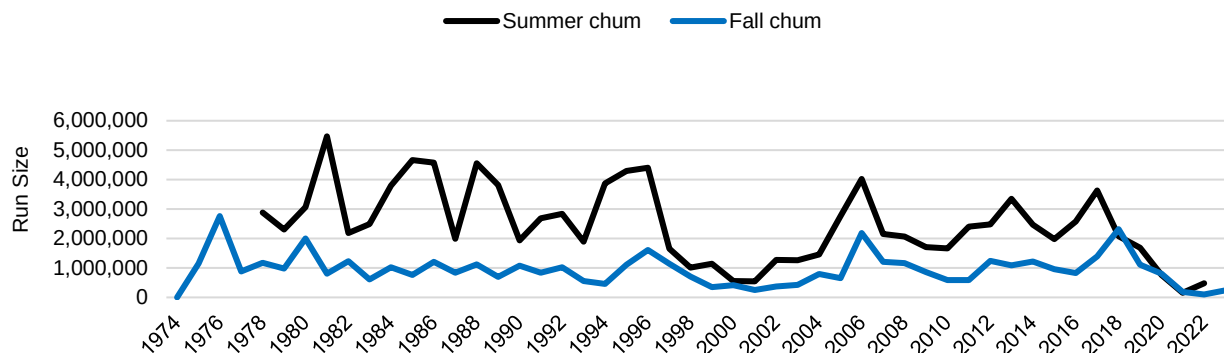
^a Includes performance for the subset of goals that were assessed. Some escapement goals were not assessed for various logistical reasons, including funding and weather.

^b NS = No survey, escapement goal was not assessed.

^c Includes 2 U.S./Canada escapement goals for the Yukon fall run in all years.

3.3.3.1.1 Yukon Area

In the Yukon Area, summer and fall chum salmon inriver abundance estimates are available based on full run reconstructions for each stock. In 2021, both Yukon River summer and fall chum salmon runs were the lowest in the time series 1978–2023, with a combined summer and fall chum salmon run size of 251,000 fish. Although run sizes increased in 2023 for both summer and fall chum salmon, they were well below average and still some of the lowest in the time series.

**Figure 3-12 Yukon River chum salmon inriver run size, 1978–2023**

Source: ADF&G.

3.3.3.1.2 Kuskokwim Area

While total chum salmon run abundance estimates are not available in the **Kuskokwim Area**, there are relative indices of abundance, including the Bethel Test Fishery in the lower river and the Kogruklu River weir in the upper river. Available data from mainstem enumeration and tributary spawner escapement monitoring projects all show a decline beginning in 2020. In 2021, the Bethel Test Fishery cumulative catch per unit effort (CPUE) and the Kogruklu River weir chum salmon abundance estimates were the lowest in the time series. In 2023, the Bethel test fishery CPUE increased significantly but

environmental conditions prevented the Kogruluk River weir from providing reliable estimates of chum salmon escapement. The Kuskokwim area has additional abundance information that can help provide context on the status of chum salmon stocks in the area. These include the Kwethluk River weir, George River weir, Salmon River weir, Takotna River weir, and the Kuskokwim River sonar, which provide indices of abundance with varying levels of reliability and representativeness of the total chum salmon abundance.

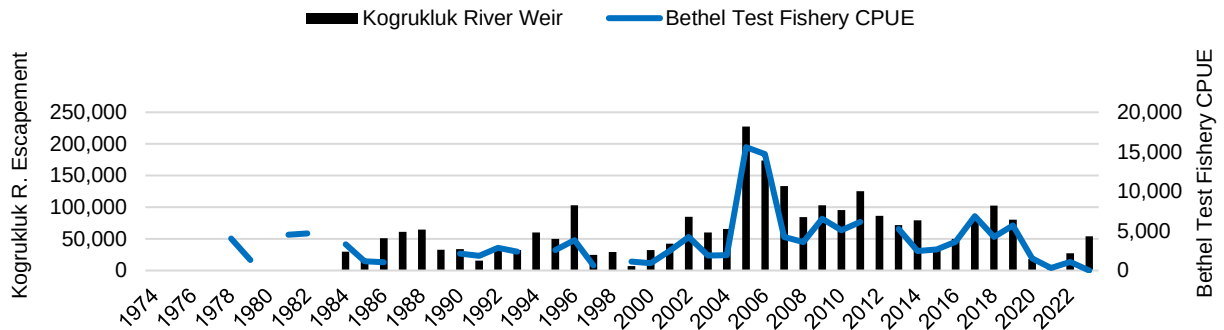


Figure 3-13 Kuskokwim River chum salmon inriver abundance, including the Kogruluk River Weir escapement and cumulative CPUE from the in-river Bethel test fishery, 1984–2023

Source: ADF&G.

3.3.3.1.3 Norton Sound Area

In Norton Sound, chum salmon escapement goals were met in two of the four rivers in both 2020 and 2021. All four escapement goals were met in 2022 and at least two of the four were met in 2023. Unlike most Western Alaska chum salmon stocks, which have been abundant historically, northern Norton Sound chum salmon abundance has been variable with prolonged periods of poor productivity. While important chum salmon stocks exist throughout Norton Sound, the only total run size estimate is for Kwiniuk River chum salmon in northern Norton Sound. However, a run reconstruction from this single system may not be a consistently reliable indicator for the whole Norton Sound region. Figure 3-14 shows chum salmon inriver abundance trends for the Norton Sound region (1997–2023) based on a standardized minimum index of the Snake, Nome, Eldorado, and North Rivers as well as total harvests. This approach that is more representative of the chum salmon returns across several management subdistricts within the Norton Sound region.

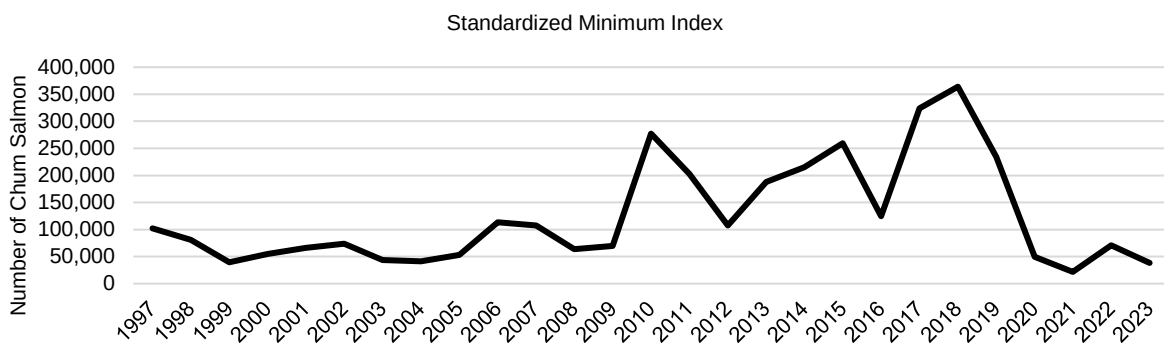


Figure 3-14 Standardized minimum inriver index composed of the sum of the Snake, Nome, Eldorado, North Rivers Weir/Tower/Escapement and total Norton Sound harvests, 1997–2023

Source: ADF&G.

3.3.3.1.4 Environmental Factors Related to Western Alaska Chum Salmon Declines

Chum salmon from Western and Interior Alaska are affected by environmental changes across multiple life stages (Figure 3-15). In freshwater, reduced oxygen levels, changes in water flow and turbidity, earlier

or later ice break-up, and riverbank erosion can have an impact on chum salmon survival during early life and outmigration to the ocean (Bash et al., 2001; Beechie et al., 2022). Chum salmon originating from Western and Interior Alaska river systems spend their first summer in the Bering Sea before migrating to the Gulf of Alaska for winter. This early marine phase is critical; young salmon need to grow quickly to avoid predators and store enough energy for their first winter at sea (Farley & Moss, 2009). Research by Kondzela et al. (2016) shows that more juveniles surviving this stage leads to more adult salmon returning later. Since 2016, this relationship has weakened due to marine heatwaves in the Bering Sea and Gulf of Alaska (Farley et al., 2024).

The recent marine heatwaves raised salmon metabolic rates, increasing their energy needs, while also disrupting the food web. Juvenile chum salmon were found to have lower energy stores, likely due to fewer prey, higher energy demands, and a shift toward eating lower-quality food like jellyfish (Farley et al., 2024). In addition, competition with increasing numbers of pink salmon and hatchery-released Asian chum salmon may have reduced access to higher-quality prey during this phase (Ruggerone & Agler, 2008). Oke et al.'s work (2020) indicates returning adult salmon are smaller than in past decades.

When adult chum salmon return to their rivers to spawn, they are again exposed to freshwater conditions that may impact survival. Water temperatures that are too high or too low can affect their metabolism and ability to spawn successfully. Low oxygen levels and changes in river flow can further reduce survival of migrating salmon. In 2019, high stream temperatures, low oxygen, and disease led to a large die-off of pre-spawning chum salmon in the Koyukuk River (Westley, 2020). A similar event occurred in 2014 in the Kobuk River, where algae blooms and large numbers of migrating salmon lowered oxygen levels, causing widespread mortality (Braem et al., 2017). Increased pathogen load is also a concern. For example, parasites like *Ichthyophonus*—linked to deaths in Yukon River Chinook salmon—may affect chum salmon in similar ways, especially under conditions that favor parasite outbreaks (Yasumiishi et al., 2020; Zuray et al., 2012).

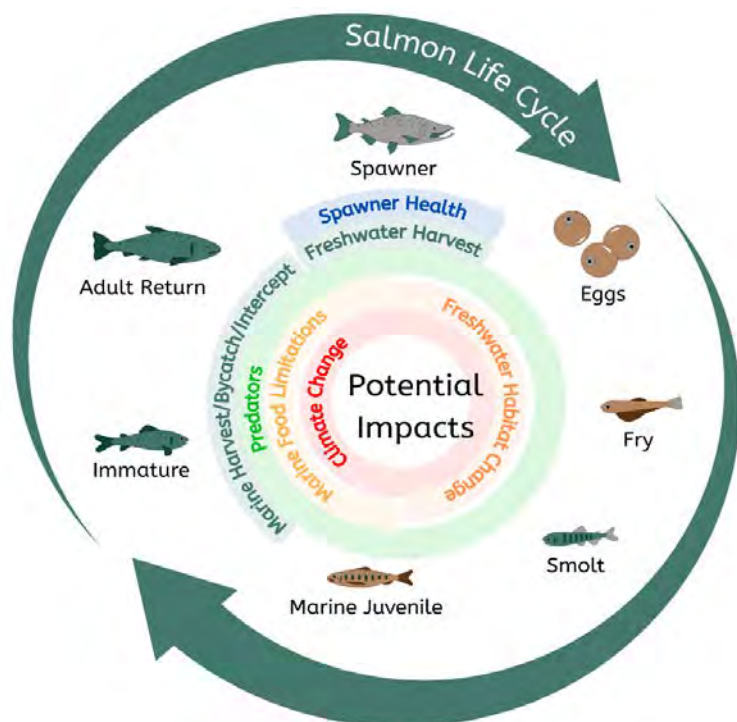


Figure 3-15 Potential environmental and climate-related impacts on chum salmon throughout their life history cycle

Source: Modified from the Alaska Salmon Research Taskforce's October 2023 report.

3.3.3.1.5 Traditional Knowledge of Chum Salmon Declines

This section provides information on factors leading to chum salmon declines, based on TK held by residents of the Yukon and Kuskokwim regions. TCC and KRITFC are the primary authors of this section. It specifically covers the Yukon and Kuskokwim regions in which TCC and KRITFC respectively have special expertise, though information may also be relevant to other regions of Western and Interior Alaska dependent upon chum salmon and impacted by this action. Note that additional information is also available in Appendices 8, 9a, and 9b, which contain submissions independently authored by KRITFC and TCC.

Yukon and Kuskokwim region TK holders share that traditional foods are sentient and respond to the behaviors and needs of people. When an animal or plant appears to a person, it is willingly offering itself to be taken and used for food, medicine, clothing, or other materials. To not take the being when it appears offends it, and it might not return to that person or place again because it feels it is no longer needed. In the words of one Yup'ik Elder:

“You know in the old days, the uses [of chum salmon] were multifold. We ate them and our dogs ate them. In the old days, they were used a lot. And I still think of what the old people say: you use them, they will come back in numbers. It’s just like I see the muskrats now. We quit hunting them and they’re disappearing.” – Robert Lekander, July 2023, KRITFC archives

Contemporary salmon fishery management aims to conserve salmon spawners by allowing spawning salmon to pass through. However, a management approach that dictates when, where, and how people can fish contradicts Indigenous stewardship principles (Voinot-Baron, 2020). With guidance from Elders, people take only what was needed at the time it was meant to be taken and without wasting it. To not be able to take salmon when salmon are in the river—when it is time to take salmon—poses a threat to food and cultural security and offends the salmon such that they may not return.

TK says salmon, once harvested, must be attentively monitored while drying and smoking to ensure it dries properly without flies/maggots or rot. Workspaces for processing fish must be cleaned so as to respect fish to come, and bones and scraps are to be properly disposed of; in Yup'ik communities of the lower Kuskokwim, traditional disposal is burial in the ground (Fienup-Riordan et al., 2020). The failure to adhere to these practices of care, and instead to disrespect and waste salmon, contributes to salmon declines. As noted in Fienup-Riordan et al., 2020:

Such careless treatment [of bones, scraps, and food], many believe, will cause the animals and plants to dwindle. Annie [Nelson] (March 2017:66) concluded: ‘Because food is stepped on, some fish are declining in numbers...’ (Fienup-Riordan et al., 2020:78).

TK holders additionally hold that salmon bycatch, as a form of wasteful and careless treatment of salmon—as a spiritual and physical offense to these fish—contributes to chum salmon declines. Similarly, TK holders from the Kuskokwim have expressed that catch-and-release sport fishing also disrespects salmon by playing with food, thus contributing to salmon declines.

Declines in salmon and at times the criminalization of traditional hunting and fishing practices have disrupted the spiritual relationship of salmon and people (Stevens & Black, 2019), as well as the Elder-youth interactions that often occurred at fish camp (see Section 4.4.3.2). The dissolution of these relationships has also contributed to salmon declines: “The root cause of the decline of fish is that young people are no longer instructed... Along with lack of instruction, the decline of fish is believed to be a product of discord and lack of consensus among people” (Fienup-Riordan et al., 2020:109).

The Council must balance the National Standards when making management recommendations to NMFS. Underpinning the Council’s decision-making process are values that are reflected in management objectives. For instance, National Standard 1 requires “conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the U.S. fishing industry.” A concept like “optimum yield” is commonplace in Federal fisheries management

but may not align with TK and Indigenous value systems. This is described in Appendix 8, independently authored by KRITFC.

Traditional fishery stewardship has been guided by Elders' TK and is centered around the values of sharing, avoiding waste, taking only what is needed in the season it appears, and carefully attending to fish from gravel to table. TK from these regions holds that, in addition to the environmental factors described above, the anthropogenic factors discussed here accumulate over time and have contributed to the recent declines. Note that more information is available in Appendices 8 and 9a, independently authored by KRITFC and TCC, respectively.

3.3.4 Effects of the Alternatives on Chum Salmon

The following sections analyze the potential impacts of the proposed alternatives on overall chum salmon and WAK chum salmon.

3.3.4.1 Alternative 1

Alternative 1 would retain existing chum salmon bycatch regulations, primarily the RHS program for chum salmon avoidance and the Chum Salmon Savings Area as a backstop measure (see Section 2.3).

3.3.4.1.1 Chum Salmon Bycatch Trends

The majority of non-Chinook (*i.e.*, chum salmon) bycatch in all Bering Sea groundfish fisheries has occurred in the pollock fishery (Table 3-24). Among the pollock sectors, the inshore sector has accounted for a greater proportion of the bycatch at 56% of the total, followed by the CP sector at 28%, the mothership sector at 9%, and the CDQ sector at 7% (Table 3-25).

Table 3-24 Number of chum salmon caught as bycatch in all BSAI groundfish fisheries compared to the Bering Sea pollock fishery, 2011–2023

Year	Chum salmon PSC in all BSAI groundfish fisheries	Annual chum salmon PSC in the pollock fishery	Chum salmon PSC in the pollock fishery as percent of total chum salmon PSC in all BSAI groundfish fisheries	B season chum salmon PSC in the pollock fishery	B season chum salmon PSC in the pollock fishery as percent of annual total
2011	194,783	191,435	98.3%	191,313	99.9%
2012	23,138	22,183	95.9%	22,172	99.9%
2013	126,463	125,316	99.1%	125,114	99.8%
2014	223,867	219,442	98.0%	218,886	99.7%
2015	241,491	237,752	98.5%	233,085	98.0%
2016	346,000	343,001	99.1%	339,236	98.9%
2017	469,769	467,678	99.6%	465,848	99.6%
2018	307,367	295,062	96.0%	294,675	99.9%
2019	354,681	347,882	98.1%	346,671	99.7%
2020	344,849	343,625	99.6%	343,094	99.8%
2021	548,752	546,042	99.5%	545,901	99.9%
2022	243,695	242,375	99.5%	242,309	99.9%
2023	113,478	112,294	99.0%	111,852	99.6%
Average	272,179	268,776	98.5%	267,704	99.6%

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

Table 3-25 Number of chum salmon caught as bycatch during the pollock B season broken out by sector, 2011–2023

Year	CDQ	CP	Mothership	Inshore	Total
2011	3,758	44,299	24,399	118,857	191,313
2012	200	1,928	977	19,067	22,172
2013	554	10,229	3,835	110,496	125,114
2014	2,407	63,066	8,091	145,322	218,886
2015	4,650	40,046	14,046	174,343	233,085
2016	15,975	134,750	43,629	144,882	339,236
2017	87,058	207,355	16,825	154,610	465,848
2018	26,586	99,447	21,303	147,339	294,675
2019	15,726	113,287	44,860	172,798	346,671
2020	8,582	77,137	19,743	237,632	343,094
2021	55,663	97,917	50,542	341,779	545,901
2022	6,365	71,786	32,262	131,896	242,309
2023	3,358	22,500	19,099	66,895	111,852
Average	17,760	75,673	23,047	151,224	267,704

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

While chum salmon are encountered almost exclusively during the pollock B season, the distribution of the bycatch varied significantly by month and year (Table 3-26). While the average bycatch was highest in June and July, a trend largely driven by the anomalously high bycatch events in 2017 and 2021, the median bycatch was highest in August. This indicates that the bycatch was typically higher in August compared to other months.

Table 3-26 Number of chum salmon caught as bycatch during the pollock B season in June and July, August, and September – November 1, 2011–2023

Year	June and July	August	Sept. – Nov. 1	Total
2011	89,264	44,971	57,078	191,313
2012	5,649	4,530	11,993	22,172
2013	46,484	49,566	29,064	125,114
2014	55,929	115,203	47,754	218,886
2015	25,419	152,804	54,862	233,085
2016	112,486	146,335	80,415	339,236
2017	361,783	69,458	34,607	465,848
2018	221,683	16,791	56,201	294,675
2019	128,137	117,108	101,426	346,671
2020	14,866	132,663	195,565	343,094
2021	397,817	123,493	24,591	545,901
2022	64,945	161,285	16,079	242,309
2023	34,248	60,208	17,396	111,852
Average	119,901	91,878	55,925	267,704
Median	64,945	115,203	47,754	242,309

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

The spatial distribution of the bycatch across the B season fishing grounds also varied over the time series. This analysis primarily stratifies the B season pollock fishing grounds by “genetic cluster areas” previously developed by the Auke Bay Labs genetics program to analyze the distribution of the genetic stock composition of chum salmon bycatch. The cluster areas are based on an analysis of the environmental and economic drivers of the pollock fishery by Haynie & Pfeiffer (2013). A map of the genetic cluster areas is available in Figure 3-16. The ordering of areas increases sequentially, moving from east to west.

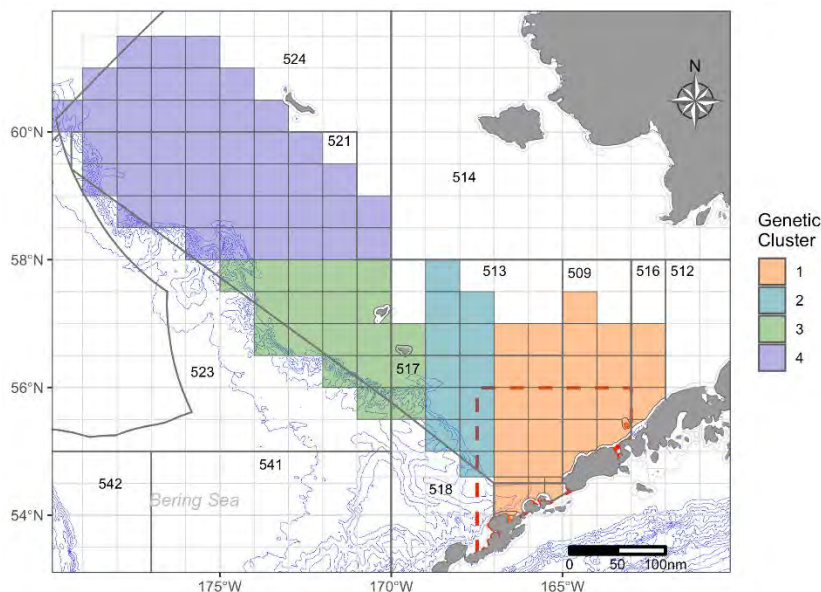


Figure 3-16 Map the genetic cluster areas as well as the CVOA (red) and Chum Salmon Savings Area (blue dotted line)

As shown in Table 3-27, the majority of chum salmon were encountered in genetic cluster 1 nearest to the Alaska Peninsula at ~47% of the B season total followed by genetic cluster 2 at ~28% of the total. Across all years, the inshore sector encountered the highest numbers of chum salmon in genetic cluster 1. Bycatch levels by sector were more variable in genetic cluster 2, but the CP sector accounted for a higher proportion of the total B season bycatch in these clusters (2011–2023).

To some extent these trends are explained by the operational differences among sectors. The vertical integration of CPs affords them greater flexibility to move and travel greater distances to target pollock. Mothership CVs deliver one haul at a time to the mothership and must coordinate their deliveries. Inshore CVs are more limited than CPs and mothership CVs in how far they can travel to find good fishing grounds and/or avoid different PSC because there is an industry standard to deliver pollock within 48-hours of it being caught. The operating range of these CVs is largely determined by their hold capacity, whether the vessel has a refrigerated seawater hold cooling systems, and horsepower.

Table 3-27 Number of chum salmon caught as bycatch in each genetic cluster area, 2011–2023

Year	Cluster 1				Cluster 2			
	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore
2011	1,442	3,725	13,546	102,897	826	13,547	575	5,277
2012	10	58	793	14,417	8	561	42	3,001
2013		1,201	1,129	75,096	1	1,856	1,650	15,355
2014	248	22	1,669	73,706	210	6,143	760	48,407
2015	1,291	2	1,040	148,704	1,129	9,436	2,348	2,691
2016	13,811	19,362	37,800	130,363	1,911	63,563	5,462	14,519
2017	31,524	843	15,346	123,854	53,296	149,655	639	30,756
2018	9,347	3,462	7,274	83,966	5,940	32,955	8,533	62,186
2019	8,344		20,954	135,353	1,992	32,201	1,236	6,887
2020		0	10,015	108,423	404	26,774	390	36,843
2021	49,239	24	16,151	156,455	1,593	57,376	34,296	181,540
2022	722	1,998	23,781	123,803	2,061	23,285	297	5,280
2023	0	5	4,539	52,484	25	609	154	7,957

Year	Cluster 3				Cluster 4			
	CDQ	CP	Mothership	Inshore	CDQ	CP	Mothership	Inshore
2011	657	8,422	9,847	10,007	833	18,605	431	676
2012	19	742	29	1,081	163	567	113	568
2013	203	4,526	320	18,110	350	2,646	736	1,935
2014	899	28,596	3,900	19,613	1,050	28,305	1,762	3,542
2015	1,146	14,940	8,883	22,948	1,084	15,668	1,775	
2016	571	44,193			49	7,616		
2017	365	34,374			1,873	22,483	840	
2018	10,807	58,581	4,085	850	492	4,449	1,411	337
2019	553	16,946	14,052	30,554	4,837	64,140	8,618	4
2020	2,289	10,350	4,319	91,461	5,889	40,013	5,019	905
2021	3,777	37,248	92	670	1,054	3,269	3	3,114
2022	3,581	37,200	3,067	2,813	1	9,303	5,117	
2023	346	7,107		2,965	2,987	14,779	14,406	3,489

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate the sector did not have observed pollock catch in the cluster area in that year. Cells with "0" indicate pollock catch was observed for the sector in that cluster area and year but no chum salmon PSC was observed.

3.3.4.1.2 Genetic Stock Composition Estimates

This section provides information on the genetic stock composition of the chum salmon caught as bycatch in the Bering Sea pollock fishery. NMFS-certified observers onboard each pollock vessel, or stationed at a shore-based processor, collect biological samples from bycaught salmon to determine the stock of origin. Observers sample Chinook salmon at a rate of 1 in 10 and chum salmon at a rate of 1 in 30 chum salmon.

Six genetic reporting groups are used to determine where the chum salmon caught by the pollock fishery originate from. These genetic groups include the Southeast Asia reporting group (primarily hatchery released fish), the Northeast Asia group (a mix of hatchery and wild salmon in unknown proportions), the Coastal Western Alaska group (CWAK, includes populations from Kotzebue Sound to Bristol Bay), the Upper/Middle Yukon reporting group (includes Yukon River fall chum and some summer chum populations), as well as the Southwest Alaska and Eastern Gulf of Alaska/Pacific Northwest reporting groups. **In this DEIS, "WAK chum salmon" refers to the combined CWAK and Upper/Middle Yukon reporting groups.**

Table 3-28 provides the estimated mean proportion and number of chum salmon taken as bycatch from each for each genetic stock reporting group in each year from 2011 through 2023. In most of the analyzed years, the Northeast Asia component contributed the majority of the bycatch followed by the Eastern Gulf of Alaska/Pacific Northwest component. On average, approximately 38% of the total bycatch was attributed to the Northeast Asia group and approximately 26% to the Eastern Gulf of Alaska/Pacific

Northwest group. During the same period, the WAK component accounted for an average of approximately 19% of the total bycatch and ranged between 4,701 fish in 2012 and 93,170 fish in 2017.

Figure 3-17 shows the stock composition of the bycatch across all genetic cluster areas during the Early (June – mid-August) and Late (mid-August – November 1) periods of the B season from 2011–2023. All genetic reporting groups were widely distributed across the genetic cluster areas. CWAK fish represented a higher proportion of the total bycatch in genetic cluster 1 in both the Early and Late periods. In comparison, the proportions of Upper/Middle Yukon component were more variable. The Northeast Asia component accounted for a greater proportion of the total bycatch in genetic cluster 2 during the Early period across all years.

Table 3-29 and Table 3-30 below provide additional and more specific information on the distribution of WAK chum salmon across the B season fishing grounds. The majority of WAK chum salmon PSC is attributed to the inshore sector (Table 3-31). At least in part, this pattern likely reflects fishing behavior the fishing grounds historically utilized by inshore CVs given their processor's locations and delivery requirements, as discussed previously.

Table 3-28 Estimated mean proportion and number of chum salmon caught as bycatch from each genetic stock reporting group compared to the total number of chum salmon caught as bycatch during the B season, 2011–2023

Year	Total Chum PSC	N.E. Asia		S.E. Asia		E. GOA/PNW		S.W. AK		CWAK		Up/Mid Yukon		WAK Combined	
		Mean	Est. #	Mean	Est. #	Mean	Est. #	Mean	Est. #	Mean	Est. #	Mean	Est. #	Mean	Est. #
2011	191,313	18.4%	35,202	17.3%	33,098	37.8%	72,318	1.5%	2,870	16.2%	30,993	8.9%	17,027	25.1%	48,020
2012	22,172	38.9%	8,625	20.3%	4,501	17.6%	3,902	2.0%	443	13.8%	3,060	7.4%	1,641	21.2%	4,701
2013	125,114	44.9%	56,164	14.7%	18,329	14.8%	18,452	1.4%	1,752	18.1%	22,633	6.3%	7,782	24.4%	30,415
2014	218,886	37.4%	81,907	18.5%	40,560	23.6%	51,701	0.7%	1,445	17.7%	38,699	2.1%	4,553	19.8%	43,252
2015	233,085	17.5%	40,790	9.7%	22,609	51.4%	119,806	1.6%	3,729	16.0%	37,294	3.9%	9,090	19.9%	46,384
2016	339,236	30.5%	103,467	8.8%	29,853	34.9%	118,393	1.3%	4,410	19.3%	65,473	5.3%	17,980	24.6%	83,453
2017	465,848	46.1%	214,756	15.7%	73,138	15.0%	69,877	3.2%	14,907	14.0%	65,219	6.0%	27,951	20.0%	93,170
2018	294,670	49.0%	144,405	17.7%	52,163	12.4%	36,543	2.0%	5,894	15.4%	45,385	3.4%	10,020	18.8%	55,405
2019	346,470	39.2%	135,950	18.0%	62,426	22.9%	79,420	3.6%	12,485	15.9%	55,143	0.3%	1,040	16.2%	56,183
2020	343,094	31.9%	109,447	12.7%	43,573	42.5%	145,815	3.8%	13,038	8.0%	27,448	1.1%	3,774	9.1%	31,222
2021	545,901	55.7%	303,903	11.9%	64,695	20.6%	112,615	2.4%	13,176	8.9%	48,658	0.5%	2,854	9.4%	51,512
2022	242,309	32.9%	79,684	10.9%	26,376	29.6%	71,775	3.6%	8,749	21.1%	51,106	1.9%	4,618	23.0%	55,724
2023	111,852	52.5%	58,064	16.3%	18,221	18.7%	20,893	2.0%	2,245	8.3%	9,246	2.3%	2,540	10.6%	11,491
Avg.	267,704	38.1%	105,566	14.8%	37,657	26.3%	70,885	2.2%	6,549	14.8%	38,489	3.8%	8,528	18.6%	46,995

Source: NMFS Alaska Region CAS, data compiled by ABL.

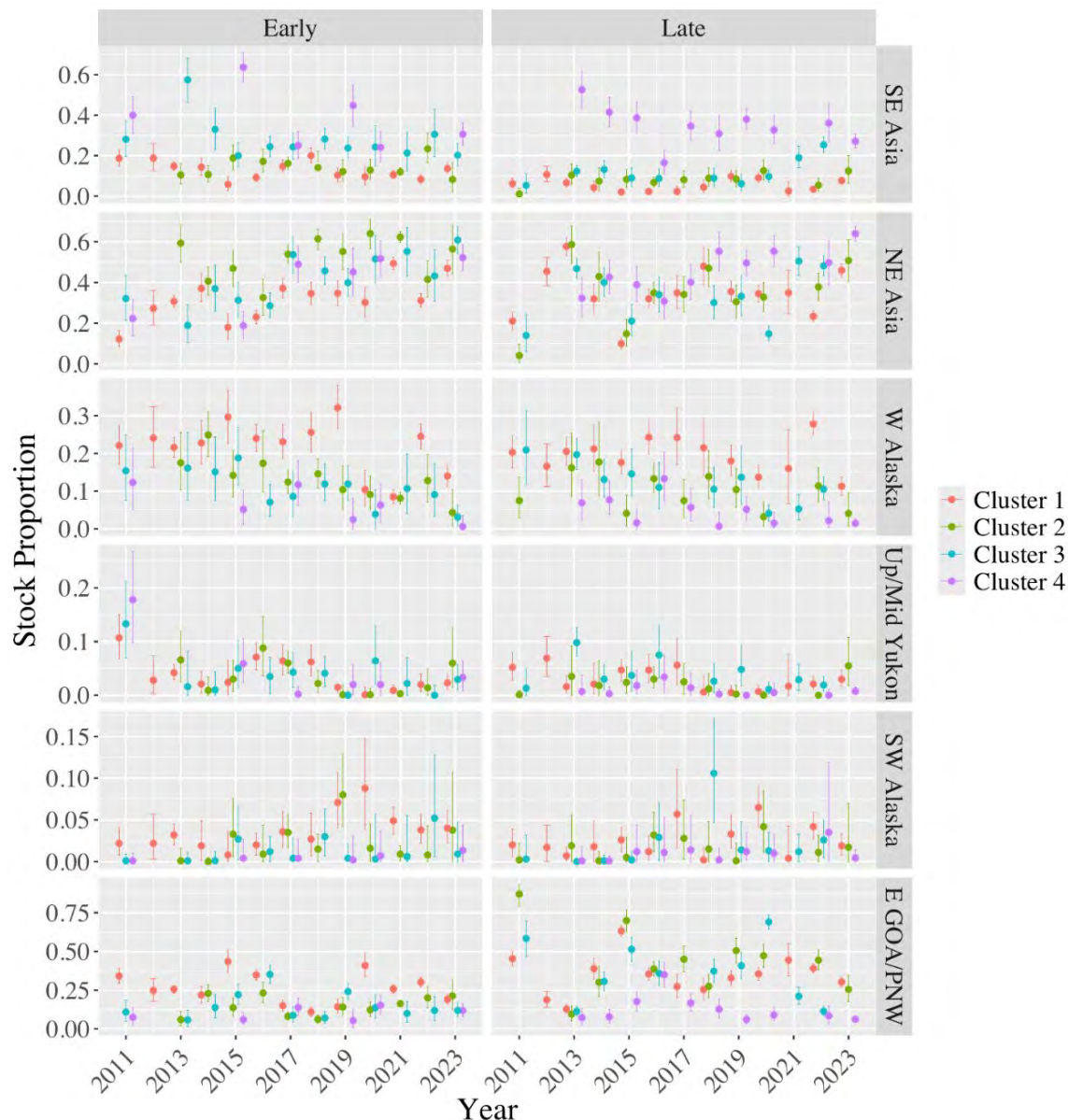


Figure 3-17 Estimated mean proportion of the stock composition of the pollock fishery's B season chum salmon bycatch in each genetic cluster area during the Early (left) and Late (right) periods, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by ABL.

Table 3-29 Total chum salmon bycatch compared to the estimated mean proportion of WAK chum salmon bycatch, and the estimated number of WAK chum salmon caught as bycatch in all genetic cluster areas during the Early period (June – mid-August), 2011–2023

	Cluster 1			Cluster 2			Cluster 3			Cluster 4		
	Total Chum	Mean WAK	Est.# WAK	Total Chum	Mean WAK	Est. # WAK	Total Chum	Mean WAK	Est. # WAK	Total Chum	Mean WAK	Est. # WAK
2011	63,806	32.8%	17,400	5,649	-	-	18,518	28.7%	4,072	15,070	30.1%	4,357
2012	5,418	26.9%	1,415	658	-	-	685	-	-	335	-	-
2013	56,233	25.8%	12,506	9,898	24.1%	1,409	2,808	17.7%	492	839	-	-
2014	46,285	24.9%	8,980	45,373	25.8%	8,340	14,151	16.1%	1,932	8,707	-	-
2015	33,004	32.0%	8,147	6,695	17.2%	1,003	25,383	23.8%	4,305	4,601	11.1%	510
2016	123,513	31.1%	34,586	13,096	26.2%	3,418	29,592	10.6%	3,137	734	-	-
2017	154,026	29.5%	39,593	220,490	18.4%	38,114	31,924	12.9%	4,117	6,105	11.9%	725
2018	80,831	31.8%	22,069	91,596	16.8%	13,565	58,358	16.0%	9,314	2,089	-	-
2019	81,122	33.6%	22,997	15,445	10.5%	1,107	56,693	11.9%	5,717	3,399	4.5%	150
2020	8,126	10.5%	593	15,177	9.2%	808	5,173	10.3%	324	7,212	8.3%	524
2021	210,222	9.4%	17,831	267,362	8.4%	19,047	11,460	12.9%	1,439	4,411	-	-
2022	100,907	26.5%	18,139	11,774	14.2%	1,264	4,714	9.1%	429	242	-	-
2023	23,718	16.3%	3,721	4,103	10.3%	379	7,686	6.1%	461	10,038	4.0%	373

Source: NMFS Alaska Region CAS, data compiled by ABL.

Notes: Hyphens are used to denote absent values (non-estimable proportions) due to sample size limitations.

Table 3-30 Total chum salmon bycatch compared to the estimated mean proportion of WAK chum salmon bycatch, and the estimated number of WAK chum salmon caught as bycatch in all genetic cluster areas during the Late period (mid-August – November 1), 2011–2023

	Cluster 1			Cluster 2			Cluster 3			Cluster 4		
	Total Chum	Mean WAK	Est. # WAK	Total Chum	Mean WAK	Est. # WAK	Total Chum	Mean WAK	Est. # WAK	Total Chum	Mean WAK	Est. # WAK
2011	57,804	25.5%	16,295	14,576	7.6%	1,066	10,415	22.2%	2,266	5,475	-	-
2012	9,860	23.5%	2,153	2,954	-	-	1,186	-	-	1,076	-	-
2013	21,193	22.1%	4,769	8,964	19.7%	1,011	20,351	29.5%	5,741	4,828	7.6%	350
2014	29,360	23.3%	7,040	10,147	19.5%	2,289	38,857	16.1%	5,629	25,952	8.0%	2,088
2015	118,033	22.3%	26,366	8,909	6.5%	566	22,534	18.3%	4,519	13,926	3.4%	473
2016	77,823	29.0%	24,577	72,359	16.3%	10,984	15,172	18.5%	2,806	6,931	16.7%	1,157
2017	17,541	29.8%	5,404	13,856	10.0%	1,385	2,815	-	-	19,091	7.1%	1,355
2018	23,218	22.1%	4,841	18,018	17.3%	2,520	15,965	13.1%	2,083	4,600	0.9%	41
2019	83,529	18.5%	16,008	26,871	17.3%	2,692	5,412	18.5%	1,027	74,200	5.2%	3,853
2020	110,312	14.4%	14,673	49,234	3.2%	1,108	103,246	5.2%	4,424	44,614	2.0%	827
2021	11,647	17.7%	2,150	7,443	-	-	30,327	8.2%	2,493	3,029	-	-
2022	49,397	29.9%	22,049	19,149	11.4%	2,065	41,947	12.4%	4,873	14,179	2.2%	312
2023	33,310	14.3%	4,782	4,642	9.6%	346	2,732	22.2%	-	25,623	2.2%	575

Source: NMFS Alaska Region CAS, data compiled by ABL.

Notes: Hyphens are used to denote absent values (non-estimable proportions) due to sample size limitations.

Table 3-31 Estimated mean number of WAK chum salmon caught as B season bycatch by sector, 2011–2023

Year	CDQ	CP	Mothership	Inshore
2011	-	8,911	4,426	32,391
2012	-	-	-	3,922
2013	-	2,467	801	28,188
2014	-	8,714	-	31,636
2015	-	4,528	1,963	34,903
2016	3,140	21,074	13,731	37,768
2017	22,672	33,429	4,562	35,172
2018	6,271	17,640	4,482	30,385
2019	2,894	5,087	7,575	40,049
2020	-	1,925	1,143	25,557
2021	6,091	7,734	3,442	33,488
2022	902	8,036	7,888	37,265
2023	86	965	979	9,735

Source: NMFS Alaska Region CAS, data compiled by ABL.

Notes: Hyphens denote insufficient samples were available to estimate genetic stock proportions.

3.3.4.1.3 Adult Equivalent and Region of Origin Impacts

Not all WAK chum salmon caught as bycatch in the pollock fishery would have otherwise survived to return to their natal systems, and so an AEQ was calculated to estimate the pollock fishery's removals of adult equivalent fish (see also Section 3.1.3 and Appendix 3). AEQ estimates are provided for the CWAK (summer runs) and Upper/Middle Yukon (Yukon-Fall run) groups from 2011–2022. AEQ estimates are not provided for the 2023 B season pollock fishery because age data are not available.

Table 3-32 provides the AEQ from the stochastic model which incorporates uncertainty in oceanic maturity, survival, in-river age composition, and estimates of stock of origin. 1000 simulations were conducted by drawing parameter values from distributions described in the “*Uncertainty in the AEQ*” section of Appendix 3 for each genetic group. The AEQ was then computed for each simulation and summarized with the mean, 5th and 95th percentile.

The mean AEQ for the CWAK group ranged between 11,539 in 2012 and 69,403 in 2017 and averaged 38,060 fish. The AEQ for the CWAK reporting group is often lower than the stock reporting group bycatch but the AEQ was greater in 2012 and 2018 (Figure 3-18). In both cases, this was due to lower bycatch occurring in that year compared to prior years, and the bycatch that did occur in prior years contributed to the AEQ. For instance, an age-3 fish caught in 2011 may have survived the marine environment and matured as age-4 fish in 2012.

The mean AEQ for the Upper/Middle Yukon group ranged between 2,175 in 2020 and 16,451 in 2017 and averaged 6,095 fish.⁶⁵ The AEQ for the Upper/Middle Yukon group exceeded stock specific bycatch estimate in 5 of 12 years (Figure 3-18). This is due to the lagged effect of the AEQ combined with the higher probability of the Yukon River Fall stock maturing earlier (Table A3-5 in Appendix 3), so a higher proportion of 4-year-old fish would mature in a given year as opposed to delaying maturity to ages 5–7 and incurring additional natural mortality.

⁶⁵ In response to the SSC's February 2025 Minutes, the analysts explored whether the chum salmon caught as bycatch late in the B season may not be maturing within the year they were caught and potentially subjected to additional oceanic mortality. This would induce an upward bias in the estimates of the AEQ. While there is some variation among years in the total number and relative proportion of fish of each genetic group caught in the late period (after stat week 34), on average 74% of the bycatch for each genetic reporting group occurred prior to this week. Not accounting for varying maturation probabilities on fish caught after stat week 34 induces minimal bias into the AEQ estimates. See Appendix 3 for more information on the approach used and results.

Table 3-32 AEQ estimated bycatch of CWAK (top) and Upper/Middle Yukon (bottom) reporting groups in the Bering Sea pollock fishery, 2011-2022. AEQ estimates are shown with the 5th, mean and 95th percentile of bycatch for the reporting groups. A stochastic model was used for AEQ estimation.

Year	Reporting Group	5th Percentile	Mean	95th Percentile
2011	CWAK	18,512	21,815	25,166
2012	CWAK	9,797	11,539	13,293
2013	CWAK	18,947	20,812	22,841
2014	CWAK	28,715	31,754	34,717
2015	CWAK	28,080	30,896	33,599
2016	CWAK	47,183	51,841	56,762
2017	CWAK	63,428	69,403	75,601
2018	CWAK	51,222	55,845	60,490
2019	CWAK	49,243	53,554	58,000
2020	CWAK	22,366	25,702	29,105
2021	CWAK	28,534	32,675	36,963
2022	CWAK	47,308	50,885	54,302
2011	Upper/Mid Yukon	7,930	10,585	13,609
2012	Upper/Mid Yukon	1,998	3,088	4,434
2013	Upper/Mid Yukon	2,000	2,641	3,260
2014	Upper/Mid Yukon	2,065	3,134	4,195
2015	Upper/Mid Yukon	3,854	5,247	6,634
2016	Upper/Mid Yukon	8,919	11,834	14,885
2017	Upper/Mid Yukon	12,881	16,415	20,198
2018	Upper/Mid Yukon	5,583	7,946	10,387
2019	Upper/Mid Yukon	1,261	2,452	3,717
2020	Upper/Mid Yukon	1,199	2,175	3,206
2021	Upper/Mid Yukon	3,229	5,007	6,823
2022	Upper/Mid Yukon	1,424	2,615	3,853

Source: NMFS Alaska Region CAS, data compiled by ABL.

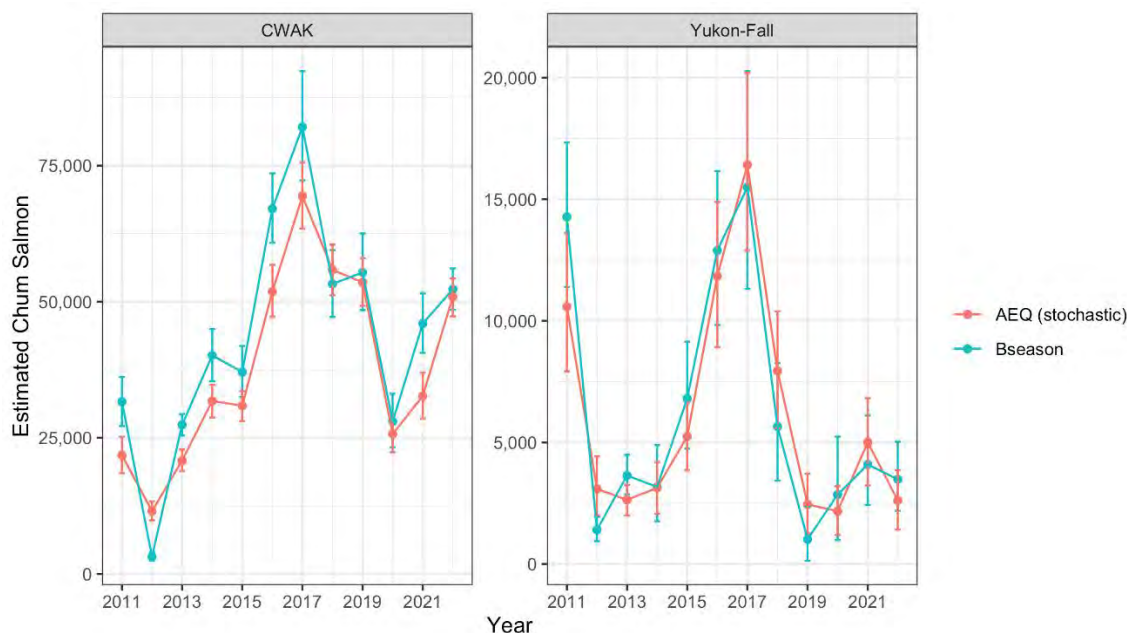


Figure 3-18 AEQ estimates for the CWAK (left) and Upper/Middle Yukon (right) in red with uncertainty in age composition of the bycatch, stock of origin, survival, and maturity compared to the estimated stock specific bycatch (blue), 2011–2022. A stochastic model was used for AEQ estimation.

Source: NMFS Alaska Region CAS, data compiled by ABL.

An AEQ analysis is not a complete assessment of the potential impact bycatch may have on WAK chum salmon populations. This type of analysis requires an estimate of the total run size which is not available

for all stocks encompassed within the CWAK reporting group.⁶⁶ This analysis provides information to scale PSC removals from the CWAK reporting group under the status quo in response to requests from the SSC, Council, and members of the public. **The data provided are only meant to contextualize the magnitude of PSC removals of chum salmon attributed to the CWAK reporting group, and these data should not be used in lieu of an impact rate or as a determinant of annual run sizes.** A full inriver run reconstruction is available for Yukon fall chum salmon and an impact rate for that stock is presented below, but trends for Yukon fall chum salmon abundance and/or the impact rate of PSC removals on this singular stock may not reflect overall trends across all WAK stocks.

Table 3-33 compares directed State commercial chum salmon harvests and subsistence chum salmon harvests in the Kotzebue, Norton Sound, Yukon (summer chum salmon only), Kuskokwim, and Bristol Bay Management Areas to the mean AEQ estimate from the stochastic model for the CWAK group (2011–2022). State commercial and subsistence harvest data are based on ADF&G’s Division of Subsistence and the Annual Management Reports or Summaries from the Commercial Fisheries Division.⁶⁷ These are the same data used throughout Chapter 4. Figure 3-19 is complementary to Table 3-33, providing a visual comparison of the same data.

This approach assumes subsistence harvests remove adult fish as they are returning to spawn, and a similar assumption is made for chum salmon caught in directed commercial fisheries. Additionally, a proportion of the chum salmon caught in Area M fishery originates from CWAK and Yukon stocks. However, ADF&G raised concerns that comparable data are not available, both in terms of annual genetic stock composition estimates and AEQ estimates of those fish. Therefore, removals from the Area M fishery or other Gulf of Alaska fisheries (*e.g.*, Chignik) are not included in this portion of the analysis. The Area M fishery is described separately in Section 4.4.4.2.

The majority of Western Alaska chum salmon harvests were attributed to State commercial and subsistence harvests. On average, the adult equivalent harvest of CWAK chum salmon from the Bering Sea pollock fishery was 1.75% of total removals over the time series (2011–2022; median of 1.71%). The AEQ represented a greater proportion of total removals during years of low CWAK abundance when directed State commercial and subsistence fisheries opportunities were limited, such as 2021 at 7.70% and 2022 at 5.35%.

⁶⁶ Kawerak, Inc., AVCP, YRITFC, TCC, NPA, and YRDFA expressed several concerns with the use of an impact rate which are available in their October 2024 letter to NMFS attached in Appendix 1 of the December 2024 preliminary DEIS, accessible at the February 2025 archived Council meeting agenda (<https://meetings.npfmc.org/Meeting/Details/3071>), agenda item C2.

⁶⁷ Commercial harvest data are based on CFEC Fish Tickets. Subsistence harvest estimates are based on post season harvest surveys, calendars, and other methodologies used by ADF&G’s Division of Subsistence.

Table 3-33 Comparison of commercial and subsistence harvests of CWAK chum salmon in the Kotzebue, Norton Sound, Yukon (summer chum salmon only), Kuskokwim, and Bristol Bay Management Areas to the mean AEQ estimated bycatch from the Bering Sea pollock fishery. Results are for the CWAK group, 2011–2022. Commercial harvest estimates do not include the Area M fishery. The stochastic model was used for AEQ estimation.

Year	Commercial Harvests	Subsistence Harvests	AEQ CWAK	Total	AEQ CWAK as % of Total
2011	1,829,422	219,687	21,815	2,070,924	1.05%
2012	1,730,289	275,314	11,539	2,017,142	0.57%
2013	2,422,608	256,407	20,812	2,699,827	0.77%
2014	1,909,752	257,967	31,754	2,199,473	1.44%
2015	2,120,060	205,556	30,896	2,356,512	1.31%
2016	2,412,277	210,885	51,841	2,675,003	1.94%
2017	3,167,952	217,268	69,403	3,454,623	2.01%
2018	3,534,473	197,713	55,845	3,788,031	1.47%
2019	2,542,701	163,149	53,554	2,759,404	1.94%
2020	492,613	129,252	25,702	647,567	3.97%
2021	320,997	70,887	32,675	424,559	7.70%
2022	810,346	90,452	50,885	951,683	5.35%
Average	1,941,124	191,211	38,060	2,170,396	1.75%

Source: ADF&G and NMFS Alaska Region CAS.

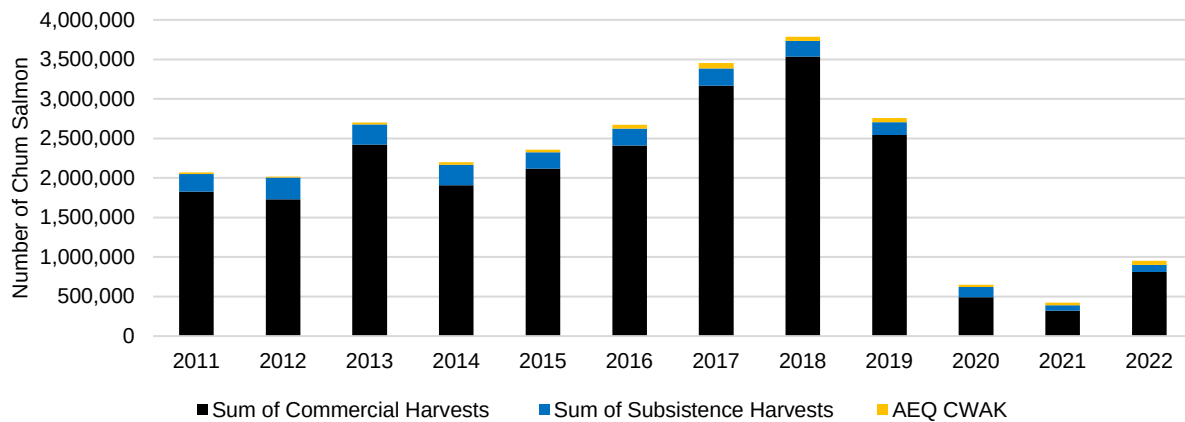


Figure 3-19 Comparison of subsistence (blue) and State commercial (black) harvest of CWAK chum salmon to the mean AEQ estimates of chum salmon bycatch from the Bering Sea pollock fishery (yellow), 2011-2022. Results are from the stochastic AEQ model.

Source: ADF&G and NMFS Alaska Region CAS.

Figure 3-20 shows the Yukon River fall chum salmon inriver run reconstruction (95% CI) and the pollock fishery's impact rate (90% CI) in each year from 2011–2022. The impact rate of bycatch on Upper/Middle Yukon chum fluctuated annually and averaged 1.0%. The impact rate was lowest in 2013 (0.22%) and 2019 (0.28%) and highest in 2021 (4.94%, 3.09%–7.33 90%CI). The higher impact rate observed in 2021 was due to 2021 being the year of highest overall bycatch and the lowest Yukon fall chum salmon run in the analyzed period. As would be expected, this indicates the impact of bycatch was greater in years of low abundance.

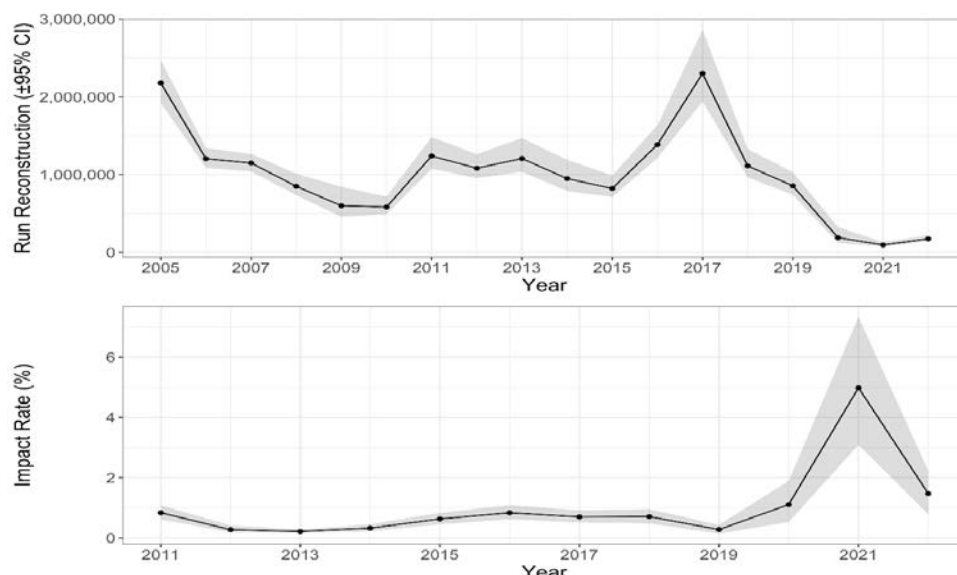


Figure 3-20 Yukon River fall chum salmon inriver run reconstruction (with 95% credible intervals in top panel) with and the impact rate (with 90% credible intervals in bottom panel), 2011–2022

Source: NMFS Alaska Region CAS and ADF&G.

3.3.4.2 Alternative 2

Alternative 2 would include an overall chum salmon PSC limit set at an amount between 100,000 and 550,000 chum salmon. The PSC limit would be in effect each year during the B season (June 10 – November 1), apportioned among the pollock sectors, and fishing must cease if the cap is met. The impact analysis for Alternatives 2 and 3 is based on a retrospective evaluation of when a given PSC limit and apportionment would have closed the B season earlier than what actually occurred for a sector, at which point the remaining amount of chum salmon PSC is considered “saved” (see Section 3.1.4).

This is a useful and necessary approach to quantify potential chum salmon and WAK chum salmon PSC reductions, as if the overall PSC limit had been in place in previous years and without changes in fleet behavior. It provides the best quantitative benchmark for potential savings, and it allows for a comparison to be made among the alternatives, PSC limit amounts, and apportionments. However, this method ignores the fact that the fleet would take measures to avoid reaching the PSC limit in the future and so the estimates are contextualized with a discussion on how the fleet may react to this regulatory change. Future changes in fishing behavior would depend on the perceived risk of hitting the overall PSC limit, fishermen’s ability to adapt, and the associated costs.

3.3.4.2.1 Overall Chum Salmon Savings Estimates

Table 3-34 shows the number of chum salmon that would have been saved had the PSC limits and apportionment options under consideration been in place from 2011–2023 and no changes in fishing behavior occurred. Cells without a value indicate years when the combination of PSC limit and apportionment were not met. Notice that there were some years when the bycatch exceeded the hard cap amount. This is due to variable weekly patterns in the historical bycatch and data lags from shoreside observers. It is not expected that this issue will be present in the future because fishing behavior would change to the extent practicable, and NMFS as well as cooperative managers would closely monitor chum salmon PSC prior to the limit being reached.

The PSC limits under consideration were shown to have had no effect in the year with the lowest historical bycatch (2012) and a greater effect in years with high historical bycatch (2021 and 2017). The greatest impact from a single sector and year would have occurred in 2021 at 289,446 chum salmon from the inshore sector under a 100,000-chum salmon PSC limit using apportionment Option 4 (AFA). This

represented approximately an 85% reduction from the sector's status quo bycatch. The greatest fleet-wide impact was shown under a 100,000-chum salmon PSC limit apportioned using Option 3 (pro rata) at a reduction of 56.4% of the total bycatch across all years.

As would be expected, the bycatch reductions decreased with a higher PSC limit. In contrast, across all years, the greatest fleet-wide impact under a PSC limit of 325,000 chum salmon and 550,000 chum salmon was shown using the apportionment Option 1 (3-year average) at a reduction of 12.4% and 3.6% of the total bycatch, respectively. Under these PSC limits, the greatest fleet-wide impact would have occurred using the 3-year average apportionment, due to the fact that this apportionment is the most constraining for the CDQ and CP sectors which also had relatively high bycatch in some years (*e.g.*, 2016 and 2017). This trend continues under a PSC limit of 550,000 chum salmon.

Under any PSC limit and apportionment combination, there was substantial interannual variability in the chum salmon bycatch reductions that would have occurred (2011–2023). As an example, in the years that a 100,000-chum salmon PSC limit would have been met using apportionment Option 1 (3-year average), the CDQ sector's bycatch would have been reduced by 0 chum salmon to a maximum ~73,000 chum salmon using based on the year (Table 3-34). This variation in savings was also the case at higher PSC limits. Thus, when considering average reductions across years from the retrospective analysis, the greater reductions accruing from years with the highest bycatch (2021 and 2017) may drive overall savings. However, assuming the interannual variability in the actual bycatch that occurred from 2011–2023 was influenced by more factors than the fleet's PSC avoidance behavior alone, this interannual variability illustrates the chum salmon bycatch reduction achieved in the future under a given combination of PSC limit and apportionment would be due to fleet performance against the limit *as well as* external factors beyond the fleet's control.

The analysis shows Alternative 2 would be expected to reduce the total bycatch compared to status quo with the magnitude varying by PSC limit, apportionment option, and year. A PSC limit set at a lower amount within the range under consideration would be more likely to become a binding constraint. Perceptions of risk would be shaped by factors like pollock aggregations, environmental conditions, and encounters of other PSC species. As described in Section 3.1.4.2, the retrospective estimates on total chum salmon bycatch reductions would represent a lower bound in terms of the potential savings that could be realized in the future, if sectors are able to stay below the PSC limit under Alternative 2. The same cannot be said for the retrospective estimates of WAK chum salmon bycatch reductions under Alternative 2. These values do not represent either a lower or upper bound for potential savings.

Table 3-34 Estimates of total chum salmon bycatch reductions as if the overall chum salmon PSC limits and sector apportionments were in place from 2011–2023

Cap:	100,000				325,000				550,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011		18,605	13,950	46,993								
2012												
2013				37,151								
2014		36,702		81,273								
2015		15,601	4,696	76,757								
2016	7,434	111,826	32,492	68,533		56,071	9,836			4,019		
2017	72,998	173,273	7,534	86,531	51,395	110,576			51,395	62,363		
2018	12,995	65,623	9,976	78,910	3,859	23,055						
2019	6,522	88,183	30,062	97,213		18,785	7,917					
2020	2,054	49,565	10,003	166,392		4,961		12,437				
2021	6,358	37,412	41,389	265,246	6,358	22,304	9,694	94,626	6,358		200	
2022	0	25,278	18,921	42,505			27					
2023		221	5,407	2,025								
Apportionment Option 2: 5-Year Average												
2011		18,605	13,950	58,971								
2012												
2013				49,747								
2014		36,702		81,273								
2015		9,729	4,273	76,757								
2016	7,434	102,929	32,492	68,533		48,996	9,836					
2017	72,998	173,273	2,444	86,531	51,395	110,576			13,321	62,363		
2018	12,995	65,623	9,976	78,910	3,434	9,445						
2019	6,522	88,183	30,062	97,213		18,785	7,917					
2020	1,453	49,565	10,003	166,392				45,164				
2021	6,358	37,412	39,786	265,246	6,358	7,726	9,694	94,626	6,358			13,053
2022		25,278	18,921	42,505			27					
2023			5,407	7,729								
Apportionment Option 3: Pro Rata												
2011		18,605	13,950	58,971								
2012												
2013				49,747								
2014		36,702		81,273								
2015		9,729	4,696	76,757								
2016	7,434	102,929	32,492	68,533		48,996	9,836					
2017	72,998	173,273	7,534	86,531	51,395	110,576			13,321	62,363		
2018	12,995	65,623	9,976	78,910	3,434	9,445						
2019	6,522	82,005	30,062	97,213		18,785	7,917					
2020	1,453	49,565	10,003	166,392				45,164				
2021	6,358	37,412	41,389	265,246	6,358	7,726	9,694	94,626	6,358		200	13,053
2022		25,278	18,921	42,505			27					
2023			5,407	7,729								
Apportionment Option 4: AFA												
2011		3,963	13,950	73,762								
2012												
2013				60,923								
2014		20,942		81,273								
2015		2,128	4,696	76,757				21,994				
2016	4,327	95,698	32,492	94,233	51,395	4,019	9,836					
2017	72,998	110,576	7,534	86,531		62,363		1,782	13,321	1,321		
2018	12,995	40,571	9,976	89,373								
2019	3,446	70,565	30,062	122,723			7,917	12,055				
2020		32,244	10,003	166,392	6,358			86,458				
2021	6,358	37,412	41,389	289,446			9,694	94,626	263		778	13,053
2022		25,278	18,921	81,764			27					
2023			5,407	12,176								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 3-35 Estimates of total chum salmon bycatch reductions reported in Table 3-34 as a percentage reduction from the sector's total B season bycatch as if the overall chum salmon PSC limits and sector apportionment options were in place from 2011–2023

Cap:	100,000				325,000				550,000			
Sector:	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average												
2011		42.00%	57.17%	39.54%								
2012												
2013				33.62%								
2014		58.20%		55.93%								
2015		38.96%	33.43%	44.03%								
2016	45.49%	82.99%	75.11%	47.30%		41.61%	22.74%			2.98%		
2017	83.85%	83.56%	44.78%	55.97%	59.04%	53.33%			59.04%	30.08%		
2018	48.88%	65.99%	46.83%	53.55%	14.52%	23.18%						
2019	41.47%	77.74%	67.01%	56.26%		16.56%	17.65%					
2020	23.93%	64.25%	50.67%	70.02%		6.43%		5.23%				
2021	11.42%	38.21%	81.89%	77.61%	11.42%	22.78%	19.18%	27.69%	11.42%		0.40%	
2022	0.0%	35.21%	58.65%	32.23%			0.08%					
2023		0.98%	28.31%	3.03%								
Apportionment Option 2: 5-Year Average												
2011		42.00%	57.17%	49.61%								
2012												
2013				45.02%								
2014		58.20%		55.93%								
2015		24.29%	30.42%	44.03%								
2016	45.49%	76.39%	75.11%	47.30%		36.36%	22.74%					
2017	83.85%	83.56%	14.53%	55.97%	59.04%	53.33%			15.30%	30.08%		
2018	48.88%	65.99%	46.83%	53.55%	12.92%	9.50%						
2019	41.47%	77.74%	67.01%	56.26%		16.56%	17.65%					
2020	16.93%	64.25%	50.67%	70.02%				19.01%				
2021	11.42%	38.21%	78.72%	77.61%	11.42%	7.89%	19.18%	27.69%	11.42%			3.82%
2022		35.21%	58.65%	32.23%			0.08%					
2023			28.31%	11.55%								
Apportionment Option 3: Pro Rata												
2011		42.00%	57.17%	49.61%								
2012												
2013				45.02%								
2014		58.20%		55.93%								
2015		24.29%	33.43%	44.03%								
2016	45.49%	76.39%	75.11%	47.30%		36.36%	22.74%					
2017	83.85%	83.56%	44.78%	55.97%	59.04%	53.33%			15.30%	30.08%		
2018	48.88%	65.99%	46.83%	53.55%	12.92%	9.50%						
2019	41.47%	72.30%	67.01%	56.26%	0.00%	16.56%	17.65%					
2020	16.93%	64.25%	50.67%	70.02%	0.00%	0.00%	0.00%	19.01%				
2021	11.42%	38.21%	81.89%	77.61%	11.42%	7.89%	19.18%	27.69%	11.42%		0.40%	3.82%
2022		35.21%	58.65%	32.23%			0.08%					
2023			28.31%	11.55%								
Apportionment Option 4: AFA												
2011		8.95%	57.17%	62.06%								
2012												
2013				55.14%								
2014		33.21%		55.93%								
2015		5.31%	33.43%	44.03%				12.62%				
2016	26.48%	71.02%	75.11%	65.04%		2.98%	22.74%					
2017	83.85%	53.33%	44.78%	55.97%	59.04%	30.08%		1.15%	15.30%	0.64%		
2018	48.88%	40.80%	46.83%	60.65%								
2019	21.91%	62.21%	67.01%	71.02%			17.65%	6.98%				
2020		41.80%	50.67%	70.02%				36.38%				
2021	11.42%	38.21%	81.89%	84.69%	11.42%		19.18%	27.69%	0.47%		1.54%	3.82%
2022		35.21%	58.65%	61.99%			0.08%					
2023			28.31%	18.20%								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.3.4.2.2 Adult Equivalent Chum Salmon Savings Estimates

This section provides the mean estimates for the AEQ reductions from the stochastic model for the chum salmon PSC limits and sector apportionments in each year from 2011–2022. Table 3-36 provides the mean AEQ reductions the CWAK reporting group alongside the status quo AEQ (gray) for comparison. Table 3-37 provides the same information for the Upper/Middle Yukon reporting group. Additionally, Table 3-38 and Table 3-39 show the mean AEQ reductions from the stochastic model for each reporting group as a percentage reduction from the status quo.

In Table 3-36 through Table 3-40, cells without a value indicate the stochastic model did not produce AEQ reductions in that year for the combination of PSC limit and apportionment. Some of the stochastic reductions were negative simply due to the random draw of parameter values (*e.g.*, age specific mortality, genetic stock composition, age composition of the bycatch) for the status quo which led to marginally lower values of AEQ than those simulated under a management measure. This can be seen with the overlap of the 5th to 95th percentile regions in Figure A3-10 in Appendix 3. These cases suggest the estimates are no different from zero and not that the impacts would increase under the proposed measure from status quo. Cells with a value of “0” or “0.00%” indicate these cases.

Similar to total chum salmon, the greatest AEQ reductions would have occurred under the lowest overall PSC limit because fewer chum salmon would have been taken as bycatch. An overall chum salmon PSC limit of 100,000 fish apportioned using Option 3 (pro rata) would have reduced the AEQ bycatch for the CWAK reporting group by an average of 21,652 fish and an average of 3,448 fish for the Upper/Middle Yukon reporting group (2011–2022). The greatest impact that would have occurred in a single year was 2017 under a 100,000-chum salmon PSC limit using apportionment Option 1 (3-year average) at 47,931 AEQ fish for the CWAK reporting group and 11,593 fish for the Upper/Middle Yukon reporting group. This higher estimate in 2017 was due to greater historical bycatch levels occurring in 2016 and 2017 and the bycatch in these years had a relatively large component of WAK and number of age-4 fish. The maturity schedule used in the AEQ model accounted for a large proportion of those fish maturing at age-4 and age-5.

Notice that the bycatch reductions varied marginally from one another based on the apportionment. The annual average AEQ reductions under a 100,000-chum salmon PSC limit for the CWAK reporting group would have been 21,519 fish, 21,612 fish, 21,652 fish, and 21,303 fish in order of apportionment option. The annual average AEQ reductions for the Upper/Middle Yukon reporting group would have been 3,391 fish, 3,437 fish, 3,448 fish, and 3,308 fish again in order of apportionment option.

When the alternatives are evaluated against their ability to reduce the AEQ bycatch of WAK chum salmon, AEQ bycatch reductions continued to accrue in years when the overall chum salmon PSC limit was *not met* (Table 3-36). For instance, no sector would have met a PSC limit of 550,000 chum salmon under any apportionment in 2018–2020 but AEQ savings from each reporting group were shown to accrue in these years because the PSC limit was met in prior years. Due to the fact that chum salmon mature and return to their river systems at multiple ages, the effect of bycatch reductions in the future would be spread over multiple calendar years. This dynamic is present across all proposed action alternatives but can only be quantitatively shown for Alternative 2 and 3.

Finally, the reported AEQ bycatch reductions do not represent either a lower or upper bound of potential future savings. The actual AEQ bycatch in future years would depend on the total bycatch level achieved as well as the genetic composition and age composition of the bycatch in a given year. The spatiotemporal dynamics associated with WAK chum salmon encounters would also play a role. For instance, a greater proportion of the bycatch has been WAK fish from June – August. An early closure in mid-August compared to early October may have a greater positive impact on WAK chum salmon. However, the pollock fishery could reduce its WAK bycatch in the future but these fish may not return to their river systems as they could still be caught by other fisheries at sea (*e.g.*, Area M fishery). This dynamic is not accounted for in the AEQ estimates.

Table 3-36 Estimates of the mean AEQ reductions from Alternative 1 (status quo) for the CWAK reporting group as if the overall chum salmon PSC limits and sector apportionments were in place from 2011–2022. A stochastic model was used for AEQ estimation.

Year	AEQ (Alt. 1)	100,000-Chum Salmon PSC Limit				325,000-Chum Salmon PSC Limit				550,000-Chum Salmon PSC Limit			
		Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
2011	21,815	8,600	9,830	9,877	9,903								
2012	11,539	3,925	4,483	4,521	4,535								
2013	20,812	6,022	7,887	7,904	9,557								
2014	31,754	14,718	15,625	15,665	14,953								
2015	30,896	14,472	14,091	14,217	12,834				1,472				
2016	51,841	30,564	29,227	29,282	30,406	7,197	6,398	6,430	2,650	635			
2017	69,403	47,931	46,819	47,296	42,193	19,945	19,302	19,396	12,453	11,369	7,470	7,495	1,596
2018	55,845	36,284	35,897	36,187	31,446	12,248	10,859	10,968	6,709	6,413	4,386	4,264	860
2019	53,554	33,467	33,429	32,977	32,322	5,822	4,924	5,055	3,140	1,317	865	774	185
2020	25,702	16,324	16,322	16,044	16,104	1,986	2,218	2,195	2,216	51	63	0	33
2021	32,675	21,189	21,097	21,119	21,538	5,629	5,863	5,810	6,707	295	650	705	444
2022	50,885	24,727	24,641	24,731	29,843	4,536	4,486	4,497	4,747	313	627	607	383

Source: NMFS Alaska Region CAS, data compiled by ABL.

Table 3-37 Estimates of the mean AEQ reductions from Alternative 1 (status quo) for the Upper/Middle Yukon reporting group as if the overall chum salmon PSC limits and sector apportionments were in place, 2011–2022, A stochastic model was used for AEQ estimation.

Year	AEQ (Alt. 1)	100,000-Chum Salmon PSC Limit				325,000-Chum Salmon PSC Limit				550,000-Chum Salmon PSC Limit			
		Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
2011	10,585	4,249	4,927	4,930	4,938								
2012	3,088	955	1,111	1,116	1,116								
2013	2,641	704	936	924	1,124								
2014	3,134	1,310	1,469	1,445	1,443								
2015	5,247	2,284	2,198	2,204	2,042				400				
2016	11,834	7,121	6,814	6,826	7,152	1,833	1,654	1,724	684	212			
2017	16,415	11,539	11,305	11,435	9,927	4,915	4,887	4,937	3,090	3,134	2,065	2,031	459
2018	7,946	5,057	5,023	5,053	4,422	1,547	1,363	1,342	822	852	541	562	47
2019	2,452	1,465	1,462	1,465	1,346	303	190	211	102	63	47	43	0
2020	2,175	1,418	1,410	1,395	1,321	110	231	251	421	0	0	0	1
2021	5,007	3,242	3,233	3,245	3,298	878	962	933	1,011	22	116	132	51
2022	2,615	1,350	1,359	1,344	1,569	262	283	289	288	0	26	53	17

Source: NMFS Alaska Region CAS, data compiled by ABL.

Table 3-38 Estimates of the mean AEQ reductions for the CWAK group reported in Table 3-36 as a percentage reduction from status quo as if the overall chum salmon PSC limits and apportionments were in place from 2011–2022. A stochastic model was used for AEQ estimation.

Year	AEQ (Alt. 1)	100,000-Chum Salmon PSC Limit				325,000-Chum Salmon PSC Limit				550,000-Chum Salmon PSC Limit			
		Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
2011	21,815	39.36%	44.84%	45.21%	45.33%								
2012	11,539	33.81%	38.02%	38.95%	39.07%								
2013	20,812	28.93%	37.87%	37.97%	45.91%								
2014	31,754	46.31%	49.06%	49.29%	47.04%								
2015	30,896	46.67%	45.07%	45.85%	41.39%				4.75%				
2016	51,841	58.83%	56.05%	56.37%	58.53%	13.85%	12.32%	12.38%	5.10%	1.22%			
2017	69,403	69.02%	67.36%	68.11%	60.76%	28.72%	27.79%	27.93%	17.93%	16.37%	10.76%	10.79%	2.30%
2018	55,845	64.78%	63.78%	64.60%	56.14%	21.87%	19.39%	19.58%	11.98%	11.45%	7.83%	7.61%	1.53%
2019	53,554	62.28%	61.86%	61.37%	60.15%	10.83%	9.16%	9.41%	5.84%	2.45%	1.61%	1.44%	0.34%
2020	25,702	63.15%	62.57%	62.07%	62.30%	7.68%	8.58%	8.49%	8.57%	0.20%	0.24%	0.00%	0.13%
2021	32,675	64.70%	64.19%	64.49%	65.76%	17.19%	17.90%	17.74%	20.48%	0.90%	1.98%	2.15%	1.36%
2022	50,885	48.39%	47.80%	48.40%	58.40%	8.88%	8.78%	8.80%	9.29%	0.61%	1.23%	1.19%	0.75%

Source: NMFS Alaska Region CAS, data compiled by ABL.

Table 3-39 Estimates of the mean AEQ reductions for the Upper/Middle Yukon group reported in Table 3-37 as a percentage reduction from status quo as if the overall chum salmon PSC limits and apportionments were in place from 2011–2022. A stochastic model was used for AEQ estimation.

Year	AEQ (Alt. 1)	100,000-Chum Salmon PSC Limit				325,000-Chum Salmon PSC Limit				550,000-Chum Salmon PSC Limit			
		Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
2011	10,585	40.22%	46.64%	46.67%	46.74%								
2012	3,088	30.54%	35.55%	35.69%	35.71%								
2013	2,641	26.77%	35.62%	35.16%	42.77%								
2014	3,134	41.65%	46.71%	45.94%	45.88%								
2015	5,247	43.60%	41.96%	42.06%	38.97%				7.64%				
2016	11,834	60.89%	58.26%	58.37%	61.15%	15.67%	14.14%	14.74%	5.85%	1.81%			
2017	16,415	70.24%	68.81%	69.60%	60.42%	29.92%	29.75%	30.05%	18.81%	19.08%	12.57%	12.36%	2.80%
2018	7,946	63.47%	63.04%	63.42%	55.51%	19.42%	17.11%	16.85%	10.32%	10.69%	6.79%	7.06%	0.59%
2019	2,452	61.36%	61.24%	61.38%	56.37%	12.71%	7.96%	8.85%	4.26%	2.62%	1.97%	1.81%	0.00%
2020	2,175	66.80%	66.40%	65.72%	62.22%	5.19%	10.89%	11.81%	19.82%	0.00%	0.00%	0.00%	0.04%
2021	5,007	65.64%	65.45%	65.70%	66.78%	17.78%	19.47%	18.88%	20.48%	0.44%	2.34%	2.67%	1.04%
2022	2,615	51.19%	51.53%	50.96%	59.49%	9.93%	10.75%	10.94%	10.94%	0.00%	0.99%	2.01%	0.65%

Source: NMFS Alaska Region CAS, data compiled by ABL.

3.3.4.2.2.1 Scaling the AEQ Reductions for the CWAK Reporting Group

This section provides information to better understand the potential conservation benefits of an overall chum salmon PSC limit by scaling the AEQ savings for the CWAK reporting group. As discussed previously, it is not possible to calculate an impact rate for the CWAK reporting group at this time because an aggregate run size is not available. Consequently, the AEQ bycatch reductions for this group are compared to in-river management thresholds for the Yukon summer chum salmon run. Chapter 4 contains an extension of this analysis for directed chum salmon users which is not repeated.

The scaling approach used here is limited because the CWAK reporting group includes more populations than Yukon summer chum salmon, but this approach is appropriate because it is the only stock within the reporting group for which a run reconstruction is available. A run reconstruction provides an estimate of escapements, or the number of fish that are not caught by fisheries and contribute to the spawning population, and harvests. Yukon summer chum salmon also have a drainage-wide escapement goal *and* the management plan contains specific thresholds for directed fisheries opportunities. The drainage wide escapement goal for Yukon summer chum salmon is 500,000–1,200,00 fish. When the run is estimated to be below 500,000 summer chum salmon, all directed chum salmon fisheries are closed. Subsistence opportunities for summer chum salmon may be provided when the run size is above 500,000 fish and commercial opportunities may be provided when the run size is above 650,000 fish (see 5 AAC 05.362).

However, the relative contribution of Yukon summer chum salmon to the CWAK reporting group each year is unknown as are the contributions of other populations in the Kuskokwim, Norton Sound, and Bristol Bay regions. In light of this, the analysis compares the estimates of AEQ CWAK chum salmon savings to the Yukon summer chum salmon run size using 25%, 50%, 75%, and 100% of the estimated AEQ value. **This is a conceptual tool developed to assist decision-makers and should be understood as indicating a spectrum of possible scenarios:** if 100% of the AEQ CWAK savings returned to the Yukon River as summer chum salmon, that would mean 0% of the saved fish return to any other river system encompassed within the reporting group; 50% of the AEQ CWAK savings returned to the Yukon River as summer chum salmon, that would mean 50% of the AEQ CWAK savings would return in unknown amounts to other river systems encompassed within the reporting group; and so on. These data and adjustments are shown in Table 3-40.

While it is unlikely that 100% of the estimated AEQ CWAK savings would return to the Yukon River as summer chum salmon in any given year, this scenario would have created the greatest impact for this stock. This scenario would similarly provide the least conservation benefits to all other stocks encompassed within the reporting group. During the analyzed period 2021 was the lowest return year at 156,130 chum salmon. At this low level of abundance, the reported AEQ savings under the lowest cap amount would not have been sufficient to provide additional opportunities for directed fisheries. Any additional fish returning would potentially help meet escapement but this conservation benefit is not guaranteed. Some number of the AEQ fish estimated to be saved could be caught in other fisheries or face in-river mortalities. It is more accurate to consider these returning fish as having a *potential* positive effect on abundance.

Table 3-40 Estimates of the mean AEQ reductions from the stochastic model for the CWAK reporting group at 100%, 75%, 50%, and 25% of the reported value as if the overall chum salmon PSC limits and apportionments were in place each year from 2011–2022 to the Yukon summer chum salmon run reconstruction (run size)

Apportionment:	Option 1: 3-Year Average				Option 2: 5-Year Average				Option 3: Pro Rata				Option 4: AFA				Yukon Summer
Adjusted AEQ:	100%	75%	50%	25%	100%	75%	50%	25%	100%	75%	50%	25%	100%	75%	50%	25%	Chum Run Size
100,000-Chum Salmon PSC Limit																	
2011	8,600	6,450	4,300	2,150	9,830	7,372	4,915	2,457	9,877	7,408	4,939	2,469	9,903	7,427	4,951	2,476	2,406,000
2012	3,925	2,944	1,962	981	4,483	3,362	2,241	1,121	4,521	3,391	2,261	1,130	4,535	3,401	2,268	1,134	2,479,900
2013	6,022	4,517	3,011	1,506	7,887	5,915	3,943	1,972	7,904	5,928	3,952	1,976	9,557	7,168	4,779	2,389	3,349,600
2014	14,718	11,038	7,359	3,679	15,625	11,719	7,812	3,906	15,665	11,749	7,833	3,916	14,953	11,215	7,476	3,738	2,467,600
2015	14,472	10,854	7,236	3,618	14,091	10,568	7,045	3,523	14,217	10,663	7,109	3,554	12,834	9,626	6,417	3,209	1,978,400
2016	30,564	22,923	15,282	7,641	29,227	21,920	14,613	7,307	29,282	21,962	14,641	7,321	30,406	22,805	15,203	7,602	2,581,500
2017	47,931	35,948	23,965	11,983	46,819	35,114	23,409	11,705	47,296	35,472	23,648	11,824	42,193	31,645	21,097	10,548	3,635,100
2018	36,284	27,213	18,142	9,071	35,897	26,922	17,948	8,974	36,187	27,141	18,094	9,047	31,446	23,585	15,723	7,862	2,074,700
2019	33,467	25,100	16,733	8,367	33,429	25,072	16,714	8,357	32,977	24,733	16,489	8,244	32,322	24,242	16,161	8,081	1,689,400
2020	16,324	12,243	8,162	4,081	16,322	12,241	8,161	4,080	16,044	12,033	8,022	4,011	16,104	12,078	8,052	4,026	763,200
2021	21,189	15,892	10,595	5,297	21,097	15,822	10,548	5,274	21,119	15,840	10,560	5,280	21,538	16,153	10,769	5,384	156,130
2022	24,727	18,545	12,364	6,182	24,641	18,481	12,320	6,160	24,731	18,548	12,366	6,183	29,843	22,383	14,922	7,461	478,690
325,000-Chum Salmon PSC Limit																	
2011																	2,406,000
2012																	2,479,900
2013																	3,349,600
2014																	2,467,600
2015													1,472	1,104	736	368	1,978,400
2016	7,197	5,398	3,599	1,799	6,398	4,799	3,199	1,600	6,430	4,823	3,215	1,608	2,650	1,988	1,325	663	2,581,500
2017	19,945	14,959	9,973	4,986	19,302	14,476	9,651	4,825	19,396	14,547	9,698	4,849	12,453	9,340	6,226	3,113	3,635,100
2018	12,248	9,186	6,124	3,062	10,859	8,144	5,429	2,715	10,968	8,226	5,484	2,742	6,709	5,032	3,354	1,677	2,074,700
2019	5,822	4,366	2,911	1,455	4,924	3,693	2,462	1,231	5,055	3,791	2,528	1,264	3,140	2,355	1,570	785	1,689,400
2020	1,986	1,490	993	497	2,218	1,664	1,109	555	2,195	1,646	1,097	549	2,216	1,662	1,108	554	763,200
2021	5,629	4,221	2,814	1,407	5,863	4,397	2,931	1,466	5,810	4,357	2,905	1,452	6,707	5,030	3,353	1,677	156,130
2022	4,536	3,402	2,268	1,134	4,486	3,365	2,243	1,122	4,497	3,372	2,248	1,124	4,747	3,560	2,373	1,187	478,690
550,000-Chum Salmon PSC Limit																	
2011																	2,406,000
2012																	2,479,900
2013																	3,349,600
2014																	2,467,600
2015																	1,978,400
2016	635	476	318	159													2,581,500
2017	11,369	8527	5685	2842	7,470	5,602	3,735	1,867	7,495	5,621	3,748	1,874	1,596	1,197	798	399	3,635,100
2018	6,413	4810	3207	1603	4,386	3,289	2,193	1,096	4,264	3,198	2,132	1,066	860	645	430	215	2,074,700
2019	1,317	988	659	329	865	649	432	216	774	580	387	193	185	139	92	46	1,689,400
2020	51	38	26	13	63	47	31	16	0	0	0	0	33	25	16	8	763,200
2021	295	221	148	74	650	487	325	162	705	529	353	176	444	333	222	111	156,130
2022	313	235	157	78	627	470	314	157	607	455	303	152	383	287	191	96	478,690

Source: NMFS Alaska Region CAS, data compiled by ABL. ADF&G provided run size information.

3.3.4.2.2.2 Impact Rate Reduction for the Upper/Middle Yukon Reporting Group

This section provides information on the potential conservation benefits of an overall chum salmon PSC limit to Yukon River fall chum salmon. Recall the Upper/Middle Yukon reporting group represents Yukon fall chum salmon. An inriver run reconstruction is available for this stock which allowed an impact rate to be calculated (Figure 3-20 and Section 3.3.4.1.3). The status quo impact rate ranged between 0.22% (2013) and 4.94% (2021), averaging 1.0% over the analyzed period. **The proposed alternatives aim to reduce bycatch and its subsequent impact from these levels.**

Here, the potential conservation benefits are quantified by calculating an impact rate reduction. This shows the proportional reduction each analyzed overall chum salmon PSC limit and apportionment could have for the Upper/Middle Yukon genetic group compared to the status quo impact rate. These data are shown in Table 3-41 which reports the mean estimates from the stochastic AEQ model (see Appendix 3). The impact rate reduction was calculated using the AEQ for the Upper/Middle Yukon genetic group that would have been caught under a given management scenario and the Yukon River fall chum salmon run reconstruction were used to calculate the new impact rate. The new impact rate estimate was then subtracted from the status quo impact rate in the same year.

As expected, the greatest reductions were estimated under a 100,000-chum salmon PSC limit. As the PSC limit amount increases to the mid-point and upper end of the analyzed range, the reductions from status quo decreased. The uncertainty surrounding the impact rate reductions also increased (see Appendix 3). The greatest reduction from status quo was 3.27% (with 5th to 95th percentiles ranging between 1.35%–5.38%) in 2021 under the lowest PSC limit using apportionment Option 1 (AFA). Another way to understand this reduction is to say that, had an overall PSC limit of 100,000-chum salmon been in effect in 2021 (and apportioned using Option 1), the model estimates the pollock fishery's impact on the Yukon fall chum salmon run (*i.e.*, the Upper/Middle Yukon reporting group) would have been 1.73% of the run size in that year. The larger reduction in 2021 is explained by that year having the highest impact rate under status quo due to the higher bycatch in that year, the AEQ that accrued from prior years, and the Yukon fall chum salmon run was at its lowest level as well as the largest reductions in the overall bycatch under this PSC limit and apportionment combo.

Table 3-41 Estimates of the mean impact rate reduction for the Upper/Middle Yukon genetic group as if the overall chum salmon PSC limits and apportionments were in place from 2011–2022 compared to status quo. A stochastic model was used for AEQ estimation.

Year	Alt. 1 Impact Rate	100,000-Chum Salmon PSC Limit				325,000-Chum Salmon PSC Limit				550,000-Chum Salmon PSC Limit			
		Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
2011	0.84%	0.34%	0.39%	0.39%	0.39%								
2012	0.28%	0.09%	0.10%	0.10%	0.10%								
2013	0.22%	0.06%	0.08%	0.08%	0.09%								
2014	0.33%	0.14%	0.15%	0.15%	0.15%								
2015	0.63%	0.28%	0.27%	0.27%	0.25%				0.05%				
2016	0.84%	0.51%	0.49%	0.49%	0.51%	0.13%	0.12%	0.12%	0.05%	0.02%			
2017	0.71%	0.49%	0.48%	0.49%	0.42%	0.21%	0.21%	0.21%	0.13%	0.13%	0.09%	0.09%	0.02%
2018	0.71%	0.45%	0.45%	0.45%	0.39%	0.14%	0.12%	0.12%	0.07%	0.08%	0.05%	0.05%	0.00%
2019	0.28%	0.17%	0.17%	0.17%	0.16%	0.04%	0.02%	0.03%	0.01%	0.01%	0.01%	0.01%	0.00%
2020	1.11%	0.75%	0.74%	0.73%	0.70%	0.06%	0.12%	0.13%	0.22%	0.00%	0.00%	0.00%	0.01%
2021	4.94%	3.21%	3.20%	3.21%	3.27%	0.85%	0.93%	0.90%	0.97%	0.03%	0.12%	0.13%	0.05%
2022	1.48%	0.76%	0.76%	0.75%	0.88%	0.15%	0.16%	0.16%	0.16%	0.00%	0.02%	0.03%	0.01%

Source: NMFS Alaska Region CAS, data compiled by ABL.

3.3.4.3 Alternative 3

Alternative 3 is similar to Alternative 2, except the overall chum salmon PSC limit would only be in effect the year after chum salmon returns were below their thresholds (see Section 2.4.1.1). Two different abundance indices are being considered but only one may be selected. ADF&G would provide the Council and NMFS information and an evaluation of whether the index met its thresholds prior to October 1 of each year. For each option, two suboptions for threshold amounts are being considered. Suboption 1 would use the 25th percentile of historical abundance for each area or stock and Suboption 2 would use the 50th percentile (Table 2-15).

Option 1 includes a Three-area index based on returns in the Yukon, Kuskokwim, and Norton Sound areas.

- If all three areas have returns above their thresholds, an overall chum salmon PSC limit would not be applied the following year.
- If two areas have returns above their thresholds, an overall chum salmon PSC limit would be applied the following year and set at an amount between 100,000 and 550,000 chum salmon.
- If one or zero areas have returns above their thresholds, an overall chum salmon PSC limit would be applied the following year set at 75% of the amount selected when two areas have returns above their thresholds.

Option 2 includes a Yukon Area index based on Yukon River summer and fall chum salmon returns.

- If both stocks have returns at or above their thresholds, an overall chum salmon PSC limit would not be applied the following year.
- If one or zero stocks have returns above their thresholds, an overall chum salmon PSC limit would be applied the following year and set at an amount between 100,000 and 550,000 chum salmon.

3.3.4.3.1 Evaluation of Index Thresholds

Table 3-42 shows chum salmon returns to each area included in the Option 1 index based on their specific data sources from 2011 through 2023. Gray shading indicates returns below thresholds set at the 25th percentile of historical abundance (2011–2023). Table 3-43 provides the same information but evaluates returns based on thresholds set at the 50th percentile of historical abundance for Option 1. Table 3-44 is specific to Option 2 and it shows the number of years when the Yukon River summer and fall chum salmon returns were below the 25th percentile (left) and 50th percentile (right) of historical abundance.

An overall PSC limit would have been in effect in 3 or 6 years under Option 1 and in 3 or 5 years under Option 2. Evaluating the index thresholds as if they were in place from 2011–2023 shows a PSC limit would not have been in effect in consecutive years until there was a consistent decline in abundance. This was observed starting in 2020. Additionally, is an inherent lag in when (the year) the PSC limit would apply.

Table 3-42 Years when historical abundance fell below the 25th percentile (Suboption 1) in the Norton Sound, Yukon, and Kuskokwim Areas under Option 1 index (gray) and an indication of whether an overall PSC limit would have been in effect under Alternative 3, Option 1, 2011–2023

Year	Yukon	Kuskokwim	Norton Sound	PSC Limit in Effect and Amount
2011	3,650,141	604,032	202,421	
2012	3,569,100	408,639	107,359	
2013	4,565,409	336,618	188,104	
2014	3,424,269	374,395	215,382	
2015	2,806,853	162,410	259,441	
2016	3,971,829	228,055	124,397	
2017	5,950,983	401,853	324,148	
2018	3,189,384	555,589	363,939	
2019	2,492,364	385,409	234,270	
2020	947,433	76,369	49,762	
2021	251,379	25,689	21,735	75% of 100-550k
2022	721,155	103,864	70,702	75% of 100-550k
2023	1,215,537	251,542	38,469	75% of 100-550k
25th percentile	1,713,000	151,636	57,300	-

Source: ADF&G.

Notes: Gray highlighting indicates values below the 25th percentile of historical abundance.**Table 3-43 Years when historical abundance fell below the 50th percentile (Suboption 2) in the Norton Sound, Yukon, and Kuskokwim Areas under Option 1 index (gray) and an indication of whether an overall PSC limit would have been in effect under Alternative 3, Option1, 2011–2023**

Year	Yukon	Kuskokwim	Norton Sound	PSC Limit in Effect and Amount
2011	3,650,141	604,032	202,421	
2012	3,569,100	408,639	107,359	
2013	4,565,409	336,618	188,104	
2014	3,424,269	374,395	215,382	
2015	2,806,853	162,410	259,441	
2016	3,971,829	228,055	124,397	
2017	5,950,983	401,853	324,148	
2018	3,189,384	555,589	363,939	
2019	2,492,364	385,409	234,270	
2020	947,433	76,369	49,762	100-550K
2021	251,379	25,689	21,735	75% of 100-550k
2022	721,155	103,864	70,702	75% of 100-550k
2023	1,215,537	251,542	38,469	75% of 100-550k
50th percentile	2,718,400	306,017	91,500	-

Source: ADF&G.

Notes: Gray highlighting indicates values below the 25th percentile of historical abundance.

Table 3-44 Years when Yukon River summer and fall chum salmon run sizes, based on the respective run reconstructions, were below the 25th percentile (left, Suboption 1) and 50th percentile (right, Suboption 2) of historical abundance for Alternative 3, Option 2, 2011–2023

	Suboption 1: 25 th Percentile		Suboption 2: 50 th Percentile	
	Yukon Summer Chum	Yukon Fall Chum	Yukon Summer Chum	Yukon Fall Chum
	1,268,700	444,600	1,978,700	803,000
2011	2,406,000	1,244,141	2,406,000	1,244,141
2012	2,479,900	1,089,200	2,479,900	1,089,200
2013	3,349,600	1,215,809	3,349,600	1,215,809
2014	2,467,600	956,669	2,467,600	956,669
2015	1,978,400	828,453	1,978,400	828,453
2016	2,581,500	1,390,329	2,581,500	1,390,329
2017	3,635,100	2,315,883	3,635,100	2,315,883
2018	2,074,700	1,114,684	2,074,700	1,114,684
2019	1,689,400	802,964	1,689,400	802,964
2020	763,200	184,233	763,200	184,233
2021	156,130	95,249	156,130	95,249
2022	478,690	242,465	478,690	242,465
2023	896,850	318,687	896,850	318,687

Source: ADF&G.

Notes: Grey highlighting indicates years when the run size fell below index thresholds.

3.3.4.3.2 Overall and Adult Equivalent Chum Salmon Savings

The impact analysis for Alternative 3 uses the same methods as Alternative 2 and is focused on the impacts that may occur due to the conditional application of a PSC limit and a PSC limit of 75,000 chum salmon for Option 1 only. As stated previously, the range of PSC limits being considered under Alternative 3 is otherwise the same as that for Alternative 2. A PSC limit of 75,000 chum salmon could only have been in place in a limited number of years (2021–2023) and only if the PSC limit set when one area failed to meet its thresholds was 100,000 chum salmon under Option 1.

Table 3-45 provides the estimates of total chum salmon PSC reductions under this PSC limit, as if it had been in place from 2021–2023. Table 3-46 provides the estimates for AEQ bycatch reductions for the CWAK reporting group in 2021 and 2022. The AEQ adjustments to 75%, 50%, and 25% of the mean estimate are also provided to align with the information provided for Alternative 2 (Table 3-40). Table 3-47 provides the estimates of AEQ reductions for the Upper/Middle Yukon group in 2021 and 2022 and Table 3-48 shows the estimated mean impact rate reductions for the reporting group in the same years.

There was a marginal difference between Option 1 and Option 2, in terms of the maximum number of years a PSC limit would have been in effect. Instead, the percentile of historical abundance that would be used to determine whether a hard cap would be in effect was more of a determining factor with the 50th percentile being more likely to result in an overall chum salmon PSC limit in effect. This threshold value may also detect a decline earlier and provide a greater benefit than thresholds set at the 25th percentile.

If conditions in the future are similar to what was observed under status quo, Alternative 3 would result in the hard cap being in effect in a variable number of years. In the years the PSC limit would not be in place, the impacts to chum/WAK chum salmon PSC would be similar to status quo. A 75,000-chum salmon PSC limit would be expected to generate marginally greater reductions compared to a PSC limit of 100,000 chum salmon. When the potential effects of the alternatives are considered across multiple years, Alternative 3 has less potential to reduce chum/WAK chum PSC than Alternative 2 due to the conditional application of the PSC limit.

Table 3-45 Estimates of total chum salmon bycatch reductions as if an overall chum salmon PSC limit of 75,000 fish and sector apportionments were in place under Alternative 3, Option 1 from 2021–2023

	CDQ	CP	M	Inshore
Apportionment Option 1: 3-Year Average				
2021	50,134	37,412	41,389	289,446
2022	689	55,285	18,921	81,764
2023		4,234	10,744	12,176
Apportionment Option 2: 5-Year Average				
2021	50,134	37,412	41,389	289,446
2022	689	25,278	18,921	81,764
2023		2,822	10,744	12,176
Apportionment Option 3: Pro Rata				
2021	50,134		41,389	289,446
2022	689	25,278	18,921	93,226
2023			10,744	12,176
Apportionment Option 4: AFA				
2021	6,358	37,412	41,389	289,446
2022		25,278	18,921	93,226
2023			10,744	12,176

Source: NMFS Alaska Region CAS, data compiled by AKFIN and ABL.

Table 3-46 Estimates of the mean AEQ reductions from the stochastic model for the CWAK group as if an overall chum salmon PSC limit of 75,000 fish and sector apportionments were in place under Alternative 3, Option 1 were in place in 2021 and 2022; the mean AEQ estimates are provided at 100%, 75%, 50%, and 25% of the reported value

	100% AEQ	75% AEQ	50% AEQ	25% AEQ	Yukon Summer Chum Run Size
Apportionment Option 1: 3-Year Average					
2021	24,081	18,061	12,041	6,020	156,130
2022	35,173	26,380	17,587	8,793	478,690
Apportionment Option 2: 5-Year Average					
2021	24,005	18,004	12,003	6,001	156,130
2022	31,659	23,745	15,830	7,915	478,690
Apportionment Option 3: Pro Rata					
2021	24,004	18,003	12,002	6,001	156,130
2022	31,638	23,729	15,819	7,910	478,690
Apportionment Option 4: AFA					
2021	23,227	17,420	11,613	5,807	156,130
2022	31,923	23,942	15,962	7,981	478,690

Source: NMFS Alaska Region CAS, data compiled by ABL.

Table 3-47 Estimates of the mean AEQ reductions for the Upper/Middle Yukon reporting group as if an overall chum salmon PSC limit of 75,000 fish and sector apportionments were in place under Alternative 3, Option 1 in 2021 and 2022. A stochastic model was used for AEQ estimation.

Year	Option 1	Option 2	Option 3	Option 4
2021	3,681	3,670	3,669	3,556
2022	1,832	1,692	1,679	1,666

Source: NMFS Alaska Region CAS, data compiled by ABL.

Table 3-48 Estimates of the mean impact rate reduction for the Upper/Middle Yukon group as if an overall chum salmon PSC limit of 75,000 fish and sector apportionments were in place under Alternative 3, Option 1 in 2021 and 2022. A stochastic model was used for AEQ estimation.

Year	Alt. 1 Impact Rate	Option 1	Option 2	Option 3	Option 4
2021	4.94%	3.69%	3.65%	3.64%	3.53%
2022	1.48%	1.03%	0.95%	0.94%	0.94%

Source: NMFS Alaska Region CAS, data compiled by ABL.

3.3.4.4 Cross-cutting Implications for Alternatives 2 and 3

In this section the analysts discuss implications relevant to both Alternatives 2 and 3.

3.3.4.4.1 Implications of the CDQ Reserve Pool for Chum and WAK Chum Salmon

The adoption of the CDQ Reserve Pool suboption could have implications for chum salmon and WAK chum salmon bycatch. In general, use of the CDQ Reserve Pool would allow for increased PSC of chum salmon, relative to Alternative 2 or 3 on its own, by adding an additional amount to the overall chum salmon PSC limit. The maximum amount of additional chum salmon in the CDQ Reserve Pool under Alternative 2 or 3 is provided in Table 2-12. These numbers represent the additional amount of chum salmon that would be added across CDQ groups' apportionments in a scenario where *all* CDQ groups notified NMFS of an intent to harvest their CDQ pollock on an inshore CV(s) in the upcoming year.

However, this amount would only be accessible by those CDQ groups that provide preseason notice of an intent to harvest their CDQ pollock with the inshore or mothership CV sectors. **It is likely that the amount of chum salmon PSC that would be apportioned each year from the CDQ Reserve Pool would be much less than the maximum amount presented in Table 2-12, if this provision is used at all.**

CDQ pollock has historically been fished on CPs and representative of CDQ groups have expressed their desire to maintain these practices.⁶⁸ As described in Section 4.2.2.2, one group fully owns the CP that has recently been harvesting the majority of their CDQ pollock, but most groups have multi-year leasing agreements with partner companies. They have found this to be a reliable, efficient, and relatively stable source of revenue with which to support their programs. Moreover, as demonstrated by the chum salmon PSC to pollock ratios in Table 2-9 the CP sector as a whole tends to have lower chum salmon encounter rates relative to the inshore or mothership sector. These lower rates of PSC align with the CDQ group's stated goals and testimony of efforts to reduce WAK chum salmon.⁶⁹ Therefore, if available and providing competitive lease rates, the CDQ groups will likely prefer to maintain existing fishing practices with the CP fleet.

However, in the future, it is possible that capacity issues or operational decisions would render a CP platform unavailable for CDQ pollock to be harvested on. The CDQ Reserve Pool is most likely to be used in this case. Even still, this provision contains specific requirements (see Section 5.1.3) that would not make it an accessible solution in the event of an emergency or other unforeseen circumstances. Most notably, chum salmon PSC limits cannot be changed mid-year. For example, in the event of a mid-year issue with a CP, it would be too late for a CDQ group to provide notice to 'switch sectors' to the inshore or mothership sector and access the CDQ Reserve Pool. If a CDQ group provided appropriate notice of an intent to have their B season CDQ pollock harvested by the inshore sector, and they were apportioned extra chum salmon PSC from the pool, they could not switch back to the CP sector mid-year.

Additionally, a CDQ group would need to commit their full B season CDQ pollock to one sector in order for the CDQ Reserve Pool to apply. Overall, this provision is intended to provide flexibility for future scenarios that may look different than the past, but to be taken advantage of it requires early decisions and commitment. Its inability to be used in an emergency or unforeseen situations may be out of alignment with the intended use by the CDQ groups given the desire expressed to remain fishing with CP sector. Given these factors if this provision is used at all, it is highly unlikely that all six CDQ groups would use this provision each year.⁷⁰

Another reason the CDQ groups would be unlikely to access the maximum amount from the CDQ Reserve Pool in Table 2-12 is because these amounts are based on harvesting with the inshore sector; however, a CDQ group(s) may also choose to harvest their CDQ pollock with the mothership sector.

⁶⁸ Public testimony to the Council, February 2025, L. Fanning; S. Ricci.

⁶⁹ For example, public testimony to the Council, February 2025, L. Fanning.

⁷⁰ Section 5.1.2 points out that the concept of the CDQ Reserve Pool could also be internalized among CDQ groups with contractual agreements without the selection of the Suboption as currently defined in the motion.

There is less of a difference between the chum to pollock ratios for the CDQ sector and the mothership sector based on historical encounter rates. Table 2-13 breaks down these adjustments by individual CDQ group if they are associated with the inshore sector and Table 2-14 if they are associated with the mothership sector. These tables provide context for the possible additional impact on chum salmon if only one or two groups use the CDQ Reserve Pool to harvest CDQ pollock with the inshore sector.

A hypothetical example may further illustrate how this suboption would function and its likely effects. Say a 325,000-chum salmon PSC limit was selected with the 3-year average apportionment (Option 1). In this example, Yukon Delta Fisheries Development Association (YDFDA) informs NMFS of an intent to harvest all its B season CDQ pollock in the mothership sector in the upcoming year and Aleutian Pribilof Island Community Development Association (APICDA) informs NMFS of an intent to harvest all of its B season CDQ pollock with the inshore sector.

- For APICDA: NMFS would apply the inshore chum salmon apportionment ratio, increasing that CDQ group's chum salmon allocation by 3,584 chum salmon (from 2,776 to 6,360 fish). This would represent 1.1% over the 325,000-chum salmon PSC limit.
- For YDFDA: NMFS would apply the mothership chum salmon apportionment ratio, increasing that CDQ group's chum salmon allocation by 1,807 chum salmon (from 2,776 to 4,601 fish). This would represent 0.6% over the 325,000-chum salmon PSC limit.
- Combined in this year, the chum salmon PSC limit would be 325,000 + 5,409 extra chum salmon apportioned to CDQ groups. This represents 1.7% over the 325,000-chum salmon PSC limit.

Providing access to a CDQ Reserve Pool could essentially raise the overall ceiling on the amount of chum salmon PSC, and theoretically WAK chum salmon PSC that could be caught under Alternative 2 or 3. However, additional consideration is needed to evaluate whether CDQ groups would catch this additional amount if they received a larger apportionment over the limit.

In this scenario the CDQ groups would fish their CDQ pollock with the inshore or mothership sector and chum salmon encounter rates may look similar to those experienced by these sectors. There is no retrospective data that demonstrates this fishing pattern for the CDQ groups; thus, the impact analysis is not extended in this way. Instead considering the inshore and mothership trends may provide some context of years that may have resulted in more chum salmon PSC and a greater likelihood that CDQ groups would have 'used' this additional amount over the PSC limit. As can be seen in Table 3-35, lower limits are more likely to constrain all sectors. Under a 100,000-chum salmon PSC limit, the inshore sector may have reached its apportionment in 12 of the 13 years, while the CDQ groups as a whole would have met the CDQ apportionment in 5-7 of the 13 years, depending on the apportionment. If CDQ pollock had been harvested with the inshore sector and had similar chum salmon encounter rates, even with an equivalent PSC limit to the inshore sector the CDQ group may have reached its limit more often than demonstrated in Table 3-35.

Although the amount a CDQ group would be able to access from the reserve pool is greater at a higher limit (*e.g.*, maximum amount of 43,328 additional fish under a 550,000 limit with a 3-yr average apportionment if all CDQ groups fished with the inshore sector; Table 2-12), it is less likely that additional chum salmon PSC would be 'used' at a higher limit because the limit would be sufficiently high enough in most years to cover chum salmon PSC that was caught. For instance, at a chum salmon PSC limit of 325,000 the inshore sector reached its apportionment of the limit in 2 to 5 of the 13 years, depending on the apportionment. Thus, the additional PSC from a reserve pool is more likely to be used in these years.

Note that a shift of CDQ pollock typically harvested with the CP sector to the inshore or mothership sectors could increase chum salmon PSC because encounter rates tend to be greater in these sectors. This dynamic could occur in the future under status quo regulations. As stated above it is generally expected that CDQ groups would prefer to continue harvesting with the CP sector for this, among other reasons.

However, this suboption may facilitate increased flexibility for this outcome should CDQ not be able to harvest with the CP fleet.

3.3.4.4.2 Uncertainty in the Potential Impacts to WAK Chum Salmon Bycatch

The analysis provides estimates of the potential overall chum salmon savings under Alternatives 2 and 3 based upon a retrospective assessment of when each sector met a given PSC limit, but this method does not account for future changes in fishing behavior. The quantitative estimates on *overall* chum salmon savings likely represent the lower bound (see Section 3.1.4.2). If in the future fishermen are able to achieve chum salmon bycatch levels below the PSC limit, the overall bycatch reductions would be greater than what is reported in this analysis but the same logic does not inherently apply to WAK chum salmon savings.

WAK fish have not accounted for a majority of the total bycatch and encounters have been spatially and temporally distributed across the B season fishing grounds. The avoidance strategies vessels use to stay below the overall PSC limit, like moving more frequently to new areas or targeting areas with the lowest chum salmon PSC rate *and* aggregations of quality pollock, may or may not reduce WAK bycatch. To illustrate this possibility, Figure 3-21 shows the overall number of chum salmon caught as bycatch (black), the estimated number of WAK chum salmon caught as bycatch (blue), and the estimated proportion of the overall bycatch that WAK fish accounted for (gray). Consider the following examples.

- The WAK component was highest in the 2011 B season at 25.1% of the total, but the overall bycatch of 191,313 chum salmon. In this year, it was estimated 48,020 WAK chum salmon were taken as bycatch.
- The WAK component was lowest in the 2020 B season at 9.1% of the total, but the overall bycatch was 343,094 chum salmon. This overall level was greater than the 2011 B season but due to the lower WAK proportion in this year, it was estimated 31,222 WAK chum salmon were caught as bycatch.
- The 2021 B season was the highest overall year of bycatch in the analyzed period. The WAK component was slightly higher than what was observed in 2020 at 9.3% of the total and the fleet was estimated to have caught 51,512 WAK chum salmon.
- The overall B season bycatch in 2022 was 242,309 chum salmon and represented a 55% reduction from the 2021 B season. The WAK component was estimated at 23.0% and it was estimated the fleet caught 55,724 WAK chum salmon.

These dynamics create uncertainty in whether the changes in fishing behavior in response to an overall chum PSC limit that has the consequence of closing the B season early would reduce WAK chum salmon bycatch compared to Alternative 1.

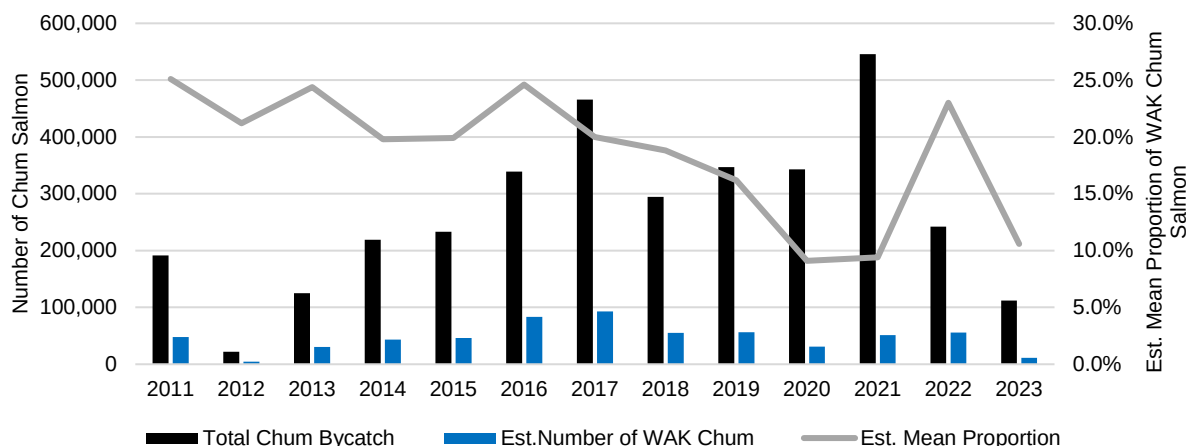


Figure 3-21 Comparison of the total B season chum salmon bycatch, estimated number of WAK chum salmon, and estimated mean proportion of WAK chum salmon in the overall bycatch from 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

However, if the pollock fishery was able to achieve total bycatch levels near the lower end of the range under the status quo (*e.g.*, 2012, 2013, and 2023), WAK chum salmon bycatch would be expected to be reduced, although the proportions would still be variable. Table 3-49 is for illustrative purposes only, providing a possible range of WAK chum salmon bycatch that could be realized in the future under the analyzed hard cap amounts. The estimated low (9.1%), mean (18.6%), and high (25.1%) proportions were multiplied by the hard cap amounts, so they likely represent a worst-case scenario for WAK chum salmon PSC, as if the fleet reached the hard cap. Note, this conceptual exercise is based on an assumption that future environmental conditions and distributions of WAK chum salmon on the pollock fishing grounds would reflect status quo.

Table 3-49 Hypothetical estimates on the number of WAK chum salmon bycatch that could be taken as bycatch under all analyzed overall PSC limit amounts based on the lowest, average, and highest estimated proportion of WAK chum salmon in the overall bycatch from 2011–2023

Overall PSC Limit	WAK Proportion Applied	Hypothetical WAK Chum PSC
75,000	Est. Low (9.1%)	6,825
75,000	Est. Mean (18.6%)	13,950
75,000	Est. High (25.1%)	18,825
100,000	Est. Low (9.1%)	9,100
100,000	Est. Mean (18.6%)	18,623
100,000	Est. High (25.1%)	25,100
325,000	Est. Low (9.1%)	29,575
325,000	Est. Mean (18.6%)	60,525
325,000	Est. High (25.1%)	81,575
550,000	Est. Low (9.1%)	50,050
550,000	Est. Mean (18.6%)	102,426
550,000	Est. High (25.1%)	138,050

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.3.4.4.3 Operational Considerations for Chum Salmon Avoidance

As noted previously, the analysts expect fishing behavior would change if the pollock fleet was required to operate under a chum salmon PSC limit (Alternative 2 or 3) in the future. The magnitude of these behavior changes would likely reflect the degree to which harvesters see the PSC limit as a risk. The fleet currently uses a variety of strategies to avoid chum salmon PSC on the fishing grounds – frequent communication among the fleet and cooperative managers, the RHS program that requires vessels to move to new areas when bycatch rates are unacceptably high, excluder devices, among others. This

section addresses some of the additional tools that could be available to the fleet based on a comparison of the current Chinook program.

Industry representatives have conveyed chum salmon PSC is encountered on the pollock fishing grounds differently than Chinook. Whereas Chinook encounters are more intermittent, chum salmon can be encountered in large pulses and intermixed with pollock. These differences in how the two species are encountered may diminish the utility of some comparisons, but it also highlights a challenge the industry will need to address if it is required to operate under a constraining chum cap. For instance, as described more in (see Section 4.3.2.1), a larger CV could catch between 0 to ~8,000 chum salmon in one trip. This more dynamic nature of historical chum salmon PSC encounters may make the potential risk of a sudden high PSC event (*i.e.*, haul or trip) greater and more difficult to plan for.

It is expected the fleet may need to use more conservative fishing practices relative to the strategies used to avoid Chinook salmon PSC, such as building in larger buffers under the limit to decrease the likelihood the sector is closed down, or considering proactive measures (*e.g.*, more test tows, consolidation of pollock harvest on more efficient pollock harvesting vessel and/or vessels that have historically had lower chum salmon PSC at the beginning of the B season, etc.) if the risk is perceived to be too great.

In addition to more conservative fishing practices, the cooperatives or IPAs may choose to apportion the chum salmon PSC limit to individual vessels (*i.e.*, “vessel-level” apportionments). As described in Chapter 2, the chum salmon PSC limit would be apportioned among the sectors and further divided among the CDQ groups and inshore sectors by NMFS. Vessel-level apportionments would not be set in Federal regulations but rather handled internally. This is how the IPAs currently manage individual vessels under the Chinook salmon PSC limit to create greater individual accountability and reduce the likelihood a sector would reach that cap. The IPAs also create different buffers to ensure member vessels stay below the Chinook salmon PSC limit, including dividing the lower PSC limit (*i.e.*, threshold amount) among members or deducting an “insurance pool” off the top to reduce the risk of reaching the cap. Internal apportionments would need to be accompanied by agreements from associated companies/vessels to adhere to these levels (through IPA agreements, for instance). If these internal apportionments were not agreed to with clear and binding penalties, it could create a moral hazard situation where vessels from different companies within a cooperative would be insulated from the risk of closure if they caught their directed fishery allocation quickly (Holland & Jannot, 2012).

These strategies appear to have been an effective strategy for the Chinook salmon PSC limit when paired with the Chinook RHS program and additional incentives specified in the IPAs. The fleet has remained under the Chinook hard cap limits every year since the limits were implemented in 2011 with amendment 91, and no sector has triggered the performance standard. Only once has the CP sector exceeded the threshold amount (*i.e.*, lower of the two Chinook salmon PSC limits) in 2019. However, it is challenging to say if the pollock fleet would be as effective at operating under a chum salmon PSC limit while still harvesting the pollock TAC which would depend on the PSC limit amount, apportionment approach, pollock aggregations, and how harvesters manage interactions with multiple PSC species with constraining limits.

Similar to the Chinook salmon PSC limits, the proposed chum salmon PSC limits would be transferable at the vessel-to-vessel level, within cooperative, between cooperatives and even between sectors. Given that chum salmon PSC is encountered differently than Chinook, harvesters and cooperative managers may place greater emphasis on the transferability provisions. This would be the case if a chum salmon PSC limit is chosen that is seen as insufficient or too great a risk to support a certain level of pollock harvest. While it might be assumed the transferability provisions will create an opportunity for the fleet to coordinate an efficient transfer of chum salmon PSC where it is needed, minimizing the amount of pollock TAC left unharvested, there are practical and operational reasons why this quota may not be transferred smoothly and efficiently to the parts of the fleet that may have a demand for additional chum salmon PSC.

The highly uncertain and variable nature of chum encounters may result in vessels unwilling to transfer the chum salmon PSC due to associated risk later in the season. Bycatch encounters that are highly uncertain and variable are likely to generate inefficient markets for PSC that are thin, lumpy and subject to price variability (Holland, 2010). In fact, it appears that open markets for Chinook salmon PSC have never developed. Despite the flexibility for transfers, Chinook salmon PSC is typically only transferred as paired transfers with a matching pollock apportionment within cooperatives. Additionally, it may be contract-fished by a vessel outside of the cooperative (under the provisions laid out in amendment 69); however, the cooperative for which the vessel is contract fishing for must supply both the pollock and the Chinook salmon PSC.

Finally, the analysts note this section has thus far focused on the operational structure of the AFA cooperative and IPAs which are largely formed around the cooperatives. Exceptions include CDQ groups that are members to applicable IPAs. Inshore CVs that do not join a cooperative are managed by NMFS under the inshore open access fishery (as described in Section 2.4). Vessels that participate in the open access fishery can deliver pollock to the inshore processor of their choice, but they could face a scenario where they race to fish the open access fishery allocation. To determine the amount of the chum salmon PSC limit that would apply to the inshore open access fishery in years when it exists, NMFS would calculate an amount of chum salmon PSC based on the proportion of the vessel's pollock catch history in the inshore open access.

From 2011–2023, participation in the open access fishery has been rare. In 2024, the Peter Pan Fleet Cooperative did not file an AFA cooperative application, and 10 vessels joined the open access fishery. Although the inter-cooperative manager helped to facilitate pollock harvests and PSC management among open access CVs in 2024,⁷¹ this type of scenario could present itself in the future. It is not clear if vessels would continue to (or again) operate under this cooperative framework. If a chum salmon PSC limit was adopted under Alternative 2 or 3, and vessels in the open access sector were operating without voluntary cooperative agreements, this could add another dimension to constraining the catch for other open access vessels.

3.3.4.5 Alternative 4

Alternative 4 would modify regulations for the salmon bycatch IPAs. Six additional regulatory provisions to reduce chum and WAK chum salmon bycatch are being considered. The six provisions reflect the recommendations contained in the Salmon Bycatch Committee's April 2023 report.⁷² The Council next took up this action in October 2023 and its motion requested IPA representatives provide proposals on potential responses to the proposed provisions under Alternative 4 in advance of the April 2024 Council meeting.⁷³ The subsequent analysis is based on the content of those proposals.⁷⁴ Additionally, industry has proactively responded and each IPA has been recently amended to include measures that generally align with the six proposed regulatory provisions.

It is not possible to quantify the potential reductions in chum and/or WAK chum salmon bycatch under Alternative 4 because 1) the RHS program for chum salmon avoidance is inherently embedded in status quo bycatch performance and cannot be teased out from other contributing factors; 2) that program relies on real-time data and fishermen's LK of changing conditions which are not available to the analysts for a retrospective analysis; and 3) some other provisions have unquantifiable elements such as the potential increase in bycatch savings should vessels be required to use excluder devices them throughout the B season (Provision 3). Therefore, each provision is analyzed for its potential to reduce chum and WAK

⁷¹ Personal communication, S. Zagorski.

⁷² The April 2023 Report can be found on the Council's archived meetings page for the April 2023 meeting (<https://meetings.npfmc.org/Meeting/Details/2983>), under agenda item C2c.

⁷³ The Council's October 2023 motion on chum bycatch can be found on the Council's archived meetings page for the October 2023 meeting (<https://meetings.npfmc.org/Meeting/Details/3003>), under agenda item C4.

⁷⁴ The IPA proposals are available in Appendices 3 and 4 of the April 2024 preliminary DEIS, accessible at the Council's archived meetings page for the April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), under agenda item C2.

chum salmon bycatch, and the analysis indicates Alternative 4 would likely reduce chum and WAK chum salmon bycatch compared to status quo.

3.3.4.5.1 Provision 1: Describe the Use of Genetic Information for Avoidance Areas

In response to Provision 1, the IPA proposals indicate salmon bycatch genetics data would be used to determine times and areas when WAK chum salmon are more likely to be encountered on the fishing grounds on a weekly basis for ADF&G stat areas. A benefit of this provision is that it would explicitly require genetics data to be considered, and the IPAs may prioritize hotspot closures in areas with higher WAK chum encounters, especially when multiple areas have been identified as hotspots. In this scenario, deference would be given to the area(s) with higher potential for encountering WAK chum salmon. However, it is less likely that there would be a need to prioritize closure areas when chum salmon bycatch rates are below RHS program thresholds such that closures are not needed in a given week, fewer than four hotspots are identified in a given week, and/or managers are weighing the tradeoffs between implementing a closure with very different estimates on WAK chum salmon proportions.

The annual post-season genetic stock composition estimates would be used to inform fleet movement at smaller scales, and inseason genetics data from a recent and ongoing pilot project may also be available to inform the fleet (see Section 3.3.4.5.1.1). Table 3-50 provides the estimated proportion of WAK chum salmon bycatch by fishing grounds area during the Early and Late periods of the B season (2019–2023). These areas were developed by Sea State to inform RHS program management (Figure 3-22). While there is some alignment with the genetic cluster areas, the fishing grounds are smaller and more closely align with fleet movement inseason. As shown, WAK chum salmon were encountered in higher proportions in the Unimak fishing grounds during the Early and Late periods compared to other fishing grounds, although WAK chum salmon also contributed a higher proportion of the overall bycatch in the Shelf Edge fishing grounds.

In terms of using genetic data, the fleet would likely carefully balance its prioritization of WAK chum salmon avoidance with other considerations like pollock CPUE. Moving the fleet to areas with lower pollock catch rates increases the likelihood the B season would extend later in the year which could increase Chinook salmon bycatch. To illustrate some of these potential tradeoffs, the number of chum salmon caught as bycatch, the pollock harvest (mt), and bycatch rate in each fishing grounds area was compared in the 2021 and 2022 B seasons (Table 3-51).

As shown, the 2021 B season fishery was widely distributed but the majority of pollock was harvested in the Unimak grounds at 47% of the total B season harvest. The highest level of bycatch and bycatch rate occurred in the Shelf Edge grounds. These data, as well as historical genetic information, indicate moving the fleet out of the Unimak and Shelf Edge fishing grounds may be an effective strategy to prioritize WAK chum salmon avoidance. However, this would likely pose a tradeoff for the CV fleet as many vessels are limited in their ability to move further northwest.

The 2022 B season pollock harvest was lower than the 2021 B season but fishing was again widely distributed across the grounds and the majority of pollock was harvested in the Unimak grounds at 42% of the total harvest, followed by the Pervents grounds at 17% of the total. The B season bycatch rate was highest in the Pribilofs (0.90 chum/mt), but this rate was substantially lower than the highest rate observed in 2021 (2.98 chum/mt). Notably, the amount of pollock harvested in the Shelf fishing grounds increased in 2022 compared to 2021.

In the 2022 B season, the fleet implemented new chum salmon avoidance measures in response to the Council's request for immediate action to reduce bycatch following the 2021 B season. The CV fleet implemented Advisory Avoidance areas based on small amounts of inseason data and historical knowledge of where high chum salmon PSC rates occurred. The first Advisory Avoidance Area went into effect on June 29 and remained in place until July 30. Two more areas were identified on July 19, one of which was extended and remained in effect until August 15 (Figure 3-23). These Advisory Avoidance Areas align with the Shelf Edge where chum salmon bycatch rates were very high in 2021. The pollock

fleet was able to achieve a lower level of bycatch in 2022 (242,309 fish), at least in part, by proactively moving the fleet away from areas with historically high bycatch rates, in addition to operating the RHS program as normal. Potentially in response to Advisory Avoidance Areas, there was an increase in fishing effort further east in the Shelf grounds. The estimated proportion of WAK chum salmon in the overall bycatch substantially increased from 9.3% in 2021 to 23.0% in 2022.

Comparing the 2021 and 2022 B seasons shows the inherent challenge of reducing WAK chum salmon *and* total chum salmon bycatch, and the reality that each fishing year is slightly different. These differences could be due to where good aggregations of pollock are, how long aggregations of pollock can sustain fishing, the costs associated with traveling to new fishing grounds, efforts to avoid other PSC species, among many other factors. However, additional chum salmon bycatch genetics data are available each year and can be incorporated into the RHS program's likelihood analysis, and each year of fishing presents new information that can be used to enhance tools for WAK chum salmon avoidance. For instance, an estimate of the proportion of WAK chum salmon encountered in the Shelf fishing grounds are only available for the 2022 B season in recent years. It is expected that RHS program managers would use this data to help inform or prioritize hotspot closures for WAK chum salmon avoidance.

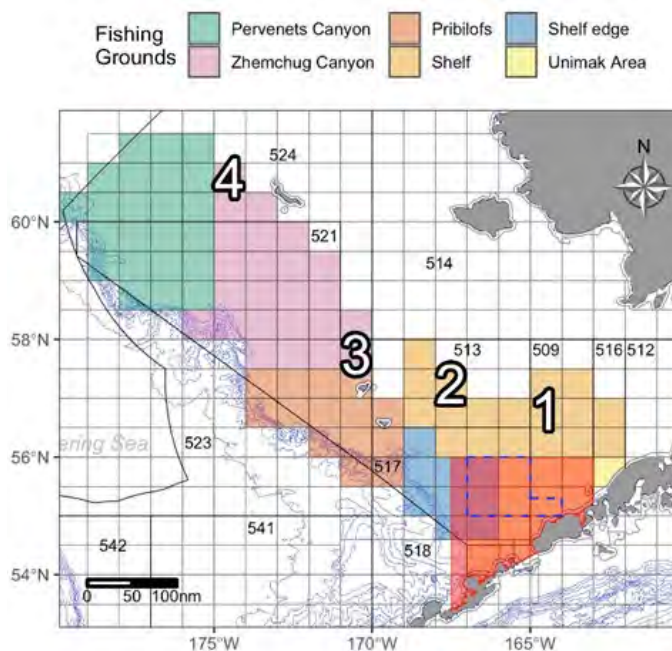


Figure 3-22 Map of fishing grounds areas developed by Sea State, Inc., as well as the CVOA (red) and Chum Salmon Savings Area (blue dotted line)

Source: Sea State, Inc.

Table 3-50 Estimated mean proportion of WAK chum salmon bycatch during the Early and Late periods by fishing grounds area developed by Sea State, Inc., 2019–2023

Grounds: Period:	Unimak		Shelf		Shelf Edge		Pribilofs		Zhemchug		Pervents	
	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
2019	33.6	18.5	-	-	11.2	11.4	11.2	17.9	-	-	-	5.1
2020	-	14.1	-	-	6.1	7.7	-	6.4	-	-	-	1.7
2021	9.3	13.6	-	-	8.7	17.3	-	7.1	-	-	-	-
2022	29.2	31.3	23.3	-	16.4	16.5	-	12.4	-	-	-	-
2023	15.8	14.6	-	-	12.3	12.5	5.2	11.9	4.9	6.9	-	-

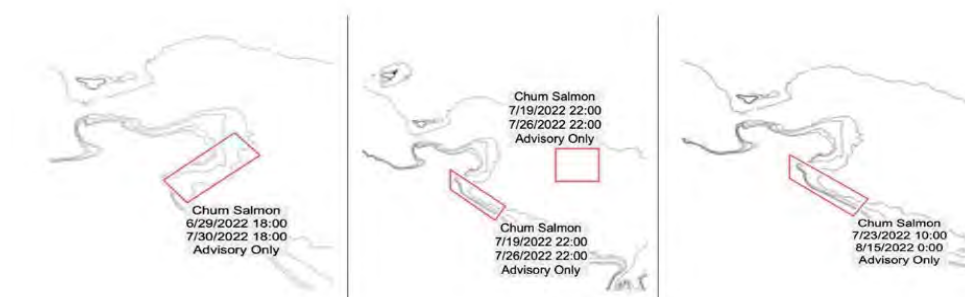
Source: NMFS Alaska Region CAS, data compiled by ABL.

Notes: Hyphens denote insufficient sample sizes.

Table 3-51 Number of chum salmon caught as bycatch, B season pollock catch (mt), and bycatch rate in each fishing grounds area for 2021 and 2022

Fishing Grounds	2021			2022		
	Chum PSC	Pollock (mt)	PSC Rate	Chum PSC	Pollock (mt)	PSC Rate
Unimak	193,969	356,108	0.54	110,795	247,880	0.44
Shelf Edge	296,967	99,437	2.98	46,160	79,877	0.57
Shelf	5,738	2,070	2.77	24,272	67,652	0.35
Pervents	35,686	72,975	0.48	31,972	97,756	0.32
Pribilofs	61	9,220	0.01	4,487	4,969	0.90
Zhemchug	13,480	213,722	0.54	24,623	90,779	0.27

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

**Figure 3-23 2022 B season chum salmon advisory avoidance areas for the CV fleets**

Source: Sea State.

3.3.4.5.1.1 Availability of Inseason Genetic Stock Composition Estimates

In 2024, the Bristol Bay Science and Research Institute implemented a pilot project to produce weekly inseason genetic stock composition estimates of the chum salmon bycatch caught by the inshore sector during the pollock B season. This project is intended to provide more timely estimates of the genetic stock composition of the bycatch in this sector compared to the post-season estimates annually available from NOAA's Auke Bay Labs (Head et al., 2025). Industry representatives and IPA managers have indicated these in-season data may be used in the future to inform efforts to avoid WAK chum salmon on the fishing grounds.

The stock composition of the bycatch varied across weeks. For instance, there was a shift from low to high proportions for the NE Asia reporting group whereas the proportions for the SE Asia reporting group shifted from high to low as the B season progressed. In 2024, all Alaska reporting groups comprised relatively low proportions of the total bycatch. There was a marginal increase in the WAK proportions later in the season, although the credible intervals overlap for the estimates and all weeks are reasonably similar to the post-season mean estimate represented by the dashed line in Figure 3-24. These mixtures could change in the future. It is possible that in-season genetics may inform decisions on where to move vessels or reduce fishing effort if the proportion of WAK fish is relatively high in the total bycatch, or these data may be used to inform the fleet that continued fishing in a given area likely presents a relatively low risk of encountering WAK chum salmon.

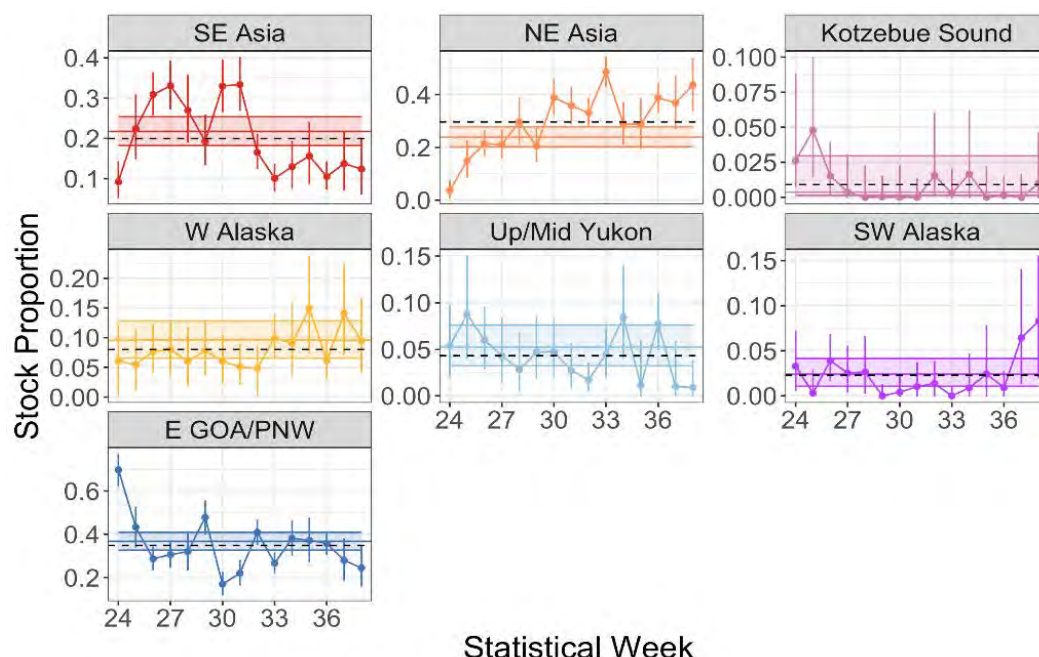


Figure 3-24 Estimated stock composition of the inshore sector's chum salmon bycatch delivered to shore-based processing facilities in Akutan and Dutch Harbor across statistical weeks during the 2024 B season

Source: BBSRI inseason genetics pilot project; figure produced by ABL.

3.3.4.5.2 Provision 2: Evaluate Closures More Than Once Per Week

Provision 2 would modify regulations to require the IPAs to describe how potential chum salmon avoidance closures would be evaluated more than once per week. The current program implements hotspots on a weekly basis—the new weekly Base Rate and any applicable hotspot closures are announced on Thursday evenings and take effect the next day (*i.e.*, Friday to Friday closures). This practice would continue *and* relevant pollock catch and bycatch data would be evaluated on Monday for potential Tuesday to Friday closures. The CP IPA has required bi-weekly evaluation of hotspot closures since 2022. The Inshore SSIP and MSSIP added a similar measure in the 2024 B season.

A benefit of this provision is that it requires relevant data to be evaluated more frequently, which has the potential to reduce chum salmon bycatch compared to status quo. Whether chum bycatch numbers or bycatch rates are increasing compared to prior days of fishing is only known after the fact, so it reduces the possibility that bycatch rates would increase without a reaction from the fleet to avoid these areas. Program managers would weigh the tradeoffs of not advising or requiring the fleet to move after a Monday evaluation of data and the risk of allowing the fleet to continue fishing in the area until the upcoming Friday.

These dynamics present an important nuance in that the effectiveness of this measure would likely not be detectable based on the number of Tuesday closures implemented in the future. The relative effectiveness of this measure may be able to be “seen” in retrospective data by a reduction in the weekly bycatch rates and peaks. The 2021, 2022, and 2023 B seasons help to illustrate this expected pattern. For instance, the highest weekly bycatch rate has decreased year-over-year (Figure 3-25) as has the highest weekly PSC level (Figure 3-26) in line with what would be expected.

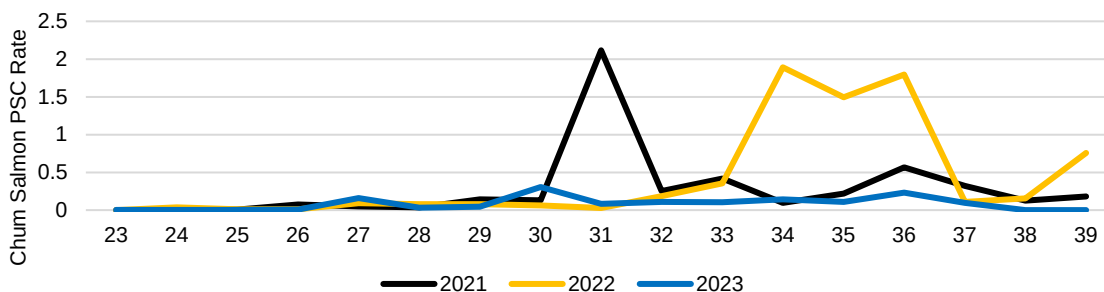


Figure 3-25 Weekly B season chum salmon bycatch rate for the CP sector in 2021, 2022, and 2023
Source: NMFS Alaska Region CAS, data compiled by AKFIN.

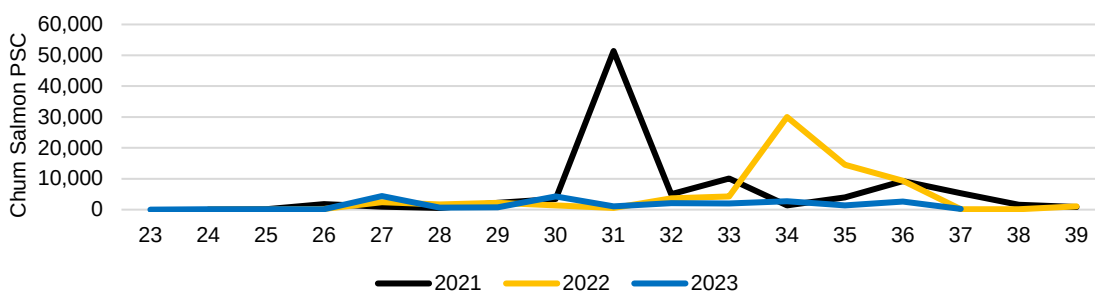


Figure 3-26 Weekly B season chum salmon bycatch for the CP sector in 2021, 2022, and 2023
Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.3.4.5.3 Provision 3: Require an Excluder Device for the Duration of the B Season

Provision 3 would require vessel operators governed by the IPAs to use salmon excluder devices for the full duration of the A and B pollock fishing seasons. Salmon excluders are bycatch reduction devices that allow for salmon to escape the pelagic trawl net with minimal losses to pollock catch. The general concept for excluder devices is that they have large escapement portal(s) to allow salmon to escape from the retentive section of the trawl net. The designs are based on salmon being much stronger swimmers than pollock; salmon can make their way forward in a pollock trawl net and react to changes in water flow and oncoming pollock whereas pollock are not able to swim forward and react to eddies or lees in the net created by the excluder device (EFP 2018-03 Final Report).

Existing regulations require the use of salmon excluder devices, with recognition of contingencies, from January 20 to March 31, and from September 1 until the end of the B season (see 50 CFR 679.21(f)(12)(iii)(E)(11)). Any additional salmon savings compared to status quo would result from the required use of an excluder device from June 10 to September 1. Vessels typically leave a salmon excluder device in the trawl net for the duration of the B season because the device provides an opportunity for salmon to escape the trawl net, and it is a significant effort to change fishing gear midseason. As such, Provision 3 would modify regulations to align with current practices as discussed below.

The **CP IPA** currently requires salmon excluder devices be used in all trawls during the A season and the end of the B season (September 1 onward) in accordance with existing regulations, but it is common practice for all CPs to leave the excluder device in the net during the entire B season. The **MSSIP** currently requires member vessels to use salmon excluders at all times when fishing in the mothership sector. If a contingency arises (*e.g.*, a torn net) that would prohibit a vessel from using the excluder device, the vessel must report to the IPA representative the circumstances of why the excluder was not used. Based on recent MSSIP reports, no contingencies have resulted in vessels temporarily not using a salmon excluder device (2019–2023).

The **Inshore SSIP** requires all A season tows be made with a salmon excluder and all B season tows after August 31st as well, but it is common practice for CVs to leave the excluder device in the net during the entire B season. In 2023 (as with other recent years), recognizing certain contingencies, there were two vessels that did not use a salmon excluder device during fishing operations. These two vessels operated trawl nets that utilize fish pumps to get the fish aboard rather than hauling the codend up a stern ramp. The type of net associated with a fish pump does not support the use of an effective excluder at this time (2023 Inshore SSIP).

In addition to excluder devices, live feed camera systems are used by all CPs and six CVs. These camera systems were originally used during the development of salmon excluders to ensure the device was taking its proper shape. These cameras provide a front facing view of the composition of the catch entering the codend. The camera system itself is not a tool that improves bycatch avoidance (compared to an excluder device for example), but it can inform a skipper's decision to stop a tow and haul the net back early because the composition of pollock and salmon in the net is perceived to be too high (2023 CP IPA). These camera systems are cost prohibitive for many vessels at approximately \$500,000. However, vessels equipped with live feed systems communicate what the skipper is seeing in terms of catch composition on the camera with cooperative managers and vessels fishing nearby.⁷⁵

3.3.4.5.4 Provision 4: Require Outlier Provisions

Provision 4 would require the IPAs to develop measures to identify vessel outliers with poor chum salmon bycatch performance compared to their peers, thereby reducing the potential for a vessel to consistently maintain higher chum salmon bycatch rates. Restrictions or penalties targeted at outliers can induce changes in fishing behavior and are a way for the IPAs to improve individual vessel behavior. Changes in fishing patterns can involve several different behaviors: avoiding areas that recently had high bycatch rates, using and sharing information on high bycatch areas; and moving vessels immediately once a high bycatch area has been identified.

To be effective, the outlier provision would need to provide operators with an incentive to change where they fish to avoid chum salmon bycatch. All other factors being equal, it is anticipated vessels would fish in an area with high pollock catch rates and that other vessels might choose to move to that area if they are able to. Any incentive that would increase the cost of catching chum salmon would reduce the likelihood that vessels would fish in areas with the highest bycatch rates, even if pollock catch rates are very good.

The definition of an outlier—how far above average a vessel can be without incurring a penalty—would be defined by the respective IPAs as would the penalty for any vessel identified as an outlier. The CP IPA incorporated an outlier provision for chum salmon in 2022. Under this IPA, a vessel is identified as an outlier when their chum salmon bycatch rate is more than 1.5 standard deviations above the sector's average bycatch rate. A vessel identified as an outlier for two consecutive B seasons is prohibited from fishing in any hotspot closure the following year. Had this measure been incorporated within the IPA in prior years (2019–2023), four CPs would have been identified as having chum salmon bycatch rates greater than 1.5 standard deviations from the mean. Of these four CPs, two would have been identified as an outlier for two consecutive B seasons and incurred the penalty the following year.

Basing the penalty on two consecutive seasons of high chum bycatch allows vessels one fishing season to adjust their behavior following one poor performing season/year and reduces the likelihood of situations where vessels have high bycatch for sustained periods of time. A CP's primary incentive to maintain good chum salmon bycatch performance is to avoid the penalty of losing the ability to fish inside a closure area the following year. The strength of the incentive depends on how often a vessel uses the flexibility afforded by its performance to fish inside a hotspot area, or the relative importance of maintaining this operational flexibility even if it is not used.

⁷⁵ Personal communication, S. Zagorski and H. Berns.

3.3.4.5.5 Provision 5: Require IPAs to Provide Weekly Reports to Western and Interior Alaska Salmon Users

Provision 5 would require the IPAs to provide weekly reports to Western and Interior Alaska salmon users. The current regulations at 50 CFR 679.21(f)(12)(iii)(D) require the IPA to identify at least one third party group that “include any entities representing Western Alaskans who depend on salmon and have an interest in salmon bycatch reduction but do not directly fish in a groundfish fishery.” Bering Sea Fishermen’s Association fulfills this third-party role under the current IPAs. At this time, it is not clear what measures the IPAs would implement to meet this provision, but the intent is to increase public transparency and communication beyond reports currently being distributed to the third-party.

3.3.4.5.6 Provision 6: Require IPAs to Prohibit Fishing in Areas with Very High Bycatch Rates

Provision 6 would require the IPAs to prohibit all vessels from fishing in stat areas with a very high weekly bycatch rate. The CP IPA incorporated this measure in 2022 and defined a very high weekly bycatch rate as greater than 5 chum/mt. The Inshore SSIP and MSSIP have defined a very high weekly bycatch rate as being greater than 3 times the Base Rate. A primary benefit of this provision is that it would close areas where bycatch rates are determined to be very high, likely resulting in some level of salmon savings as vessels are required to avoid the entire statistical area regardless of their performance. These larger closures would occur in addition to any RHS closures.

The analysis evaluates the number and location of ADF&G groundfish stat areas that would have met the CP sector’s threshold in 2022 and 2023 when this measure was in place. Three stat areas had a weekly bycatch rate above 5 chum/mt of pollock in 2022 and four stat areas were above that threshold in 2023 (Table 3-52). Closing stat areas with very high chum salmon bycatch rates would likely reduce chum salmon bycatch, but the potential for WAK chum salmon savings would depend on where the closed stat area is located, when the rates were identified as being very high and thus were closed during the B season, how much effort is displaced from the area, and ultimately where vessels move to.

For instance, in 2022, closing stat area 765900 in the Pervents fishing grounds would be unlikely to result in WAK chum salmon savings because the Late period proportions have historically been low or non-estimable because of insufficient sample sizes (Table 3-50). However, closing statistical area 715630 in the Pribilofs fishing grounds in 2023 during the Late period could have resulted in WAK chum salmon savings, depending on where vessels moved to. The estimated proportion of WAK chum salmon in the Pribilofs fishing grounds during the Late period was 11.9% in 2023.

Unique to the CP IPA, the potential for chum salmon savings would also be affected by whether an area was closed due to CP rates or CV rates because the sector uses fleet-wide data to inform its hotspot program. Statistical areas 655500, 645434, and 644501 are located inside the Unimak fishing grounds which historically has had a higher proportion of WAK chum salmon in the Late period, compared with other fishing grounds. WAK chum salmon savings could have resulted from closing these areas to CPs if they intended to harvest CDQ pollock in these areas. These two stat areas are located inside the CVOA where CPs are prohibited from harvesting AFA pollock.

Table 3-52 ADF&G groundfish statistical areas where the weekly chum salmon bycatch rate for CPs exceeded 5 chum salmon per mt of pollock (Provision 6 of Alternative 4) in 2022 and 2023

Year	Statistical Area	Fishing Grounds	Statistical Week During the B Season	Weekly Rate in the Area
2022	765900	Pervents	36	6.3
	655500	Unimak	33	5.4
	645434	Unimak	33	5.5
2023	715630	Pribilofs	33	6.1
	655500	Unimak	33	11.4
	655430	Unimak	33	5.1
	645501	Unimak	33	11.4

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.3.4.6 Alternative 5

Three different inseason corridor options are being considered under Alternative 5 but only one may be selected for implementation. Among all three options, the inseason corridor, the range of PSC limits (50,000–350,000 chum salmon), apportionment options/suboption, and closure window of June 10 – August 31 are the same. All or part of the corridor would close to the sector or cooperative that attained the PSC limit during the closure window. The three inseason corridor options differ from one another based on the number and location of stat areas inside that would close and the entity that would implement the closure.

Table 3-53 Summary of primary differences among the inseason corridor options under Alternative 5

Option	Number of Stat Areas Closed	Entity Managing the Closure
Option 1	40	NMFS
Suboption 1	29	NMFS
Option 2	19 to 29	IPAs

3.3.4.6.1 Inseason Corridor Genetic Stock Composition Estimates

As discussed previously, the inseason corridor under Alternative 5 represents the combined area of genetic cluster areas 1 and 2 where ~84% of the WAK chum salmon caught as bycatch were taken during the analyzed period (see Section 3.3.4.1.2). A new genetic stock identification analysis was completed for Alternative 5 by aggregating observer samples from the bycatch in clusters 1 and 2. The results of that analysis are presented first as the stock composition of the bycatch inside and outside the corridor is relevant to all options.

Table 3-54 shows the estimated mean proportion and number of WAK chum salmon caught as bycatch inside the corridor during the Early (June and July), Middle (August), and Late (September – November 1) periods. Note that similar data for the stock composition of the bycatch outside the corridor are not provided because there were insufficient samples in outside areas for analyses to be completed for comparison. As such, Table 3-55 provides the Early (June through mid-August) and Late (mid-August through November 1) period breakouts for the WAK component of the bycatch both inside and outside of the inseason corridor from 2011–2023. Figure 3-27 shows the estimated mean proportion for all genetic stock reporting groups during the Early and Late periods as well as inside and outside the inseason corridor.

When the Early, Middle, and Late periods of the B season are compared to one another, the proportion of WAK chum salmon was typically greater in the Early period which encompasses June and July (Table 3-54). However, the Middle period estimates were greater in 2012, 2013, 2022, and 2023 and the Late period estimates were greater in 2017 and 2021. Sometimes there were significant differences in the estimated mean proportion across periods within a single year. As an example, the WAK component accounted for 44.8% of the total bycatch inside the corridor during the Early period in 2015 compared to 20.1% and 21.4% in the Middle and Late periods. However, despite the proportion being nearly double

for the early period, the number of WAK chum caught was less than 25% that caught in the Middle period.

Table 3-54 Estimated number and proportion of WAK chum salmon caught as bycatch inside the inseason corridor during the Early, Middle, and Late periods of the B season, 2011–2023

Year	Early		Middle		Late	
	Est. Number	Est. Proportion	Est. Number	Est. Proportion	Est. Number	Est. Proportion
2011	15,793	30.3%	10,980	29.8%	8,542	16.3%
2012	908	20.6%	1,399	34.7%	1,870	19.5%
2013	8,211	23.8%	13,817	28.2%	2,177	18.1%
2014	6,328	26.6%	17,128	21.5%	5,795	20.8%
2015	4,384	44.8%	19,077	20.1%	13,231	21.4%
2016	13,917	31.4%	36,715	28.7%	20,897	18.4%
2017	64,095	23.1%	20,452	18.1%	4,012	25.0%
2018	36,411	26.0%	3,194	9.2%	6,754	17.5%
2019	24,707	34.2%	8,100	26.1%	15,191	14.7%
2020	-	-	5,131	9.9%	15,135	11.9%
2021	12,291	9.1%	32,276	9.3%	2,402	18.8%
2022	4,304	18.1%	39,698	28.9%	2,796	14.0%
2023	2,462	13.3%	5,853	15.1%	1,235	14.9%

Source: NMFS Alaska Region CAS, data compiled by ABL.

Notes: Hyphens denote insufficient samples were available to estimate genetic stock proportions. Estimates on the WAK component inside the inseason corridor are able to be provided for the Early (June and July), Middle (August), and Late (September – November 1) periods of the B season because of the larger sample size provided by combining genetic clusters 1 and 2.

When the Early and Late period proportions inside and outside the inseason corridor are compared to one another, the Southeast and Northeast Asia reporting groups consistently accounted for the largest proportions of chum salmon PSC in both the Early and Late periods, both inside and outside of the inseason corridor (Figure 3-27). The WAK component was higher inside the inseason corridor during the Early period in all but one year (2021) and greater inside the inseason corridor during the Late period for all 13 analyzed (Table 3-55). Both inside and outside the corridor, WAK chum salmon contributed a smaller proportion of the total bycatch during the Late period. For instance, in 2011 the proportion dropped from 29.7% (Early) to 20.8% (Late) inside and from 26.3% (Early) to 13.1% (Late) outside. However, there is substantial interannual variability in both the estimated number and proportion of WAK chum salmon bycatch during both the Early and Late periods as the proportions ranged from a high of 30.0% in 2016 to a low of 8.9% in 2021 (Early) and from a high of 23.1% in 2013 to a low of 3.1% in 2023, respectively.

Table 3-55 Estimated number and proportion of WAK chum salmon caught as bycatch inside and outside the inseason corridor during the Early and Late periods of the B season, 2011–2023

Year	Early Inside		Early Outside		Late Inside		Late Outside	
	Est. Number	Est. Proportion	Est. Number	Est. Proportion	Est. Number	Est. Proportion	Est. Number	Est. Proportion
2011	20,621	29.70%	9,062	26.90%	15,011	20.80%	2,119	13.10%
2012	1,426	25.70%	313	20.20%	2,580	20.70%	302	11.60%
2013	17,033	25.90%	610	15.40%	7,344	24.70%	5,911	23.1%
2014	21,945	23.90%	3,522	15.40%	8,231	20.80%	8,890	13.70%
2015	10,559	26.60%	4,649	15.50%	25,451	20.10%	3,962	10.80%
2016	41,025	30.00%	2,849	9.40%	32,060	21.50%	4,097	17.9%
2017	84,904	22.70%	4,836	12.70%	6,138	19.60%	2,795	12.70%
2018	38,277	22.20%	9,739	16.00%	7,079	17.20%	2,430	11.80%
2019	28,656	29.70%	6,408	10.70%	18,154	16.50%	4,293	5.40%
2020	2,317	10.00%	-	-	18,457	11.70%	8,190	5.50%
2021	42,213	8.90%	2,350	13.10%	3,153	17.20%	2,610	7.70%
2022	28,299	25.10%	-	-	18,533	27.00%	6,395	11.40%
2023	4,440	16.00%	861	4.90%	5,402	14.20%	892	3.10%

Source: NMFS Alaska Region CAS, data compiled by ABL.



Figure 3-27 Estimated mean proportion of the chum salmon bycatch inside (red) and outside (blue) the inseason corridor for all genetic stock reporting groups, broken out by Early (left) and Late (right) periods, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by ABL.

3.3.4.6.2 Chum Salmon Bycatch Trends Inside the Corridor

This section contains additional information on chum and WAK chum salmon bycatch relevant to all three inseason corridor options. Note these data are generally available in other portions of the document but are compiled here for the ease of the reader. Alternative 5 would close certain areas to directed pollock fishing during a discrete period of the B season if the corridor chum salmon PSC limit is met. Future bycatch reductions could occur if vessels are able to change their fishing behavior and/or the bycatch and bycatch rates are lower outside the closed areas compared to within. For this reason, a series of tables are provided to show the distribution of chum and WAK chum salmon PSC.

Table 3-56 compares the total B season chum salmon bycatch to that which occurred inside the inseason corridor (limited fishing grounds but all months of the B season), during the closure window of June 10 – August 31 (limited months but all fishing grounds), and inside the corridor during the closure window (limited months and fishing grounds). Table 3-57 provides the same information for WAK chum salmon PSC estimates where the estimated number of WAK chum salmon caught as bycatch during the closure window is the sum of the Early and Middle period estimates. Finally, Table 3-58 compares the number of chum salmon each sector caught as bycatch during the closure window to the number of chum salmon caught inside the inseason corridor during the same period.

As shown, the inseason corridor and closure window capture a substantial amount of the B season bycatch both spatially and temporally. An average of ~73% of total B season bycatch occurred within the corridor, and ~58% occurred within the corridor during the closure window (2011–2023; Table 3-56). Similarly, an average of ~84% of WAK chum salmon were caught inside the corridor, ~76% during the closure window, and ~64% inside the corridor during the closure window (Table 3-57).

Table 3-56 Comparison of the total number of chum salmon caught as B season bycatch to the number of chum salmon caught inside the inseason corridor, during the closure window of June 10 – August 31, and inside the corridor during the closure window, 2011–2023

Year	Total B Season Chum Bycatch	Total Chum Bycatch Inside the Corridor		Total Chum Bycatch from June 10 - August 31		Chum Bycatch Inside Corridor from June 10 - August 31	
		Number	As % of Total	Number	As % of Total	Number	As % of Total
2011	191,313	141,502	74.0%	139,030	72.7%	98,928	51.7%
2012	22,172	18,018	81.3%	11,169	50.4%	9,181	41.4%
2013	125,114	95,558	76.4%	96,037	76.8%	86,210	68.9%
2014	218,886	131,122	59.9%	174,087	79.5%	110,520	50.5%
2015	233,085	166,429	71.4%	183,349	78.7%	124,699	53.5%
2016	339,236	285,998	84.3%	273,738	80.7%	221,911	65.4%
2017	465,848	405,796	87.1%	440,368	94.5%	394,665	84.7%
2018	294,675	213,349	72.4%	260,990	88.6%	190,423	64.6%
2019	346,671	206,924	59.7%	244,217	70.4%	118,953	34.3%
2020	343,094	180,866	52.7%	155,686	45.4%	57,380	16.7%
2021	545,901	493,872	90.5%	522,166	95.7%	484,025	88.7%
2022	242,309	181,226	74.8%	239,397	98.8%	180,026	74.3%
2023	111,852	65,727	58.8%	99,946	89.4%	61,044	54.6%
Average	267,704	198,953	72.6%	218,475	78.6%	164,459	57.6%
Median	242,309	180,866	74.0%	183,349	79.5%	118,953	54.6%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 3-57 Comparison of the estimated total number of WAK chum salmon caught as B season bycatch to the estimated number of WAK chum salmon caught inside the inseason corridor, during the closure window of June 10 – August 31, and inside the inseason corridor during the closure window, 2011–2023

Year	Total B Season WAK Chum Bycatch	WAK Chum Bycatch Inside Corridor		WAK Chum Bycatch, June 10 - August 31		WAK Chum Bycatch Inside Corridor, June 10 - August 31	
		Number	As % of Total	Number	As % of Total	Number	As % of Total
2011	46,294	35,315	76.3%	36,451	78.7%	26,773	57.8%
2012	4,177	4,177	100.0%	2,307	55.2%	2,307	55.2%
2013	30,979	24,205	78.1%	24,252	78.3%	22,028	71.1%
2014	41,621	29,251	70.3%	32,972	79.2%	23,456	56.4%
2015	44,861	36,692	81.8%	31,344	69.9%	23,461	52.3%
2016	78,565	71,530	91.0%	57,668	73.4%	50,632	64.4%
2017	95,444	88,560	92.8%	90,006	94.3%	84,548	88.6%
2018	57,737	46,360	80.3%	49,366	85.5%	39,605	68.6%
2019	58,722	47,998	81.7%	41,587	70.8%	32,807	55.9%
2020	29,414	20,266	68.9%	8,321	28.3%	5,131	17.4%
2021	50,680	46,969	92.7%	47,290	93.3%	44,566	87.9%
2022	52,630	46,798	88.9%	49,798	94.6%	44,002	83.6%
2023	11,202	9,550	85.3%	9,847	87.9%	8,315	74.2%
Average	46,333	39,052	83.7%	37,016	76.1%	31,356	64.1%
Median	46,294	36,692	81.8%	36,451	78.7%	26,773	64.4%

Source: NMFS Alaska Region CAS, data compiled by ABL

Table 3-58 Comparison of each sector's chum salmon bycatch inside the corridor during the closure window of June 10 – August 31 to each sector's total bycatch during the same period, 2011–2023

Year	CDQ			CP			Mothership			Inshore		
	Chum PSC Jun 10 – Aug 31	Corridor PSC Jun 10 – Aug 31	Corridor PSC as % of Total	Chum PSC Jun 10 – Aug 31	Corridor PSC Jun 10 – Aug 31	Corridor PSC as % of Total	Chum PSC Jun 10 – Aug 31	Corridor PSC Jun 10 – Aug 31	Corridor PSC as % of Total	Chum PSC Jun 10 – Aug 31	Corridor PSC Jun 10 – Aug 31	Corridor PSC as % of Total
2011	2,117	829	39.2%	26,768	4,826	18.0%	15,608	9,552	61.2%	94,537	83,721	88.6%
2012	134	18	13.4%	1,362	619	45.4%	942	828	87.9%	8,731	7,716	88.4%
2013	324	1	0.3%	8,386	3,033	36.2%	3,700	2,779	75.1%	83,627	80,397	96.1%
2014	2,037	458	22.5%	42,476	5,411	12.7%	5,478	1,667	30.4%	124,096	102,984	83.0%
2015	2,307	242	10.5%	30,608	5,114	16.7%	9,439	1,296	13.7%	140,995	118,047	83.7%
2016	15,490	14,875	96.0%	125,492	74,314	59.2%	28,943	28,943	100.0%	103,813	103,779	100.0%
2017	85,691	84,800	99.0%	194,352	150,480	77.4%	15,866	15,026	94.7%	144,459	144,359	99.9%
2018	24,701	13,547	54.8%	86,659	33,739	38.9%	18,137	13,080	72.1%	131,493	130,057	98.9%
2019	3,522	76	2.2%	94,502	25,917	27.4%	24,481	1,811	7.4%	121,712	91,149	74.9%
2020	3,738		0.0%	37,312	4,821	12.9%	5,870	298	5.1%	108,766	52,261	48.0%
2021	54,048	49,407	91.4%	81,593	54,498	66.8%	50,363	50,268	99.8%	336,162	329,852	98.1%
2022	6,111	2,529	41.4%	70,172	24,705	35.2%	31,545	24,037	76.2%	131,569	128,755	97.9%
2023	3,335	25	0.7%	19,322	614	3.2%	13,938	3,554	25.5%	63,351	56,851	89.7%
Average	15,658	13,901	36.3%	63,000	29,853	34.6%	17,255	11,780	57.6%	122,562	109,994	88.3%
Median	3,522	644	22.5%	42,476	5,411	35.2%	15,608	3,554	72.1%	121,712	102,984	89.7%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.3.4.6.3 Option 1

As described in Section 3.1.5, the analysis uses different methods because the best scientific information available to evaluate the potential impacts of the three options is different. Specific to Option 1, the impact analysis primarily relies on chum salmon PSC, genetics, and catch data to estimate the likely outcomes based on preemptive changes in fishing behavior that may occur and potential responses after a closure.

The Fleet Movement Model was run for Option 1 to estimate the impacts of redistributing pollock catch from the corridor (all 40 stat areas) after the corridor PSC limit was met through August 31. However, there were many weeks when the model had nowhere to redistribute catch after a cap was met, particularly for the inshore and mothership sectors. This issue was more pronounced under a 50,000-chum salmon corridor PSC limit, varying between ~17% and 100% of the weeks a sector fished after the cap was met but the sector did not fish outside of the corridor's 40 stat areas (Table 3-4). This is problematic because the model does not account for the PSC in these weeks which means the annual estimates for net changes in chum salmon PSC also do not include these weeks when fishing historically occurred. The annual net change estimates for chum salmon PSC would be different if the model was able to redistribute catch in these weeks and the effect could be positive or negative.

Pre-Corridor Closure

Option 1 would reduce chum and WAK chum salmon PSC inside the corridor and likely WAK chum salmon across the duration of the B season. These reductions would be achieved if vessels are able to constrain their PSC while fishing inside the corridor prior to a closure. Vessels would be incentivized to change their behavior to avoid chum salmon PSC to stay below the corridor PSC limit to maintain access to historically important fishing grounds and operational flexibility or in response to some other incentive. Figure 3-28 compares the chum salmon PSC in June, July, and August inside the corridor to the PSC rate observed in each month outside of the corridor. Figure 3-29 is complementary and shows each month's average chum salmon PSC rate inside and outside the corridor. These data clearly indicate that the chum salmon PSC rates inside the corridor were greater than what occurred outside the corridor in the majority of years.

The **CP and CDQ** sectors have relied on the corridor's fishing grounds to a lesser degree than the mothership and inshore sectors (Table 3-12). CPs are vertically integrated and have a high degree of operational flexibility which has influenced where these vessels target pollock in the B season. CPs have also been affected by regulations that prohibit them from harvesting AFA pollock inside the CVOA during the B season. Based on these considerations, if Option 1 were implemented, a corridor closure may not hold a significant consequence. However, maintaining operational flexibility is a primary incentive embedded in the RHS program, and a similar incentive would apply for these sectors (and others) under Alternative 5. CP operators will want to maintain access to potential fishing grounds, even if those fishing grounds are not utilized each year. CPs may also proactively fish outside the corridor in Clusters 3 or 4 (as able), which could also mitigate the risk of encountering unexpectedly high bycatch leading to a corridor closure. Either scenario could reduce chum salmon PSC compared to status quo.

The **inshore** and **mothership** sectors have heavily relied on the fishing grounds inside the corridor (Table 3-12) and these vessels would likely take greater measures to avoid the consequence of being closed out of the entire inseason corridor. If Option 1 was implemented, CVs operating in both sectors would likely carefully monitor their PSC inside the corridor and adapt their fishing behavior as able, and larger inshore CVs may be encouraged (or required by their cooperative) to fish farther northwest outside of the corridor where any bycaught chum salmon would not count towards the corridor cap. Either approach could reduce chum salmon bycatch compared to status quo.

Similar to the overall bycatch, WAK chum salmon bycatch rates were higher inside the corridor compared to outside areas in all analyzed years, except the Early period in 2016 when the WAK chum salmon bycatch rate inside the corridor was 0.53 WAK chum/mt compared to 0.06 WAK chum/mt

outside the corridor. From 2011–2023, the estimated number of WAK chum salmon caught as bycatch outside the corridor never exceed the estimated number inside. These data indicate preemptive measures would also have the likely effect of reducing WAK chum salmon bycatch as well.

That being said, vessels could shift their fishing effort into the western portion of the inseason corridor prior to a closure if it is beneficial for them to do so. Although the estimated proportions of WAK chum salmon inside genetic cluster 2 were typically less than those in genetic cluster 1 in the Early period (June through mid-August), the total PSC rates were typically much higher. If vessels chose to target pollock inside the western portion of the inseason corridor, the overall bycatch could increase along with the WAK chum salmon bycatch. This outcome is unlikely because any chum salmon caught inside the corridor accrues to the corridor PSC limit, and vessel operators are expected to minimize their overall bycatch to the extent practicable throughout the entire corridor to avoid being displaced.

The outcomes for chum and WAK chum salmon PSC would be impacted by changes in fishing behavior, particularly by inshore CVs. If required to operate under Option 1 in the future, the inshore sector may slow the pace of fishing or require some vessels to stand down. These scenarios would be more likely when the risk of meeting the PSC limit is greater, and they could create data gaps for the RHS program. The RHS program relies on large amounts of fishery-dependent data to determine where bycatch hotspots are on a weekly or bi-weekly basis. Fewer CVs fishing, or fishing in somewhat irregular patterns, could result in vessels being moved to areas with unknown PSC. This could occur under status quo, but a key difference for Option 1 is that cooperative managers and/or vessel operators may be more reluctant to test fish in certain areas because of the risk of meeting the PSC limit with a bad tow.

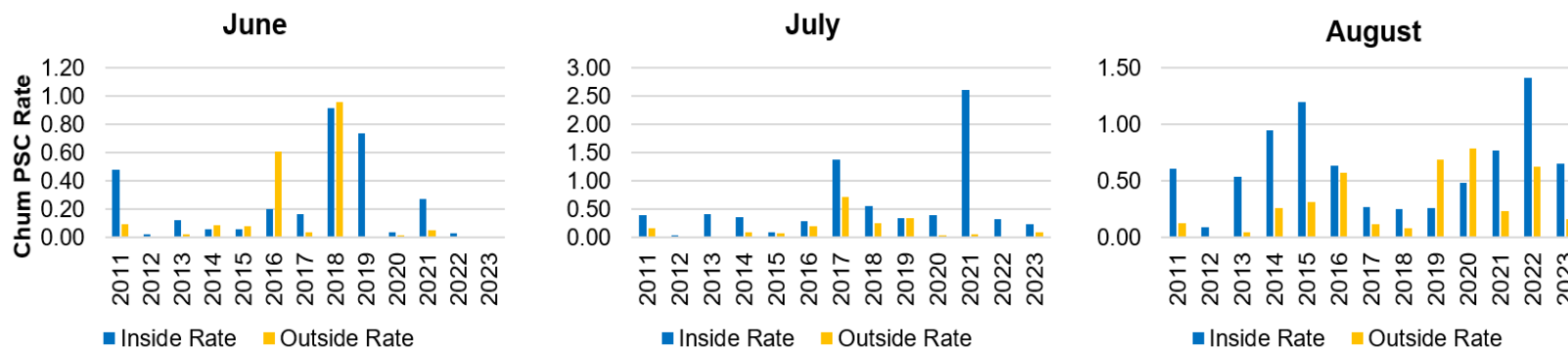


Figure 3-28 Comparison of the monthly chum salmon PSC rate during June, July, and August (closure window) inside the inseason corridor to all outside areas, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

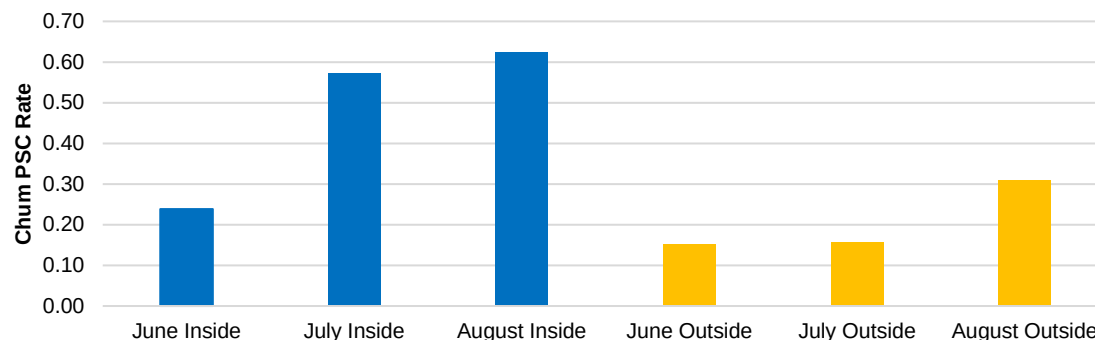


Figure 3-29 Comparison of the average monthly chum salmon PSC rate in June, July, and August inside to corridor to the average monthly rate in all outside areas, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

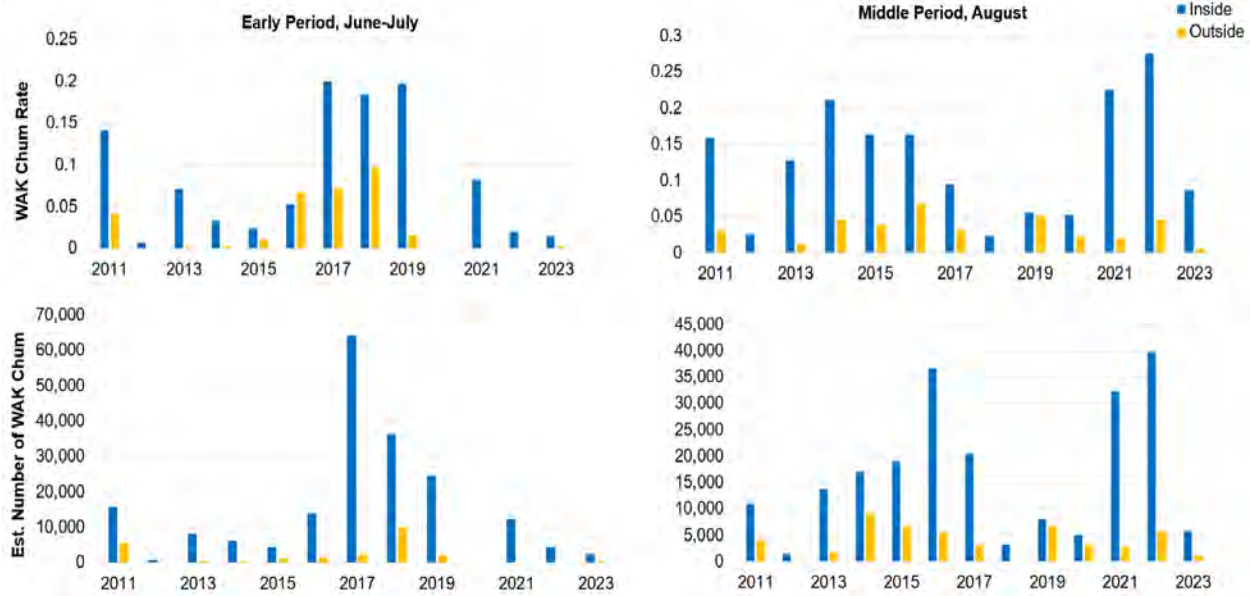


Figure 3-30 Estimated WAK chum salmon bycatch rate inside the inseason corridor (blue) and outside the corridor (orange) during the Early and Middle period (top panel) and the estimated number of WAK chum salmon caught as bycatch inside the inseason corridor (blue) and outside the inseason corridor (orange) during the Early and Late period (bottom panel), 2011–2023

Source: NMFS Alaska Region CAS, data compiled by ABL.

Post-Corridor Closure

If a cooperative or sector met the inseason corridor chum salmon PSC limit and was required to move outside the corridor through August 31, all vessels would move northwest outside the corridor as able or choose to stand down until the corridor area reopened. No pollock sector can fish farther east due to the Nearshore Bristol Bay Trawl Closure. Pollock vessels cannot fish around the Pribilof Islands which are encompassed in the Pribilof Islands Habitat Conservation Zone, and the fleet would not fish further west off of the “shelf edge” where there is break in the continental shelf (Figure 3-31).

If the CP and CDQ sectors met the corridor PSC limit and moved northwest, this behavior would largely reflect their historical fishing patterns under status quo. The potential conservation benefits for WAK chum salmon may be limited. A full corridor closure would likely be most impactful for chum and WAK chum salmon PSC if it included the inshore sector which had higher chum and WAK chum salmon PSC inside the corridor compared to other sectors. Inshore CVs impacted by a closure would likely move to areas outside the corridor particularly if a closure occurred earlier in the B season, although some vessels may not have the capacity to travel further northwest to do so. However, if pollock quota is consolidated onto larger vessels to be fished outside of the corridor or smaller vessels stand down until the corridor is reopened, this outcome would still have the potential to reduce chum and WAK chum salmon PSC compared to status quo. The potential costs to the inshore sector are addressed in Section 4.3.5.1.2.

More nuanced outcomes for chum/WAK chum salmon PSC would occur in the future under Option 1 than what the simplified scenarios presented directly above imply. The fishing conditions vary each year even if some general trends hold constant (see for instance Figure 3-28). Option 1 could increase chum salmon PSC from status quo if vessels are moved outside the corridor to stat areas with higher chum salmon PSC rates. This would be more likely under a 50,000-chum salmon PSC limit compared to a 200,000- or 350,000-chum salmon PSC limit. Table 3-59 shows each sector’s chum salmon PSC rate inside the corridor as well as genetic clusters 3 (C3) and 4 (C4) in June, July, and August. These data are spatially and temporally aggregated so there could be other dynamics (*i.e.*, one or two stat areas in one or

two weeks) driving PSC rates. However, some examples are provided below to demonstrate the potential risks of Option 1.

- 1) In 2019, the mothership sector's August chum salmon PSC rate was higher in cluster 3 (3.42 chum/mt) compared to its corridor PSC rate (0.12 chum/mt). This would present a risk if the mothership sector met the corridor PSC limit and catch was displaced to cluster 3. While this is a possibility in the future, it must be noted the mothership sector did not meet a 50,000-chum salmon PSC limit in 2019 under any apportionment (Table 3-15), so despite the higher PSC rate in cluster 3 no increases would be expected compared to status quo.
- 2) The inshore sector's July 2019 chum PSC rate in cluster 3 (1.94 chum/mt) was greater than its PSC rate inside the corridor (0.28 chum/mt). The inshore sector met a 50,000-chum salmon PSC limit in 2019 under all apportionment options on either June 29 or June 22 (Table 3-15). Across all apportionment options, the amount of displaced pollock catch in 2019 under Option 1 was greater than 200,000 mt. This scenario would increase chum salmon PSC from status quo particularly if the inshore sector moved to the fishing grounds in cluster 3.
- 3) In 2020, inshore sector's August chum PSC rate in cluster 3 (5.63 chum/mt) was greater than its corridor PSC rate (0.50 chum/mt). This would present a risk if catch was displaced from the corridor to cluster 3. In this year, the inshore sector met a 50,000-chum salmon PSC limit. The date the cap was met varied by apportionment between either August 22 (Options 1 and 2) or August 15 (Options 3 and 4), displacing ~13,000 mt or ~31,000 mt (Table 3-15 and Table 3-12). It is possible the outcome for chum salmon PSC would be worse in 2020 compared to 2019 because of the higher bycatch rate in cluster 3 but it is unlikely given the comparatively lower amount of redistributed catch.

In summary, Alternative 5 aims to reduce chum and WAK chum salmon PSC by incentivizing PSC avoidance pre-closure and by moving vessels away from historically high PSC areas if the corridor PSC limit is met. **Option 1 would likely reduce chum and WAK chum salmon PSC compared to status quo.** This could be achieved regardless of whether a corridor closure occurs, and this option presents a strong incentive for inshore CVs to modify their fishing behavior to avoid chum and WAK chum salmon PSC inside the corridor to avoid being moved from historically important fishing grounds. The bycatch would likely be reduced in most years after a corridor closure, but this may not always be the case. The distributions of pollock, chum salmon, and WAK chum salmon PSC in a given year, as well as how vessels react to the closure, would play a meaningful role in determining whether the bycatch would increase or decrease compared to status quo.

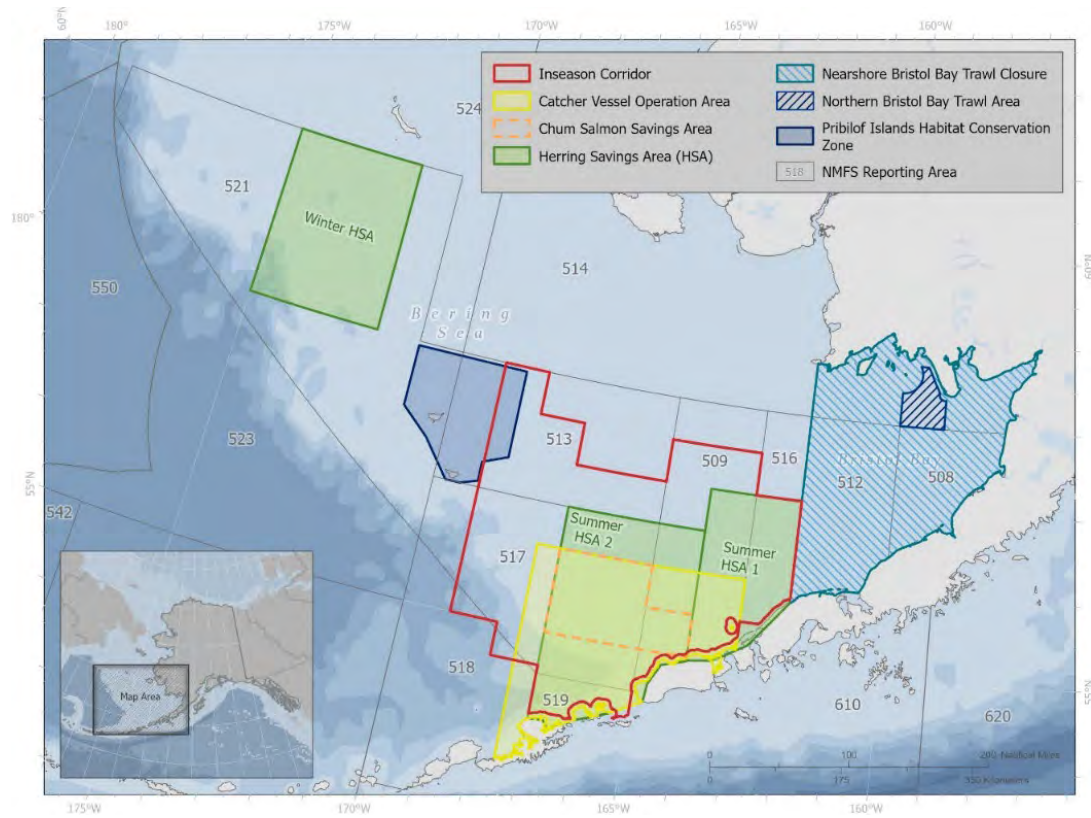


Figure 3-31 Inseason corridor under Alternative 5 and other relevant groundfish management boundaries in the Bering Sea

Source: AKFIN.

Table 3-59 Each sector's chum salmon PSC rate inside the corridor, genetic cluster area 3 (C3), and genetic cluster area 4 (C4) in June, July, and

CDQ									
	June			July			August		
	Corridor	C3	C4	Corridor	C3	C4	Corridor	C3	C4
2011	0.34	0.01	0.06	0.19	0.03	0.02	0.20	0.03	0.01
2012	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.01	0.01		0.01	0.00		0.00	0.01
2014	0.01	0.05	0.01	0.03	0.03	0.02		0.06	0.04
2015	0.02	0.02	0.02	0.04	0.06	0.01		0.06	0.03
2016	0.15	0.18	0.01	0.21			0.32	0.11	0.02
2017	0.02	0.00	0.00	2.30	0.10	0.27	0.31	0.02	0.23
2018	1.33	1.38	0.01	0.53	1.34	0.01	0.29	0.09	0.02
2019		0.01	0.01	0.06	0.03	0.00	0.03	0.05	0.19
2020			0.00			0.00		0.09	0.16
2021		0.01	0.00	4.24	0.00	0.00	0.41	0.25	0.05
2022	0.00	0.00		0.20	0.01	0.00	2.63	0.12	
2023	0.00	0.00		0.00	0.02	0.07	0.05	0.03	0.05

CP									
	June			July			August		
	Corridor	C3	C4	Corridor	C3	C4	Corridor	C3	C4
	0.00	0.06	0.16	0.19	0.15	0.20	0.74	0.11	0.10
	0.01	0.00	0.00	0.05	0.01	0.00	0.00	0.00	0.00
	0.00	0.05	0.02	0.29	0.01	0.01	0.22	0.31	0.01
	0.10	0.71	0.02	0.21	0.14	0.04	0.10	0.49	0.17
	0.02	0.19	0.06	0.41	0.09	0.05	1.00	0.35	0.11
	0.32	1.00	0.10	0.26	0.25	0.03	0.89	0.58	0.82
	0.03	0.05	0.01	2.08	0.75	0.83	0.50	0.10	0.17
	2.04	1.53	0.02	0.79	0.83	0.01	0.09	0.49	0.02
	0.01	0.00	0.00	1.27	0.34	0.00	2.15	0.51	0.85
	0.04	0.01	0.00	0.75	0.04	0.01	0.91	0.89	0.42
	0.07	0.07	0.00	9.24	0.15	0.01	0.17	0.53	0.06
	0.09	0.01	0.01	0.12	0.01	0.01	2.69	0.78	1.18
	0.00	0.00	0.00	0.07	0.14	0.10	0.27	0.17	0.11

Mothership									
	June			July			August		
	Corridor	C3	C4	Corridor	C3	C4	Corridor	C3	C4
2011	0.66		0.00	0.12	0.23	0.07	0.38	0.66	0.04
2012	0.01	0.00	0.02	0.04	0.01	0.00	0.02	0.00	0.00
2013	0.01	0.02	0.02	0.25	0.03	0.02	0.01	0.03	0.02
2014	0.03	0.05	0.01	0.17	0.06	0.03		0.27	0.09
2015	0.05	0.08	0.04	0.09	0.21	0.11	0.11	0.42	0.06
2016	0.23			0.50			0.68		
2017	0.09			0.62			0.04		0.08
2018	0.71			1.42	0.29	0.04	0.04	0.40	0.05
2019	0.21	0.03		0.46	0.79	0.01	0.12	3.42	0.78
2020		0.06		0.07	0.07	0.02	0.09	0.16	0.35
2021	0.13	0.03	0.00	1.90		0.00	0.41		
2022	0.01			0.19			1.97	1.52	0.62
2023	0.00			0.04			0.35		1.60

Inshore									
	June			July			August		
	Corridor	C3	C4	Corridor	C3	C4	Corridor	C3	C4
	0.45	0.08	0.04	0.43	0.21	0.05	0.64	0.15	0.16
	0.03	0.00	0.00	0.05	0.01	0.00	0.13	0.00	0.00
	0.15	0.00	0.00	0.44	0.01	0.00	0.56	1.09	0.07
	0.06	0.05	0.01	0.46	0.86	0.22	0.98	0.38	0.17
	0.07	0.06		0.07	0.38		1.21	2.16	
	0.17			0.32			0.50		
	0.25			0.88			0.18		
	0.81	1.63		0.45	0.07	0.03	0.27	0.12	0.02
	0.87	0.04	0.01	0.28	1.94		0.14		
	0.04	0.02		0.35	0.15	0.11	0.50	5.63	0.23
	0.30	0.14		2.19	0.04		0.87	0.13	0.55
	0.01			0.45			1.20	1.06	
	0.01	0.00		0.28	0.03	0.03	0.73	0.36	0.06

August, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without values indicate a sector did not target pollock inside the area during that month and year. PSC rates of "0.00" indicate fishing did occur but no chum salmon PSC was observed in that month and year.

3.3.4.6.4 Suboption 1

Suboption 1 would close 29 of 40 stat areas inside the corridor (~75% of the area) to a sector that attained its apportionment of the corridor PSC limit, and 11 stat areas inside the corridor would be exempted from closure. Vessels in a sector that met the apportionment of the PSC limit would be allowed to continue fishing inside the 11 stat areas exempt from closure and all other areas outside the corridor through August 31. The inseason corridor (40 stat areas), range of PSC limits (50,000–350,000 chum salmon), apportionment options, and closure window of June 10 – August 31 for Suboption 1 are the same as Option 1 and Option 2 (as discussed below).

3.3.4.6.4.1 Redistribution of Historical Pollock Catch

Because Suboption 1 would exempt 11 stat areas inside the corridor from closure which are historically important fishing grounds, it substantially decreased the proportion of weeks where the model could not redistribute catch to open stat areas compared to Option 1 (Table 3-5). Therefore, the analysis presents the model results. (see Section 3.1.5 for a description of the model’s methodology).

Nevertheless, caution must be used when interpreting these estimates because there are still many uncertainties associated with the results. The same challenge as Option 1 is present in that the annual net change estimates would be different if the model was able to redistribute catch in the weeks when no fishing occurred outside of closed areas, and the model cannot account for behavior changes. Compared to the model run for Option 1, the inshore sector’s catch was able to be redistributed in all weeks a PSC limit and apportionment were met (Table 3-5). This issue was still prevalent for all other sectors but to a lesser degree and was most pronounced under a 50,000-chum salmon PSC limit for the mothership sector in 2022 (100% of cases where catch could not be redistributed), and in 2016 for the CDQ and CP sectors under a 350,000-chum salmon limit (100% of cases where catch could not be redistributed). The reason for this that the CDQ and CP sectors met apportionment Options 1–3 for a 350,000-chum salmon PSC limit on August 27 and no fishing occurred outside the corridor through the end of the closure window. **In summary, readers should focus most on the direction of the estimated net changes as positive or negative rather than the actual values that are reported.**

Chum Salmon

The displacement of pollock catch from the 29 closed stat areas was estimated to reduce chum salmon PSC under all analyzed PSC limits, apportionments, and years, although in some cases the outcomes were close to neutral. These results are available to the reader in Figure 3-32 which compares the estimated net change in chum salmon PSC (dark blue) to the chum salmon bycatch occurring under status quo (light blue) under all analyzed cap amounts and apportionments; years where no closure was estimated for that apportionment are cross hatched in black. Figure 3-34 shows the annual net change estimates, which represent the difference between the estimated net change in PSC and status quo PSC in Figure 3-32, for all years in which closures were applied and broken out by genetic reporting group.

Across all years, the greatest bycatch reductions were estimated under a PSC limit of 50,000 chum salmon using apportionment Option 4 (AFA) at an average reduction of ~71,000 and a maximum of ~293,000 chum salmon. However, the estimated median reduction was ~33,000 chum salmon. At this cap level, the average is driven by the high reductions estimated in 2017 and 2021 which were the highest years of historical bycatch inside the corridor at 394,665 and 484,025 chum salmon, respectively.

The estimated bycatch reductions decrease under the greater analyzed PSC limits. Under a 200,000-chum salmon PSC limit, the bycatch reductions ranged between 0 and ~134,900 chum salmon. Under a 350,000-chum salmon PSC limit, bycatch reductions were predicted in 2 of the 3 years when closures applied (2017 and 2021). The range of bycatch reductions predicted in those two years ranged from ~52,890 and ~104,200 chum salmon.

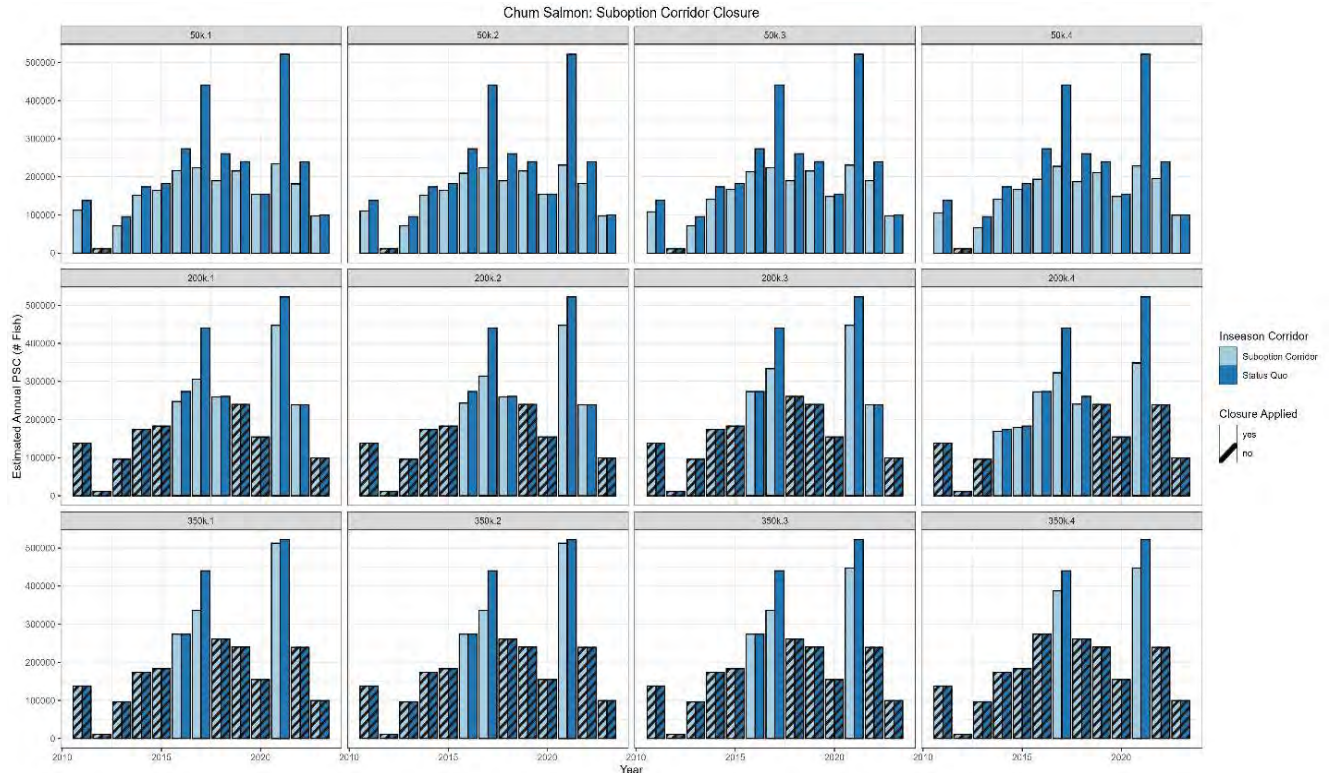


Figure 3-32 Comparison of the pollock fleet's historical chum salmon PSC inside the corridor (dark blue, status quo) to the fleet's estimated chum salmon PSC (light blue, suboption corridor) for each analyzed corridor chum salmon PSC limit and apportionment option under Suboption 1, Alternative 5, 2011–2023

Source: NMFS Alaska Region CAS.

Notes: The analyzed corridor chum salmon PSC limits are shown in ascending order from 50,000 (50k) to 350,000 (350k); apportionment options are shown in ascending order from left to right. As an example, facet "50k.3" shows the estimates under a 50,000-chum salmon corridor PSC limit using apportionment Option 3 (pro rata).

The higher bycatch levels inside the 29 stat areas compared to all outside areas where fishing occurred is the driving factor for the estimated net change results. To illustrate this, Figure 3-31 provides three different correlations to show the relationship between the estimated net change in PSC (dependent variable) and displaced pollock catch (left panel), PSC inside the corridor (middle panel), and the new PSC estimates (right panel). There is a strong correlation between the PSC levels observed inside the 29 stat areas and the net reduction in chum salmon PSC. Note that each plot represents a simple correlation and does not control for the influence of the other variables. Thus, chum salmon PSC could be reduced if a closure occurred under Suboption 1 because vessels would be moved out of an area with historically high chum salmon PSC, not as a result the amount of pollock catch displaced.

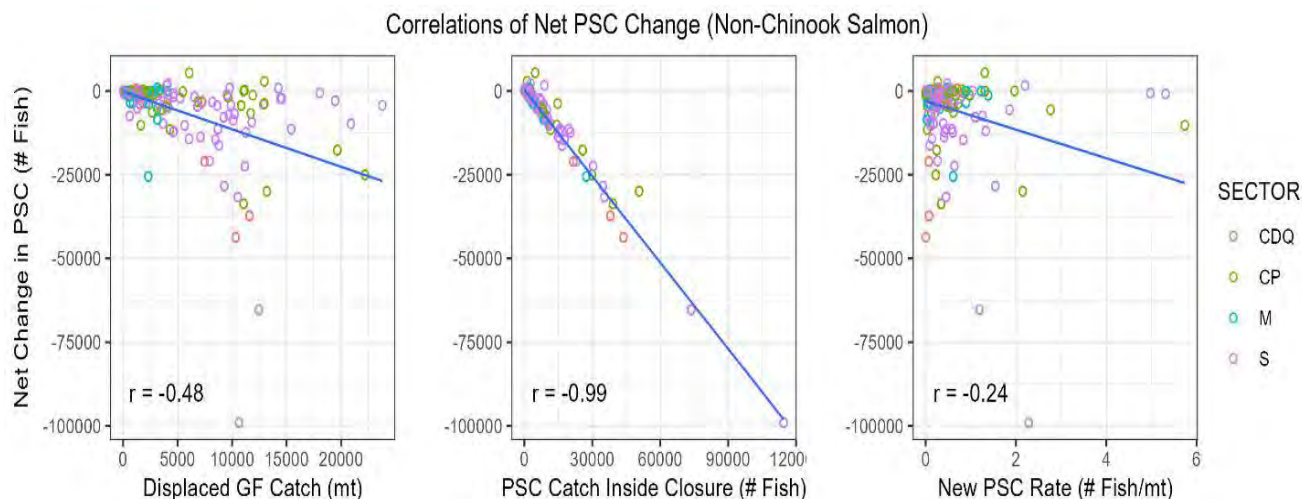


Figure 3-33 Pearson correlations of net change in chum salmon PSC and displaced pollock catch, observed PSC inside the closed stat areas, and new PSC for all sectors

Source: NMFS Alaska Region CAS.

WAK Chum Salmon

Consistent with the overall reduction in chum salmon, the estimated net change in WAK chum salmon PSC is projected to be negative under Suboption 1. The net change estimates for WAK chum salmon under Suboption 1 were calculated by subtracting the estimated number of WAK chum inside the corridor from the number of WAK chum that would have been caught outside the corridor. The estimates of WAK chum were derived by multiplying the total PSC inside or outside the corridor by their respective genetic estimates from the early or late time period.

Averaged across years, the greatest WAK bycatch reductions were expected under a 50,000-chum salmon PSC limit using apportionment Option 4 (AFA). An average reduction of ~14,500 and median reduction of 9,800 chum salmon were estimated (minimum of ~800 and a maximum of ~53,000). Again, under this PSC limit, the average is driven by the high reductions estimated in 2017 and 2021 which were the highest years of historical bycatch inside the corridor. The estimated WAK bycatch reductions decrease as the inseason corridor PSC limit increases. Under a 200,000-chum salmon PSC limit, the bycatch reductions ranged between 0 and ~34,100 WAK chum salmon and occurred in 4 to 6 years depending on the apportionment. Under a 350,000-chum salmon PSC limit, WAK bycatch reductions were predicted in 2 of the 3 years when closures applied (2017 and 2021). The range of bycatch reductions predicted in those two years ranged from ~1300 and ~25,100 WAK chum salmon.

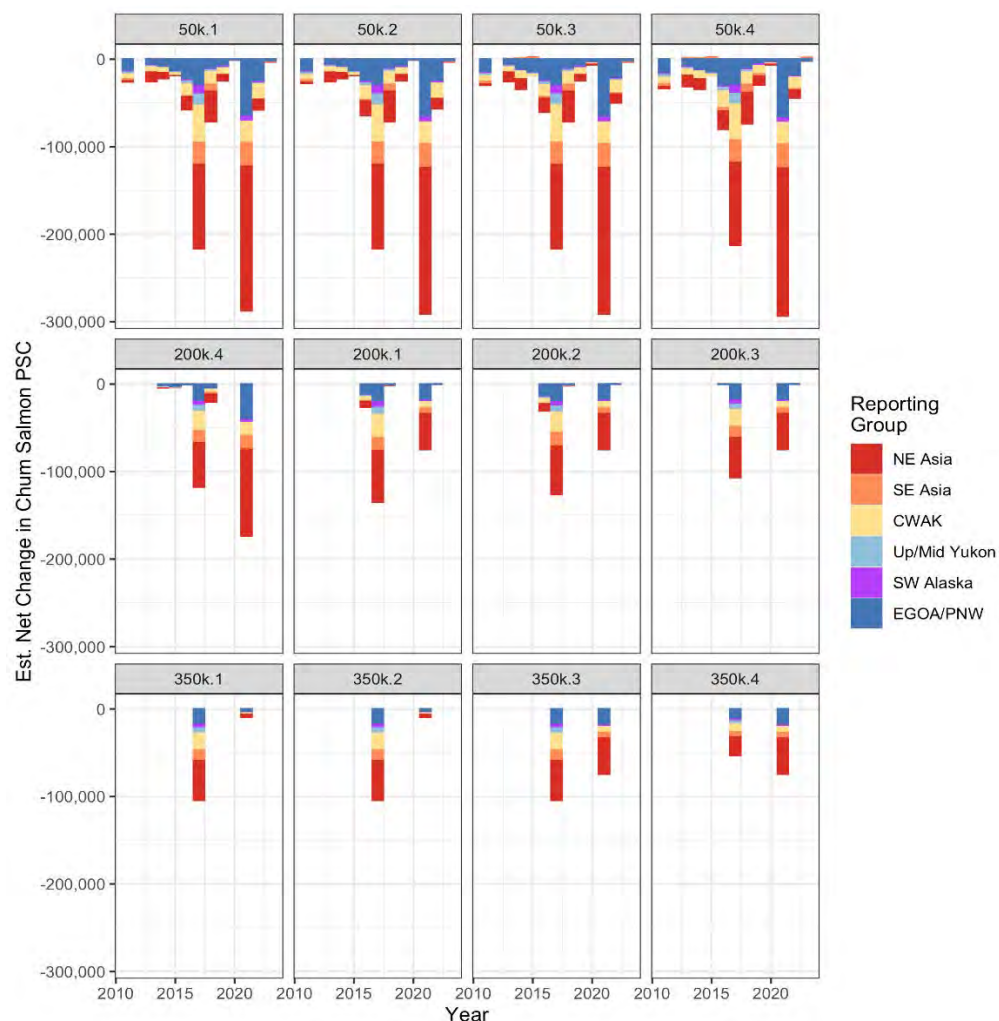


Figure 3-34 Annual net change estimates for chum salmon PSC under Suboption 1, Alternative 5, broken down by genetic reporting group

Source: NMFS Alaska Region CAS.

Notes: The analyzed corridor chum salmon PSC limits are shown in ascending order from 50,000 (50k) to 350,000 (350k); apportionment options are shown in ascending order from left to right. As an example, facet "50k.3" shows the estimates under a 50,000-chum salmon corridor PSC limit using apportionment Option 3 (pro rata).

Discussion

Based on the Fleet Movement Model and associated examination of historical catch and bycatch rates inside and outside the closed areas, it is expected that Suboption 1 would reduce chum and WAK chum salmon PSC compared to status quo. However, the magnitude of the reductions is uncertain. A primary factor driving the uncertainty are the instances when the model cannot redistribute catch to outside areas because no fishing occurred outside of the corridor. As stated previously, no changes in PSC are estimated in these weeks and the net change estimates would be different from what is reported if the model could displace fishing effort.

Additionally, there were some weeks when the model displaced a sector's pollock catch to a single stat area or to a relatively small number of areas. This may be unrealistic. Congestion on the fishing grounds, the magnitude of harvest displaced, or future pollock CPUE in that week may prevent catch from being recovered in the way predicted by the model. If vessels are moved out of the corridor, they will likely be fishing in unknown areas. In the future, the distribution of the fishery after the corridor closed is unlikely to perfectly occur within areas historically fished, and the model cannot account for the PSC rates in

unknown areas. That being said, if chum salmon PSC rates were to increase, the RHS program would still operate and constrain bycatch by isolating discrete areas within all remaining open areas as needed.

Vessel operators are balancing multiple objectives (target catch/quality/CPUE, timing, and various non-target groundfish and PSC species constraints), so the decisions they make when faced with suboptimal choices can be informed by the incentives that would be established in regulation. The model displaced catch in proportion to where catch actually occurred in outside areas, which may not always be where the fishery would go in the future. Competing goals often include seeking higher quality fish or avoiding other PSC species. Other factors that are expected to direct where vessels would go include bycatch rates, fish size, fish quality, and congestion on the fishing grounds.

3.3.4.6.5 Option 2

The inseason corridor (40 stat areas), range of PSC limits (50,000–350,000 chum salmon), apportionment options, and closure window of June 10 – August 31 for Option 2 are the same as Option 1 and Suboption 1 and would be specified in Federal regulations. Under Option 2, Federal regulations would also require between 19 and 29 stat areas inside the corridor to close. The IPAs would determine, and NMFS would review and approve, the exact stat areas to close if the PSC limit were attained and manage a closure. The stat areas the IPAs select to close may change year-to-year upon review and approval by NMFS but may not change inseason.

Federal regulations would require the IPAs to evaluate stat areas based on chum salmon PSC, pollock CPUE, and genetics data. In making their respective selections, it is expected the IPAs would also consider the operational differences among vessels that influence fishing behavior, the areas with reliable fishing grounds such that the TAC could be utilized, the distribution and density of chum salmon PSC encounters across the fishing grounds compared to the distribution and density of other PSC species like herring and Chinook salmon, genetic stock composition estimates indicating areas where WAK chum salmon were encountered, and more nuanced information from fishermen/IPA members on the depths and contours along the Bering Sea shelf where pollock and PSC species are likely to be encountered.

In general, it is expected the IPAs would look to leave open stat areas with high pollock CPUE or reliably good fishing (*i.e.*, catch rates and aggregations as well as fish quality) while closing stat areas that represent moderate to high PSC risk. However, optimizing their selections in this way could prove challenging because each year of fishing is slightly different. This point is demonstrated in Table 3-60 that shows the distribution of the fishery across corridor stat areas in all analyzed years, as well as Figure 3-35 and Figure 3-37 showing a rolling three-year average for the pollock catch and PSC rates in each corridor stat area in the most recent five years.

Whether Option 2 would reduce chum and WAK chum salmon bycatch relative to no action depends on the selections made by the IPAs. The IPAs could close stat areas based on the highest historical chum salmon PSC rates, but this type of prioritization may actually restrict fishing in areas where WAK chum salmon encounters were lower (*e.g.*, stat areas 675530 and 685600). This scenario could have a relatively neutral impact to WAK chum salmon compared to the status quo. *Conversely*, the IPAs could close stat areas with comparatively low pollock catch and higher WAK chum salmon bycatch rates (*e.g.*, stat areas 665500 and 685630). The IPAs may also select stat areas that would have a relatively low impact on fishing behavior, based on the historical data. No pollock catch was observed in stat area 655412 during the analyzed period while other areas like 685730, 635700, and 645630 were fished in one year. More nuanced tradeoffs would likely emerge among stat areas with comparable catch and PSC. In these scenarios IPA and cooperative managers may rely more heavily on fishermen's LK on chum salmon PSC encounters including the depth and contours when making selections.

If the IPAs select stat areas to close that had relatively little or no fishing history, the impacts to chum salmon PSC would be close to neutral. There is no reason to expect the IPAs would deliberately choose stat areas that present a moderate to high PSC risk and so Option 2 is not expected to increase PSC

compared to status quo. Furthermore, the RHS program would operate in addition to Option 2, helping to constrain chum salmon PSC both prior to and after a corridor closure.

Beyond the IPAs selections of stat areas, chum/WAK chum salmon PSC reductions could be driven by additional incentives (*e.g.*, rewards for fishing outside the corridor) or penalties (*e.g.*, financial penalties levied on poor performing vessels) established within the IPAs, and pollock fishermen value the opportunity provided by unrestricted fishing grounds. It is also worth noting that the variability in fishing conditions could drive greater incentives in years when the distribution of pollock and chum salmon are different from what was predicted preseason. If the IPAs create sufficient incentives for bycatch avoidance behavior, chum and WAK chum salmon PSC could be reduced prior to and regardless of a corridor closure because the chum/WAK chum salmon PSC rates have historically been higher inside the corridor compared to outside areas (similar to Option 1 and Suboption 1).

The RHS program may play a meaningful role in identifying more discrete areas with higher PSC rates and closing those areas for a period of time. Likewise, if the corridor partially closed to a sector that attained its apportionment, chum salmon PSC could be reduced compared to status quo if vessels move to stat areas exempted from closure (either inside or outside the corridor perimeter) and achieve lower PSC/PSC rates. However, chum salmon can be widely distributed among the corridor's stat areas and the PSC rates in a given stat area showed variability year-to-year. The IPAs would likely balance their selections against the different criteria which are likely to pose tradeoffs, and they would be required to select areas prior to the B season using imperfect information.

Table 3-60 Pollock harvest (mt) inside corridor stat areas from June 10 – August 31 and summary of the number of years or areas fished, 2011–2023

Stat Area	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Number of Years Fished
625531					51	969	3	118	54	97				6
625600	165					3,277		116	801	45				5
625630									174		241			2
635504	4,200	2,065	7,655	2,235	492	4,473	2,799	354	448	383	79	44	2,278	13
635530	12,259	2,534	2,867	3,676	83	19,530	457	1,830	1,773	6,693	281		1,276	12
635600	1,394			1,184	67	17,435	15	97	931	1,809			216	9
635630	163		97	3		337			163	874				6
635700										884				1
645434	870	2,025	1,465	980	50	638	1,563	204		330	2,206	1,192	4,187	11
645501	42,861	22,292	52,188	30,618	769	13,404	45,774	33,036	14,643	9,949	47,426	52,397	26,533	13
645530	13,846	3,112	6,091	5,084	288	1,080	2,005	2,553	247	1,219	6,528	9,218	7,060	13
645600	1,587	127		185		30,084				708	735	444	11,694	8
645630						157								1
645700	156					166								2
655409	18,389	10,955	2,493	24,882	37,579	39,810	52,812	56,404	53,223	27,443	26,530	17,761	24,723	13
655410	421	2,021	177	1,307	4,667	1,127	2,828	2,208	5,118	4,829	2,389	223	1,668	13
655412														0
655430	22,118	29,535	15,719	79,139	142,763	191,783	130,035	93,192	164,346	46,895	123,915	104,870	70,211	13
655500	20,152	6,151	13,951	25,516	23,975	55,639	35,019	16,005	11,047	113	54,141	30,760	22,876	13
655530	6,657	17,353	14,845	5,424	3,024	4,389	6,060	6,467	324	693	17,587	21,731	9,386	13
655600	7,433	3,072	1,723	158	222	18,817	1,548	350	641	108	93	6,375	9,866	13
655630	176					1,019			70		2		184	5
665401	618	266	207	480	120	7,649	2,486	10,516	1,403	4,440	3,427	707	1,133	13
665430		589	431	12,498	19,959	29,746	18,296	5,595	3,972	2,729	6,724	3,351	4,972	12
665500		540	2,787	18,504	8,494	8,486	14,379	1,594	181		4,185	4,509	136	11
665530	50	11,284	10,385	2,281	328	4,458	16,289	9,635			931	3,955	408	11
665600	2,883	19,705	11,923	215		17,627	13,230	1,876		85		25,232	76	10
665630	1,928	30	701		11	10,283		959			321	2,275		8
675430				323	286	465	5,679	211	96	219				7
675500		37	5,830	23,414	30,135	15,441	36,146	38,146	6,129	11,067	8,592	10,619	2,960	12
675530	101	3,234	10,134	13,665	3,534	9,514	34,539	6,286	94	195	1,864	18,634	719	13
675600	5,734	18,472	35,940	3,576	789	7,206	40,917	4,300		63	92	28,554	1,964	12
675630	5,675	7,187	8,863	225		16,043	1,910	8,135	3	24		3,502		10
675700		61			659	4,181		3						4
685500			332	2,366	3,166	4,437	13,305	10,226	7,023	5,211	2,584	4,411	4,701	11
685530	285	1,138	563	7,558	31,839	16,361	45,881	17,701	16,691	10,308	20,089	21,467	7,791	13
685600	7,783	10,962	16,304	18,023	4,484	3,218	28,347	5,754	1,815	2,205	2,352	8,970	17,192	13
685630	20,740	14,490	6,624	6,176	197	9,087	5,146	8,638		1,596	355	1,269	1,005	12
685700		154			3,351	117			1,132					4
685730									192					1
Number of Areas Fished	27	27	26	28	27	36	27	30	28	29	25	25	26	-

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Gray highlighted cells indicate the 11 stat areas that would remain open under Suboption 1 which is only provided as a reference point for the reader.

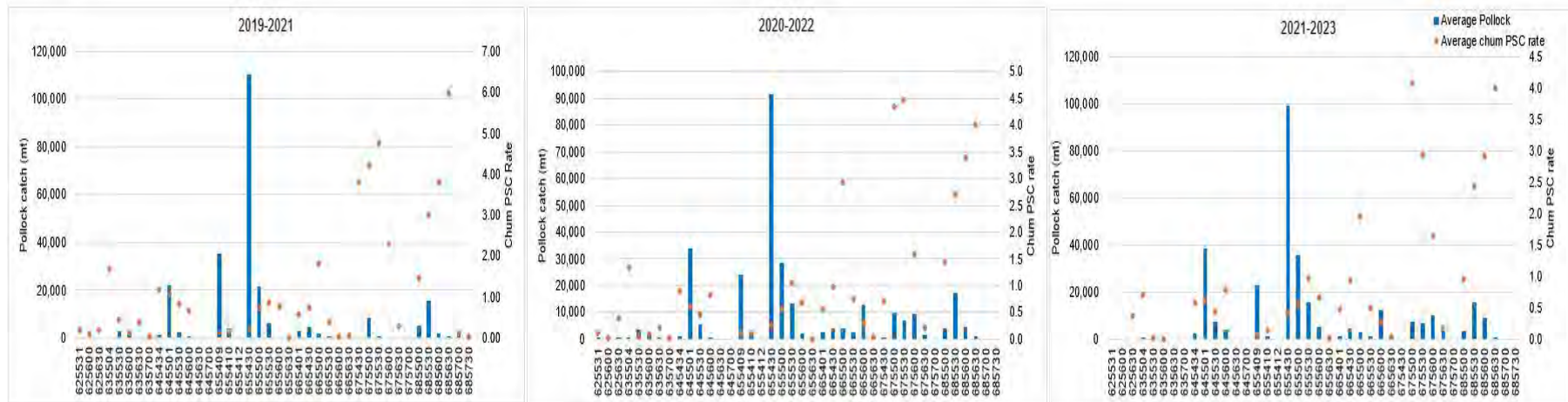


Figure 3-35 Comparison of the rolling three-year average pollock catch (mt) inside each inseason corridor stat area (blue bar) and the stat area's chum salmon PSC rate (orange) in 2019-2021, 2020-2022, and 2021-2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

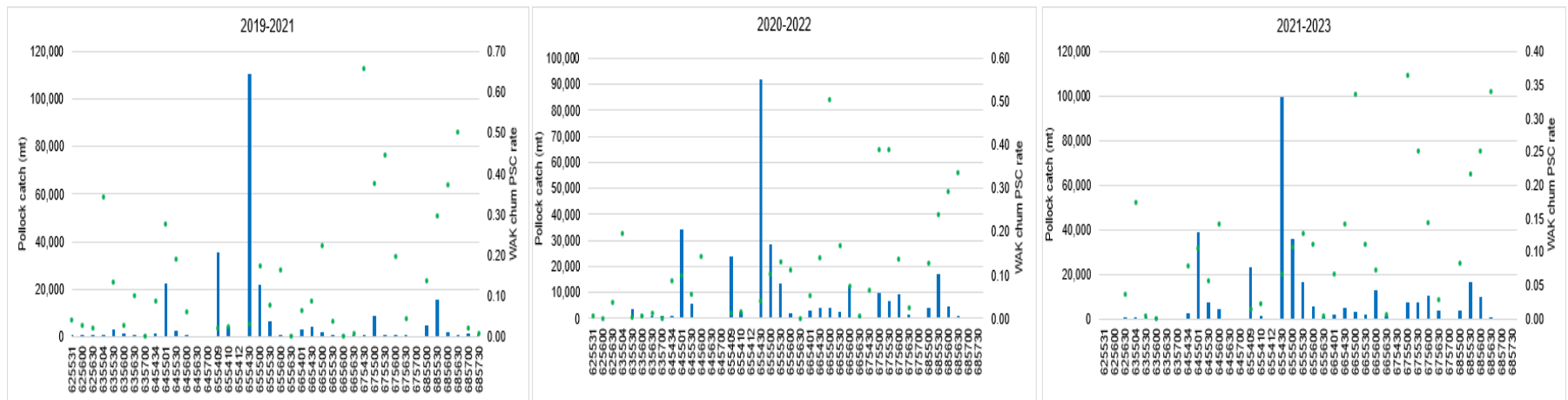


Figure 3-36 Comparison of the rolling three-year average pollock catch (mt) inside each inseason corridor stat area (blue bar) and the stat area's WAK chum salmon PSC rate (green) in 2019-2021, 2020-2022, and 2021-2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.3.4.6.6 Comparison of Inseason Corridor Options

What follows is a brief discussion comparing the three inseason corridor options analyzed in the preceding sections. There are two primary ways bycatch could be reduced compared to status quo under Alternative 5—vessels change their fishing behavior to avoid reaching the corridor PSC limit and/or vessels are displaced from some or all of the corridor through August 31. The three inseason corridor options present the same risk in that attaining the chum salmon PSC limit would displace vessels from the corridor, but whether a closure actually occurs in the future would depend on the PSC limit amount, apportionment option, and a sector's ability to avoid chum salmon PSC in the corridor.

The historical data show all three inseason corridor options under consideration have the potential to reduce chum and WAK chum salmon PSC after a closure. More specifically, Option 1 and Suboption 1 are expected to reduce chum and WAK chum salmon PSC inside the corridor and likely reduce WAK chum salmon bycatch across the entire B season. This assessment is driven by chum salmon PSC data from 2011–2023 that clearly indicate the chum and WAK chum salmon PSC was typically greater inside the corridor (all 40 stat areas) compared to outside areas (see also Figure 3-37). The analysis cannot provide a similar statement (or conclusion) for Option 2 only because the stat areas that would close after the corridor chum salmon PSC limit is met are at present unknown. Option 2 is expected to reduce chum and WAK chum salmon PSC inside the corridor prior to a closure as vessels constrain their PSC against the limit; however, the impacts that would occur after a closure are uncertain.

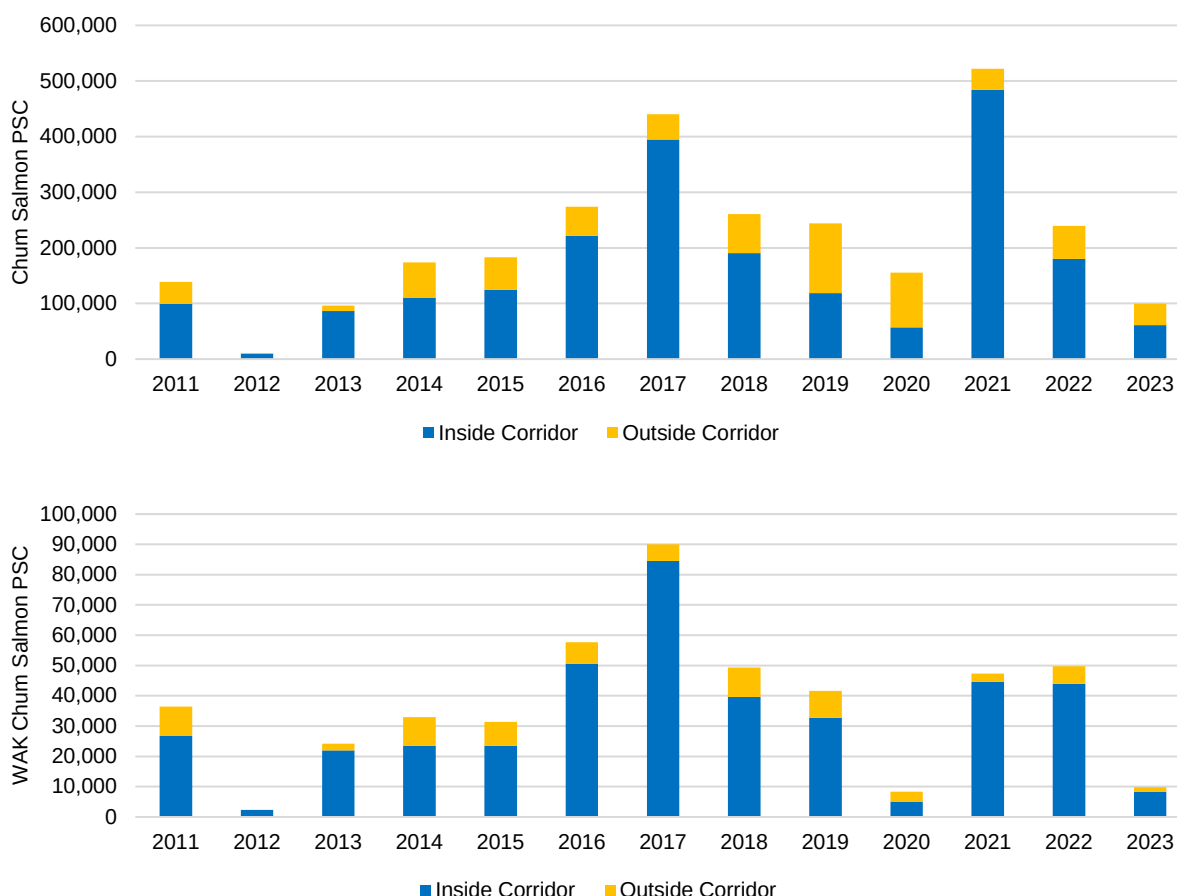


Figure 3-37 Comparison of the number of chum salmon (top panel) and WAK chum salmon (bottom panel) caught as bycatch inside the inseason corridor (blue) to all outside areas (yellow) (from June 10 – August 31, 2011–2023)

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

If Alternative 5 is selected, bycatch reductions could be achieved by preemptive changes in fishing behavior to constrain PSC inside the corridor. Option 1 would provide the strongest incentive for preemptive changes in fishing behavior because it would close the largest amount of fishing area. The retrospective evaluation of when sectors would have met a corridor PSC limit and apportionment combination, had no changes in fishing behavior occurred, showed greater amounts of displaced pollock catch under a corridor PSC limit of 50,000 chum salmon. These estimates show the pollock harvest that would have needed to be recovered in outside areas for impacted sectors to fully harvest their quota.

Suboption 1 and Option 2 also create an incentive for vessels to preemptively change their behavior to stay below the corridor PSC limit but the risk that pollock harvest would not be fully recovered after a closure is less than Option 1. Table 3-61 illustrates this point by showing each sector's pollock catch inside the entire corridor (Option 1) and inside the 11 exempted stat areas (Suboption 1) during the closure window as a percentage of the sector's total B season harvest in that year. Suboption 1 would exempt 11 stat areas from closure after the PSC limit were met. Approximately 47% of the pollock caught in all 40 corridor stat areas occurred in these 11 exempted areas from 2011–2023.

Similar information cannot be provided for Option 2 because the areas that would close are at present unknown. Option 2 would allow the IPAs to manage the inseason corridor closure including the ability to select the stat areas to close if the corridor PSC limit were met. The potential for Option 2 to place pollock at risk of not being harvested would be the same as Suboption 1 if the IPAs selected the same 11 stat areas. Option 2 provides even greater operational flexibility because up to 21 stat areas could be exempted from closure and so it is less likely that pollock catch would be at risk of being displaced and/or not being recovered if the PSC limit were met.

Table 3-61 Each sector's pollock catch inside the inseason corridor (left) and 11 stat areas exempted from closure (right) as a percentage of total B season catch, 2011–2023

Year	CDQ		CP		Mothership		Inshore	
	Inseason Corridor as % of B Season Total	11 Exempt Stat Areas as % of B Season Total	Inseason Corridor as % of B Season Total	11 Exempt Stat Areas as % of B Season Total	Inseason Corridor as % of B Season Total	11 Exempt Stat Areas as % of B Season Total	Inseason Corridor as % of B Season Total	11 Exempt Stat Areas as % of B Season Total
2011	6.2%	2.1%	3.2%	1.4%	31.0%	5.1%	54.6%	19.9%
2012	6.3%	3.3%	10.9%	2.4%	48.8%	10.2%	39.5%	16.3%
2013	0.6%	0.0%	5.3%	0.5%	30.3%	9.3%	59.4%	8.8%
2014	20.2%	13.7%	10.4%	1.5%	20.4%	2.5%	68.6%	32.3%
2015	12.9%	1.1%	10.8%	0.0%	22.5%	10.6%	75.1%	56.0%
2016	86.1%	43.5%	49.2%	9.2%	77.5%	37.0%	84.9%	59.6%
2017	81.6%	15.0%	52.0%	1.2%	74.1%	43.1%	87.5%	49.2%
2018	17.9%	3.1%	14.4%	3.2%	27.9%	8.8%	78.1%	48.3%
2019	1.8%	0.0%	8.3%	0.0%	18.4%	13.5%	72.3%	62.0%
2020	0.0%	0.0%	2.5%	0.0%	4.7%	4.6%	39.5%	25.5%
2021	15.6%	0.4%	4.3%	0.0%	77.1%	46.9%	75.5%	39.1%
2022	18.1%	0.6%	36.6%	0.6%	79.8%	35.0%	95.4%	42.7%
2023	3.6%	0.0%	7.6%	0.1%	43.4%	40.9%	56.9%	25.0%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Alternative 5 could also reduce bycatch through a corridor closure that redistributes fishing effort to outside areas (Option 1) or a limited number of exempted areas inside the corridor (Suboption 1 and Option 2). However, it is very challenging to determine which inseason corridor option may have the greatest impact *after* a closure occurs. Future outcomes would depend on the option selected as well as the PSC limit and apportionment, the amount of pollock catch displaced, the PSC rates in the areas that vessels move to, and many other nuanced factors.

Option 1 has high potential for reducing chum/WAK chum salmon PSC after a closure so long as the chum salmon PSC rates in the stat areas outside the corridor where fishing effort is redistributed to do are not substantially higher. Based on the historical data from 2011–2023, it was uncommon for the chum

salmon PSC rates to be greater outside the corridor compared to within. However, some years were shown to have the potential to increase chum salmon PSC from status quo (2019 and 2020).

It is very challenging to determine which inseason corridor option may have the greatest impact *after* a closure occurs because the outcome depends on the amount of pollock catch displaced, the PSC rates in the areas that vessels move to, and many other nuanced factors.

The impacts of **Suboption 1** after a closure occurred were evaluated using a Fleet Movement Model that redistributed pollock catch on a weekly basis to open stat areas where historical catch occurred and in proportion to the distribution of historical catch in each area. Note there were weeks when the model was unable to redistribute catch to outside areas because no fishing occurred outside of the corridor. Changes in PSC are not estimated in these weeks and so the estimates would be different from what is reported if the model could displace fishing effort. Readers should focus most on the direction of the estimated net changes in PSC as either positive or negative and not the actual values reported.

In all years a corridor PSC limit and apportionment combination were met, the displacement of pollock catch from the 29 stat areas that would close under Suboption 1 was estimated to reduce chum salmon PSC compared to status quo, although the outcomes were close to neutral in some cases. The consistency in the direction of the net change estimates was driven by the higher historical bycatch inside the 29 stat areas compared to all other stat areas where fishing occurred. These results are promising in terms of the potential for PSC reductions but it must be noted that vessel operators balance multiple objectives (target catch/quality/CPUE, timing, and various non-target groundfish and PSC species constraints). In summary, the decisions they would make in the future could be different from what was done in the past.

Option 2 could also reduce chum/WAK chum salmon PSC compared to status quo but future outcomes would depend on the stat areas selected by the IPAs. The IPAs could select stat areas with relatively low impact on their fishing behavior but their selections would also need to consider historical PSC and genetics data. The contracts could also include additional incentives or penalties for vessels governed by them.

Compared to Option 1, Suboption 1 and Option 2 would be less likely to displace large amounts of fishing effort after a corridor closure because some of the catch redistributed from closed areas would be recovered in exempted stat areas inside the corridor. Continued fishing inside exempted stat areas would have close to neutral impacts to chum/WAK chum salmon PSC compared to status quo, but the risk that chum/WAK chum salmon PSC would increase because vessels are redistributed to areas with unknown PSC rates is less under Suboption 1 and Option 2.

Compared to Option 1 and Suboption 1, Option 2 would allow the stat areas that close to vary over time without a regulatory amendment. It is expected that the IPAs would use this regulatory flexibility in the future if the distribution of pollock relative to chum/WAK chum salmon PSC change. Option 1 and Suboption 1 would require an action be initiated to modify these regulations. In making their selections, the IPAs would use their knowledge of the locations, depths, contours, and fishing strategies. It is possible this assessment would lead to selections of more discrete areas, such as the lateral half of a stat area, to remain open or close. Finally, the IPAs can implement hotspot closures within hours of a known high bycatch event whereas NMFS generally requires 3 to 5 days from the time a decision is made to implement an inseason closure, and it could take longer depending on weekends or holidays.

3.3.4.6.7 Option 3

Option 3 of Alternative 5 would implement an abundance-based threshold that would suspend the inseason corridor. Option 3 may be selected in conjunction with any option or element from Alternative 5, as well as Alternatives 2 or 4, but it may not be selected alongside Alternative 3. Yukon summer and fall chum salmon returns would need to be at or above the 75th percentile (Suboption 1) or the 90th percentile (Suboption 2) for the inseason corridor to be suspended. As with Alternative 3, these thresholds are based on the run reconstruction for each stock using data from 1992–2022).

Table 3-62 shows the returns for each stock from 2011–2023 and gray shading indicates a year when that stock was at or above its threshold. Run sizes assessed against the 75th percentiles of abundance are shown on the left and whereas the 90th percentile is shown on the right. **As shown, the inseason corridor would have been suspended in 2 of 13 years (2014 and 2018) under Suboption 1 and would not have been suspended in any of the 13 analyzed years under Suboption 2.** If abundance is similar in the future, the inseason corridor would apply in most years. However, Option 3 would provide lesser conservation benefits compared to Alternative 5 without Option 3 because the management measure would be in effect each year. Option 3 would not confer greater conservation benefits than what could be realized under any inseason corridor option (Option 1, Suboption 1, or Option 2) alone.

Table 3-62 Years when Yukon River summer and fall chum salmon run sizes, based on the respective run reconstructions, were above the 75th percentile (left) and 90th percentile (right) of historical abundance, 2011–2023

Stock:	Yukon Summer Chum	Yukon Fall Chum	Yukon Summer Chum	Yukon Fall Chum
Thresholds:	Suboption 1: 75th percentile		Suboption 2: 90th percentile	
	2,671,450	1,150,758	3,871,700	1,390,329
2011	2,406,000	1,244,141	2,406,000	1,244,141
2012	2,479,900	1,089,200	2,479,900	1,089,200
2013	3,349,600	1,215,809	3,349,600	1,215,809
2014	2,467,600	956,669	2,467,600	956,669
2015	1,978,400	828,453	1,978,400	828,453
2016	2,581,500	1,390,329	2,581,500	1,390,329
2017	3,635,100	2,315,883	3,635,100	2,315,883
2018	2,074,700	1,114,684	2,074,700	1,114,684
2019	1,689,400	802,964	1,689,400	802,964
2020	763,200	184,233	763,200	184,233
2021	156,130	95,249	156,130	95,249
2022	478,690	242,465	478,690	242,465
2023	896,850	318,687	896,850	318,687

Source: ADF&G.

Notes: Gray highlighting indicates years when the run size was at or above its threshold.

3.3.4.6.8 Option 4

Pacific herring PSC in the BSAI groundfish trawl fisheries is managed under an annual PSC limit set at 1% of the annual spawning stock biomass. Attainment of the PSC limit triggers a closure of the relevant HSAs to the trawl fishery (see Section 3.5). Option 4 would modify the start date for the Winter HSA closure for the pollock fishery from September 1 to September 30. No other element of the Pacific herring PSC management framework specified in regulation at 50 CFR 679.21(e)(3)(iv)(B) through (F)) would be affected. Option 4 may only be selected as a component of Alternative 5.

The potential effects of Option 4 on chum/WAK salmon would result from allowing directed fishing for pollock with trawl gear to continue inside the Winter HSA throughout the month of September, *if the pollock fishery had attained its apportionment of the herring PSC limit*. Directed fishing may otherwise occur inside the Winter HSA in September. Since 2011, directed fishing for pollock with trawl gear was only prohibited inside the Winter HSA during September in the 2020 B season (Table 3-21).

To assess the potential impacts of Option 4 on chum/WAK chum salmon PSC, Table 3-63 shows the chum salmon PSC rate during the month of September inside each HSA and all outside areas. Directed fishing for pollock occurred in 10 of 13 years inside the Winter HSA. The average and median chum salmon PSC rate in the Winter HSA was less than what was observed in Summer HSA2 and all outside areas. If Option 4 were selected as an element of Alternative 5, the impacts to chum salmon PSC would be close to neutral and only differ from status quo in year the herring PSC limit is met prior to September in the fishing year.

Table 3-63 Bering Sea pollock fishery chum salmon PSC rate in the month of September inside the Herring Savings Areas and all other outside areas, 2011–2023

Year	Summer HSA1	Summer HSA2	Winter HSA	Outside Areas
2011	0.10	0.54	0.02	0.16
2012	0.23	0.51	0.01	0.07
2013	0.83	0.57	0.02	0.29
2014		0.45	0.16	0.55
2015		0.54	0.08	0.28
2016		0.83		0.27
2017		0.25	0.18	0.77
2018		0.23	0.10	0.49
2019		0.71	0.81	0.36
2020		0.64		0.90
2021		0.05	0.03	0.31
2022		0.04	0.85	0.43
2023		0.09		0.23
Average	-	0.42	0.23	0.39
Median	-	0.52	0.09	0.33

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate pollock catch was not observed inside the area in the month of September in the given year.

3.3.4.6.9 Implications of the CDQ Reserve Pool for Chum and WAK Chum Salmon

Adding a CDQ Reserve Pool to an inseason corridor cap could have implications for chum salmon and WAK chum salmon PSC. The maximum amount of additional chum salmon in the CDQ Reserve Pool under Alternative 5 is provided in Table 2-27. These numbers represent the additional amount of chum salmon that would be added across CDQ groups' apportionments in a scenario where *all* CDQ groups notified NMFS of an intent to harvest their CDQ pollock on an inshore CV(s) in the upcoming year. However, it is not expected that all CDQ groups would access the reserve pool each year, if the provision is used at all.

In particular, the challenges and reasons this suboption may not be used that are highlighted for an overall PSC limit (Section 3.3.4.4.1), also stand for this suboption under the inseason corridor. CDQ groups would likely prefer to continue harvesting with the CP sector, and this option as currently designed may not be used to accommodate an inseason emergency or unforeseen conditions. Moreover, implementation of an inseason corridor is most expected to adversely impact the inshore sector, given its limits in mobility. Therefore, the implementation of Alternative 5 may result in even less interest in moving CDQ pollock quota to the inshore sector relative to status quo conditions. In order to use this suboption CDQ groups would need to notify NMFS in the prior year of this intent for all of their pollock quota in the B season and they could not change mid-season. Thus, it would most likely be used in a situation where there were capacity issues or operational decisions would render a CP platform unavailable for CDQ pollock to be harvested on.

Use of the CDQ Reserve Pool under Alternative 5 could result in greater chum salmon PSC and theoretically WAK chum salmon PSC, relative to not adopting this suboption. In the event of CDQ pollock quota shifting to the inshore or mothership sectors, chum salmon encounter rates may increase and look more similar to historical catch and bycatch patterns in these sectors (Section 3.3.4.1.1). The additional PSC limit from the reserve pool would result in a smaller number of fish at a lower chum salmon PSC corridor cap relative to a higher chum salmon PSC corridor cap (e.g., a 50,000-chum salmon cap would allow up to an additional 4,689 chum salmon to be caught and a 350,000-chum salmon cap would allow up to an additional 32,822 chum salmon be caught if *all* CDQ groups received an inshore adjustment; Table 2-27). However, the additional amount of chum salmon PSC would be more likely to be 'used' if a lower chum salmon PSC corridor cap was instituted that would have otherwise halted the B season for the CDQ sector.

3.3.4.7 Combined Effects of the Alternatives on Chum and WAK Chum Salmon

This section discusses the potential impacts to chum and WAK chum salmon PSC from a combination of alternatives. Note that Alternatives 2 and 3 are mutually exclusive, as is Alternative 3 and Alternative 5, Option 3. All other options and components of the proposed action alternatives may be selected in combination.

Alternative 2 or 3 + Alternative 5

Alternatives 2 and 3 include overall chum salmon PSC limits that would require directed pollock fishing in the B season to cease if the cap were met, whereas Alternative 5 includes an inseason corridor chum salmon PSC limit that would close certain areas to directed fishing for a period of time but fishing could continue in open areas. If Alternative 5 is selected in conjunction with Alternative 2 or 3, the pollock fishery would need to balance its operations under two different chum salmon PSC limits. Only chum salmon caught inside the inseason corridor accrue to that PSC limit under Alternative 5, but any chum salmon caught inside the corridor would also count to the overall PSC limit (Alternative 2 or 3) as would all chum salmon caught outside the corridor.

Selecting an overall PSC limit and an inseason corridor PSC limit as part of a PA would likely result in different fishing strategies because the sectors would consider the risk of meeting either PSC limit and the associated consequence of doing so. The consequence of meeting the inseason corridor PSC limit is not equal among sectors. For instance, CPs have relied less on the fishing grounds encompassed within the corridor's 40 stat areas compared to the inshore and mothership sectors. This management measure may have relatively little impact on CP's fishing behavior and these vessels would primarily be motivated by the overall PSC limit. A sector's assessment of risk and consequence against two different chum salmon PSC limits would also take into consideration strong aggregations of quality pollock and avoiding other PSC species.

Regardless of which chum salmon PSC limit is driving behavior, adopting both in combination would likely reduce bycatch compared to status quo. A benefit of this regulatory scenario is that the overall chum salmon PSC limit would constrain the total bycatch in a given year, limiting the total number of chum salmon that could be incidentally taken as bycatch outside the corridor both prior to and after a closure. It is expected that selecting Alternative 2 or 3 in conjunction with Alternative 5 would likely have conservation benefits for WAK chum salmon because the inseason corridor and closure window (June 10 – August 31) spatially and temporally overlaps the majority of the WAK chum salmon bycatch since 2011.

However, fishermen's responses to the interplay of the two PSC limits would create dynamic outcomes. Fewer WAK chum salmon would be caught if vessels preemptively change their behavior while fishing inside the corridor to avoid the consequence of a closure (responding to Alternative 5 or Alternative 3), if vessels seek out areas with good pollock CPUE and low bycatch rates and those areas are outside the corridor (primarily responding to Alternative 2 or 3 or Alternative 5 post closure). An overall and inseason corridor PSC limit set at higher amounts in their respective ranges (*i.e.*, 100,000–550,000 and 50,000–350,000 chum salmon) would provide a weaker incentive for behavior changes compared to a combination of caps set at the lower or middle values of their respective ranges. Here, the impacts to WAK chum salmon may be neutral to status quo depending on the conditions in a given year.

Alternative 2 or 3 and/ or Alternative 5 + Alternative 4

As discussed previously, Alternative 4 would modify the requirements for the IPAs. The IPAs have largely designed and implemented new measures that respond to the proposed regulatory changes in Alternative 4. Selecting Alternative 4 in conjunction with an overall chum salmon PSC limit (Alternative 2 or 3) or corridor chum salmon PSC limit (Alternative 5) is not expected to diminish the function or benefit of any other new management measure.

Note that this is not suggesting the efficacy of the RHS program for chum salmon avoidance could not be impacted by Alternative 2, 3, or 5 but this impact is largely separate from the proposed changes to regulations in Alternative 4. That impact would primarily result from a scenario where fewer vessels are fishing (either due to temporary stand-down, consolidation, or a closure). The RHS program relies on fishery-dependent data to determine areas with higher or lower PSC encounters. Fewer vessels fishing (i.e., data points) may increase the risk that vessels inadvertently move to areas with much higher PSC. While some provisions of Alternative 4 are related to the RHS program, the efficacy of the measures implemented in response to the new regulations would be secondary to the program as a whole.

The IPA's responses to the proposed regulatory provisions of Alternative 4 could be effective tools to reduce bycatch while operating under the PSC limits proposed in Alternatives 2 or 3 and/or 5. For example, the use of bi-weekly hotspot closures (Provision 2) would help the pollock industry be more reactive to chum salmon encounters on the pollock grounds. Additionally, if more vessels are using salmon excluders and this decreases chum salmon catch (Provision 3), it may help the sector remain under their chum salmon PSC limit. Establishing thresholds for stat areas with "very high" chum salmon bycatch rates and closing those areas to all vessels in addition to regularly identified RHS closures could potentially reduce chum salmon PSC (Provision 6).

As noted above, an overall chum salmon PSC limit (Alternatives 2 and 3) provides pollock fishermen an incentive to avoid all chum salmon regardless of their stock of origin to avoid reaching the cap. IPA representatives have indicated they would respond to Provision 1 of Alternative 4 by completing a weekly assessment on whether areas are more likely to have higher proportions of WAK chum salmon in the overall bycatch. When hotspot closures need to be prioritized, deference would be given to those areas more likely to have higher proportions of WAK chum salmon. This provision would also require the fleet to use the best available information as it evolves. As such, this measure in response to Provision 1 of Alternative 4 could provide a mechanism to prioritize WAK chum salmon avoidance through the IPAs while operating under an overall hard cap.

3.3.4.8 Combined Effects of Environmental Trends and Planned Actions on Chum Salmon

Numerous past and present human actions impacting chum salmon, and WAK chum salmon more specifically, have been discussed throughout the preceding sections and all incorporated references. Past and present human actions addressed in Chapter 3 affecting chum salmon and WAK chum salmon include bycatch in the Bering Sea pollock fishery, competition from hatchery releases, and environmental factors associated with environmental change.

WAK chum salmon are also caught in other fisheries and through directed harvest in subsistence and commercial fisheries. These topics are analyzed in Chapter 4, but their effect on chum salmon and WAK chum salmon is addressed here under the resource category component of the impact analysis. The subsequent content of this section describes reasonably foreseeable environmental trends and planned actions in the area that may have a combined effect with the proposed actions including authorization and prosecution of the Bering Sea pollock fishery and ecosystem change, described at the beginning of Chapter 3.

Bycatch Management Tools and Ongoing Research

Although previously established in Federal regulation, gear modifications are one way to reduce salmon bycatch in the pollock fishery. Salmon excluder devices have been successful in reducing Chinook salmon bycatch. In May 2025, NMFS issued an exempted fishing permit for vessels working with the [North Pacific Fisheries Research Foundation](https://www.fisheries.noaa.gov/s3/2025-05/EFP-2025-01-salmon-excluder-permit-akro.pdf) to support initial at-sea trials of a new concept for a salmon excluder device designed specifically to reduce chum salmon bycatch.⁷⁶

⁷⁶ <https://www.fisheries.noaa.gov/s3/2025-05/EFP-2025-01-salmon-excluder-permit-akro.pdf>

Other research is being conducted to provide better information on the spatial distribution and stock composition of the bycatch (see Appendix 8, Attachment 2 and 3 as well as Head et al., 2024). Depending on the outcome of the research, this additional information may aid the pollock fishery in its efforts to avoid WAK chum salmon inseason. Other ongoing work may also improve the resolution of stock structure, which could eventually allow managers to estimate the stock-specific impacts of harvest at a much finer scale (see Appendix 8, Attachment 1).

South Alaska Peninsula Management Area (Area M)

Some number of WAK chum salmon is also caught in Area M commercial salmon fisheries. Section 4.4.4.2 provides information on commercial chum salmon fisheries across Western and Interior Alaska. The Area M fishery is proximate to the action area, and while specific aspects of overall State of Alaska salmon fishery management continue to be modified, it is reasonably foreseeable that this fishery will continue in the future.

Hatchery Releases of Chum Salmon

Hatcheries produce salmon fry which are released into the ocean to grow and mature before returning as adults to the hatchery or local rivers and streams for harvest or spawning. A number of hatcheries produce chum salmon in Korea, Japan, Russia, the US, and Canada that may affect WAK chum salmon during their life at sea. It is reasonably foreseeable the hatchery production will continue at a levels historically observed into the future.

Subsistence and Commercial Chum Fisheries

ADF&G manages commercial, subsistence, sport, and personal use salmon fisheries (Section 3.3.3) in rivers and state marine waters and within Federal waters in Alaska USFWS and KRITFC co-manage rural subsistence salmon fisheries in periods of conservation concern. It is reasonably foreseeable that the current management systems for salmon fisheries will continue into the future, even though some specific aspects may change. In addition, if ADF&G determines there is surplus fish beyond escapement needs within Western and Interior River systems and opens subsistence fisheries or other directed fisheries, a reasonably foreseeable action may be the prosecution of those fisheries (State management thresholds and past prosecution of these fisheries are further described in Section 4.4.3). As described in Table 3-23, many of these river systems have seen limitations or closures of commercial and subsistence opportunities in recent years, including the Yukon and Kuskokwim Rivers.

The cumulative effect of the combined effects of environmental trends and planned actions and proposed alternatives are inherently considered throughout this section in the analysis of impacts on chum salmon. Any impacts on chum savings from pollock fishery incentives or restrictions created from the proposed alternatives may be offset if adverse impacts on chum from other human actions increase. Conversely, if future external human impacts on chum are less adverse, the overall impacts of chum salmon savings may be enhanced.

3.4 Chinook Salmon

Chinook salmon (*Oncorhynchus tshawytscha*) are the largest of all Pacific salmon species, with weights of individual fish commonly exceeding 30 pounds. In North America, Chinook salmon range from the Monterey Bay area of California to the Chukchi Sea area of Alaska. On the Asian coast, Chinook salmon occur from the Anadyr River area of Siberia southward to Hokkaido, Japan. In Alaska, they are abundant from the southeastern panhandle to the Yukon River. Chinook salmon typically have relatively small spawning populations and the largest river systems tend to have the largest populations. Major populations of Chinook salmon return to the Yukon, Kuskokwim, Nushagak, Susitna, Kenai, Copper, Alsek, Taku, and Stikine rivers with important runs also occurring in many smaller streams.

Like all species of Pacific salmon, Chinook salmon are anadromous. They hatch in fresh water and rear in main-channel river areas for one year. The following spring, Chinook salmon smoltify and migrate to the saltwater estuary. They spend anywhere from one to five years feeding in the ocean, then return to spawn in fresh water. All Chinook salmon die after spawning. Chinook salmon may become sexually mature from their second through seventh year, and as a result, fish in any spawning run may vary greatly in size. Females tend to be older than males at maturity. In many spawning runs, males outnumber females in all but the 6- and 7-year age groups. Small Chinook salmon that mature after spending only one winter in the ocean are commonly referred to as “jacks” and are usually males. Alaska streams normally receive a single run of Chinook salmon in the period from May through July.

Chinook salmon often make extensive freshwater spawning migrations to reach their home streams on some of the larger river systems. Yukon River spawners bound for the headwaters in Yukon Territory, Canada will travel more than 2,000 river miles during a 60-day period. Chinook salmon do not feed during the freshwater spawning migration, so their condition deteriorates gradually during the spawning run as they use stored body materials for energy and gonad development.

Each female deposits between 3,000 and 14,000 eggs in several gravel nests, or redds, which she excavates in relatively deep, fast-moving water. In Alaska, the eggs usually hatch in the late winter or early spring, depending on time of spawning and water temperature. The newly hatched fish, called alevins, live in the gravel for several weeks until they gradually absorb the food in an attached yolk sac. These juveniles, called fry, wiggle up through the gravel by early spring. In Alaska, most juvenile Chinook salmon remain in fresh water until the following spring when they migrate to the ocean as smolt in their second year. Juvenile Chinook salmon in freshwater feed on plankton and then later eat insects. In the ocean, they eat a variety of organisms including herring, pilchard, sand lance, squid, and crustaceans.

3.4.1 Effects of the Alternatives on Chinook Salmon

3.4.1.1 Alternative 1

The proposed alternatives under consideration in this action would not modify the existing regulations for Chinook salmon PSC. Chinook salmon bycatch is managed by a hard cap established under amendment 91 to the BSAI Groundfish FMP and more stringent regulations established under amendment 110 (see 50 CFR 679.21(f)(12)(iii)(E)(2)).⁷⁷ The amendment 91 hard cap took effect in 2011 and the annual level of Chinook salmon PSC has decreased substantially since. From 2011–2023, the annual average bycatch was 18,325 Chinook salmon compared to 40,876 fish from 1991–2010 (Figure 3-38).

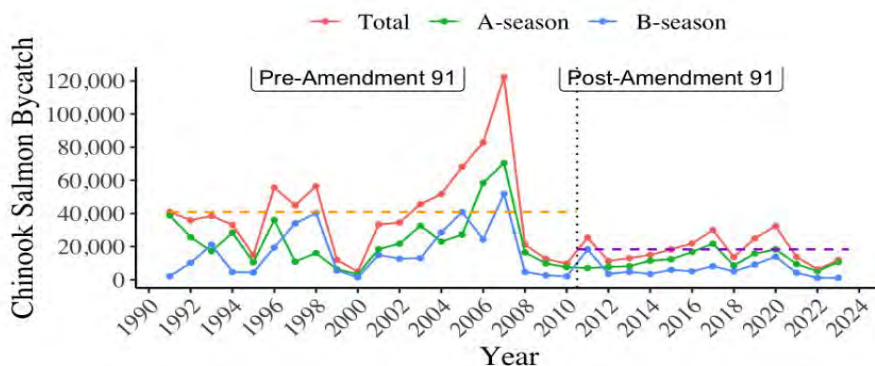


Figure 3-38 Chinook salmon taken as bycatch in the Bering Sea pollock trawl fishery for the A season (green), B season (blue), and total (green), 1991–2023

Source: NMFS Alaska Region CAS.

Horizontal dashed lines represent the mean bycatch pre- and post-amendment 91.

⁷⁷ The current Chinook salmon bycatch management program was extensively evaluated in the Final EIS prepared for Amendment 91 (NMFS, 2009) and the EA/RIR prepared for Amendment 110 (NMFS, 2016), in addition to what is presented here.

Chinook salmon are encountered in the A and B season, but the A season bycatch is typically greater than the B season bycatch (Figure 3-39). In most years, the inshore sector has accounted for the majority of the B season Chinook PSC, as shown in Figure 3-39. The distribution of Chinook salmon bycatch also varies spatially between the A and B seasons. During the A season, Chinook salmon were encountered within and just outside of the eastern portion of the CVOA. During the B season, the bycatch was more distributed across the Bering Sea shelf (Figure 3-41). Specific to the B season fishery, Chinook salmon are more prevalent on the fishing grounds in the later aspect with notable increases in September and October. This trend is demonstrated in Figure 3-40 that shows the average number of Chinook salmon taken as bycatch in each month of the B season as well as the average Chinook PSC rate using data from 2011–2023.

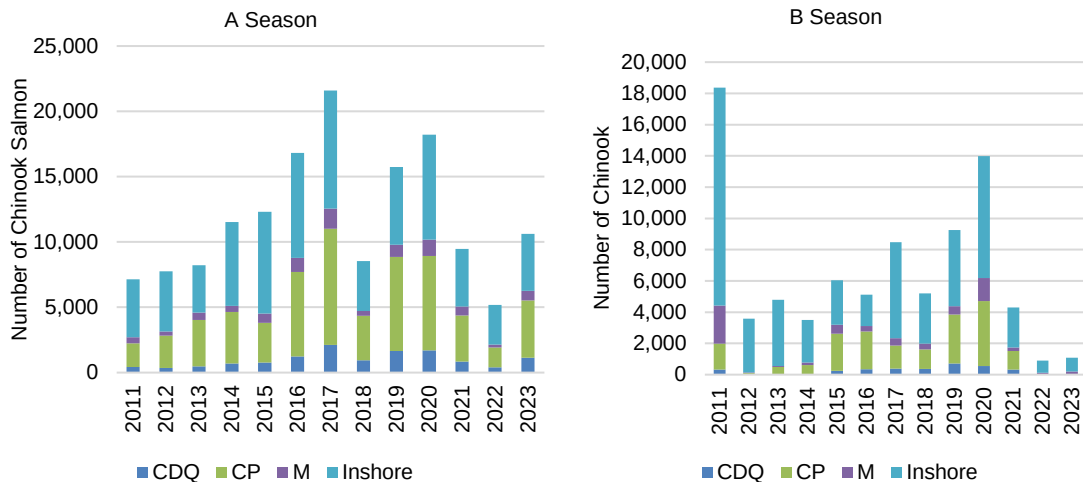


Figure 3-39 Number of Chinook salmon caught as bycatch during the pollock fishery's A season (black) and B season (blue), 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

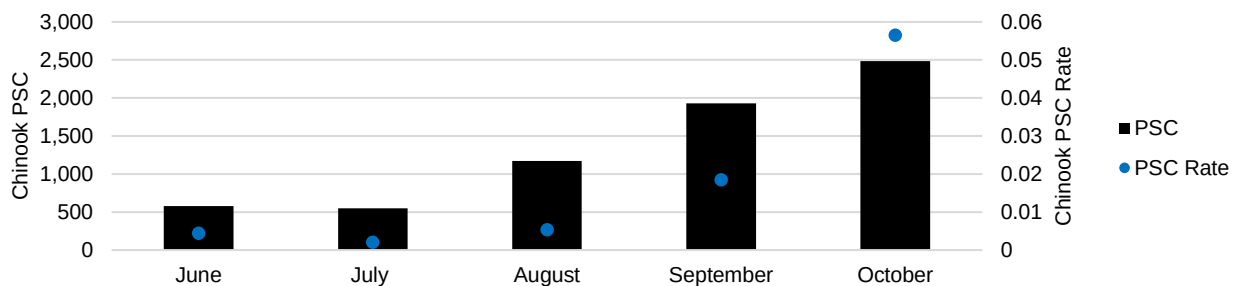


Figure 3-40 Average monthly Chinook salmon PSC (black) and PSC rate (blue) for each month of the pollock B season, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

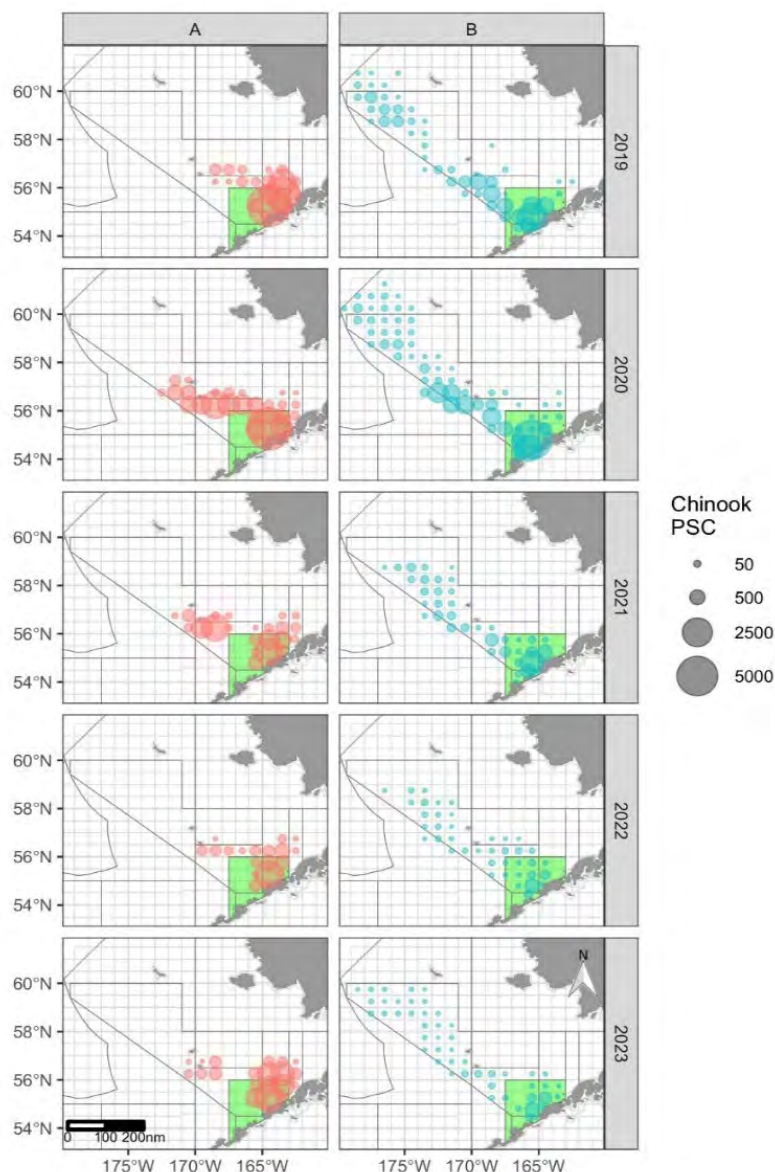


Figure 3-41 Location and timing of Chinook salmon PSC in the Bering Sea pollock A (left) and B season (right) by NMFS management areas (black) and ADF&G stat areas (gray) where circles represent the total amount of bycatch and the CVOA is shaded green, 2019–2023

Source: NMFS Alaska Region CAS.

3.4.1.1.1 Genetic Stock Composition Estimates

Chinook salmon caught as bycatch in the Bering Sea pollock fishery originate from river systems across Russia, Asia, Alaska, and the Pacific Northwest. Geneticists use 11 regional stock reporting groups to estimate the origin of the Chinook salmon caught as bycatch each year. These are the Russia, coastal Western Alaska, Middle Yukon, Upper Yukon, North Alaska Peninsula, Northwest Gulf of Alaska, Copper River, Northeast Gulf of Alaska, Coastal Southeast Alaska, British Columbia, and West Coast United States reporting groups. The coastal western Alaska genetic stock reporting group includes all major river systems in western Alaska from the Kotzebue region in the north to the Bristol Bay region in the south excluding the middle and Upper Yukon River.

A relatively high proportion of the overall bycatch is attributed to the coastal WAK reporting group annually. The coastal WAK component has decreased from a high of 68.0% of the total bycatch in 2011

to a low of 23.7% in 2017 and has fluctuated around 47% since 2020 (Figure 3-42). In recent years, the North Alaska Peninsula reporting group has accounted for a greater proportion of the overall bycatch, averaging 13.5% between 2011–2020 and 31.9% from 2021–2023. Although the proportion of this group has increased in recent years, the overall bycatch has been lower so the number of Chinook salmon caught in this reporting group has remained consistent, averaging 3,160 fish (2011–2023).

The relative contribution of the regional groups to the overall bycatch varies during the A and B season. However, the coastal WAK reporting group, as well as the middle and Upper Yukon groups, are encountered in both the A and the B season. This is shown in Figure 3-43 which provides the estimated stock proportion for each group during the A (left) and B (right) season for each analyzed year.

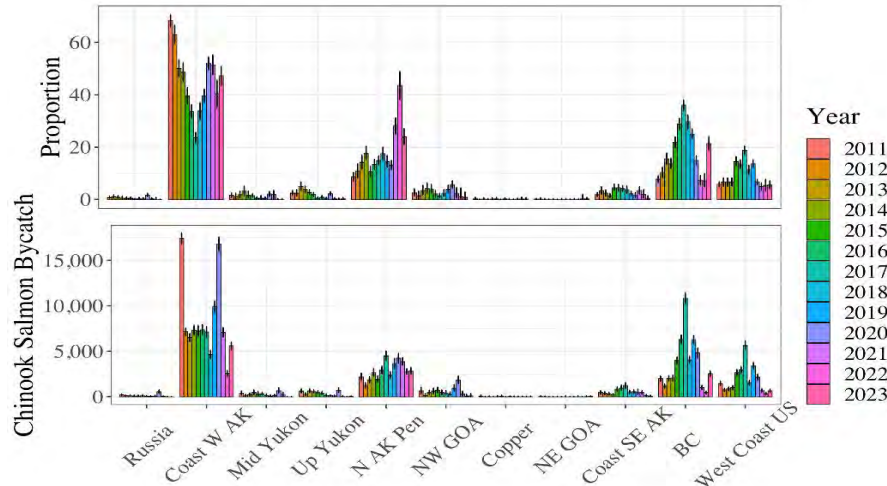


Figure 3-42 Annual stock composition estimates (top) and estimated number of Chinook salmon bycatch (bottom) with their 95% credible intervals (black line) in the Bering Sea pollock fishery, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by ABL.

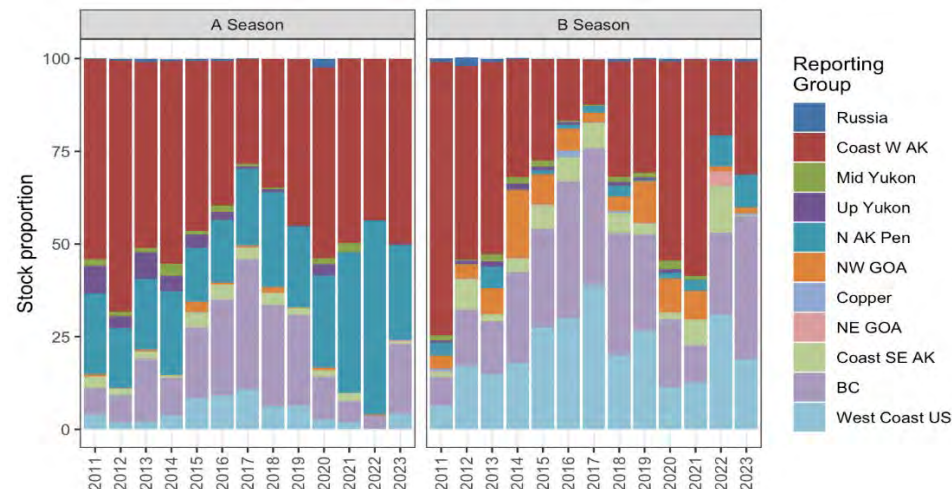


Figure 3-43 Regional stock composition estimates of Chinook salmon bycatch in the Bering Sea pollock fishery during the A (left) and B (right) seasons, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by ABL.

3.4.1.1.2 Adult Equivalent and Region of Origin Impacts

This section provides the results for the Chinook AEQ analysis as well as the estimated impact of bycatch on Western Alaska run sizes. Note the information provided here is specific to the coastal WAK and

middle and Upper Yukon reporting groups and is substantially abbreviated from the content provided in Appendix 4. The Chinook salmon taken as bycatch in the pollock fishery range in ages from age-2 to age-7, but the majority are 3- to 6-years old (see Appendix 4). Similar to chum salmon, Chinook salmon mature and return to the rivers at multiple ages and so the impact of bycatch in a given year can be spread out over multiple return years. In large part, this is the key dynamic an AEQ analysis tries to assess.

Prior Chinook AEQ and impact analyses have provided estimates for the Upper Yukon reporting group that captures Canadian-origin fish as well as an aggregation of the coastal WAK and Middle Yukon reporting groups (referred to as “combined WAK”). This analysis uses the same reporting categories. Figure 3-44 shows the estimated AEQ bycatch across multiple run years for the Upper Yukon reporting group (top panel) and the combined WAK reporting group (bottom panel). As shown, estimates of the AEQ bycatch for each reporting group were highest in 2007 coinciding with the historically high PSC year and have since decreased.

Table 3-64 shows the estimated median impact of the bycatch on the Upper Yukon and combined coastal WAK reporting groups in each year from 2011–2023. The AEQ bycatch accounted for less than 1% of the run size for the Upper Yukon reporting group in all years except for 2022 when the impact was estimated at 1.1%. The estimated impact of the pollock fishery’s bycatch on combined WAK stocks averaged 2.02% of the combined run size and ranged between 1.4% (2015 and 2018) and 3.6% (2020).

The proposed action alternatives that create incentives for chum and WAK chum salmon avoidance could have a wide range of subsequent impacts to Chinook salmon PSC from these levels.

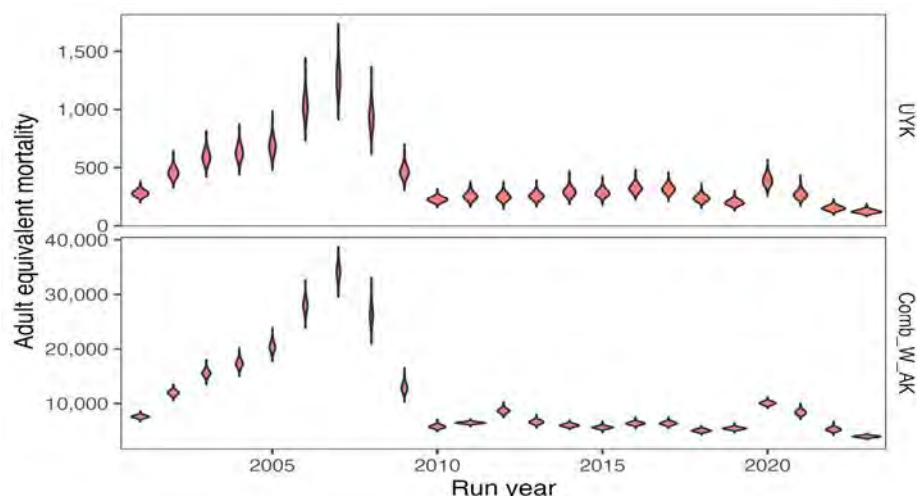


Figure 3-44 Chinook salmon PSC adult equivalent mortality by run year for the Upper Yukon stock (upper panel) and the combined Western Alaska (coastal Western Alaska and Middle Yukon) stocks (lower panel)

Source: NMFS Alaska Region CAS, data compiled by AFSC.

Table 3-64 Estimated impact (median and lower and upper 95% confidence intervals) for combined western Alaska stocks and Upper Yukon impact estimates by year of return (run-year), 2011–2023

Year	Upper Yukon	Combined WAK
2011	0.4% (0.3% - 0.5%)	1.7% (1.6% - 1.8%)
2012	0.5% (0.4% - 0.6%)	2.5% (2.3% - 2.8%)
2013	0.6% (0.5% - 0.8%)	2.3% (2.1% - 2.6%)
2014	0.4% (0.3% - 0.6%)	2.2% (2.0% - 2.4%)
2015	0.3% (0.3% - 0.4%)	1.4% (1.2% - 1.5%)
2016	0.4% (0.3% - 0.5%)	1.6% (1.5% - 1.7%)
2017	0.3% (0.3% - 0.4%)	1.6% (1.5% - 1.8%)
2018	0.3% (0.2% - 0.4%)	1.4% (1.2% - 1.5%)
2019	0.2% (0.2% - 0.3%)	1.2% (1.1% - 1.3%)
2020	0.7% (0.6% - 0.9%)	3.6% (3.4% - 3.8%)
2021	0.8% (0.6% - 1.0%)	3.0% (2.8% - 3.4%)
2022	1.1% (0.9% - 1.5%)	2.1% (1.8% - 2.3%)
2023	0.8% (0.6% - 1.0%)	1.7% (1.6% - 1.9%)

Notes: Source: NMFS Alaska Region CAS, data compiled by AFSC.

3.4.1.2 Alternative 2 or 3

The impacts of the proposed alternatives are analyzed against the status quo impact of the pollock fishery's Chinook salmon PSC.

Potential for Chinook Salmon PSC Reductions

Chinook salmon PSC is only expected to decrease under Alternative 2 or 3 if the B season closes earlier than it otherwise would have because the overall chum salmon PSC limit is met. The retrospective analysis shows a 100,000 chum salmon PSC limit would have reduced Chinook salmon PSC by an average of 5,200 to 5,400 fish across years the PSC limit was met (2011–2023). The number of Chinook salmon that would have been saved decreased under PSC limits of 325,000 and 550,000 chum salmon because these caps were met in fewer years (Table 3-65).

Table 3-65 Estimates of fleet-wide Chinook salmon PSC reductions as if the overall chum salmon PSC limits and apportionment had been in place from 2011–2023

Year	100,000				325,000				550,000			
	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt. 1	Opt. 2	Opt. 3	Opt. 4
2011	17,407	17,479	17,479	16,754								
2012												
2013	3,544	3,626	3,626	3,762								
2014	2,834	2,834	2,834	2,720								
2015	3,293	3,057	3,093	2,270				1,392				
2016	4,503	4,467	4,467	4,394	1,919	1,733	1,733	1,358	1,228			
2017	5,781	5,749	5,781	5,539	1,003	1,003	1,003	1,913	781	770	660	191
2018	3,658	3,658	3,658	3,788	1,232	789	789				2,102	
2019	8,270	8,270	8,253	8,041	2,991	2,991	2,991	1,196				
2020	12,191	12,154	12,154	11,796	6,231	4,594	4,594	6,319				
2021	3,098	3,089	3,098	3,173	2,892	2,760	2,760	2,216	308	2,030	1,981	1,981
2022	441	441	441	522	0	0	0	0				
2023	381	494	494	544								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate an overall chum salmon PSC limit and apportionment were not met. Cells with "0" values indicate at least one sector met the overall PSC limit and apportionment, but no Chinook salmon were estimated to be saved.

Potential for Chinook Salmon PSC Increases

Chinook salmon PSC is expected to increase if greater pollock catch is shifted to September and October than would have otherwise occurred under Alternative 2 or 3. This is because the timing of chum/WAK chum salmon PSC encounters and peak pollock harvests are dissimilar to Chinook PSC. These trends are demonstrated in Figure 3-45 that shows the proportion of B season pollock harvested in each month (top panel) and the proportion of B season Chinook salmon PSC (bottom panel) from 2011–2023. Greater

amounts of pollock were typically harvested in July and August, often more than 50% of the B season total when combined since 2011. The pollock harvested in September and October was notably less in large part due to the increased Chinook salmon PSC that occurs in these months. Since 2017, the IPAs have included incentives so vessels complete their fishing by October to avoid Chinook salmon PSC. The amount of pollock harvested in September and October in 2020 was greater than other years due to COVID-19 disruptions affecting the CP sector, the Summer HSA1 closure from June 15 – July 1, and the distribution of pollock was “patchy”⁷⁸ in that year resulting in lower CPUE. Notice that the proportion Chinook salmon encountered in October 2020 was also greater.

If Alternative 2 or 3 were selected, an overall chum salmon PSC limit would motivate different fishing behavior and how fishermen react to the management measure would determine the outcomes for Chinook PSC. Vessels may decide to slow their pace of fishing to closely monitor their chum salmon PSC against the hard cap, especially as the risk of meeting it increases. Vessels may also move more frequently, the IPAs could use lower thresholds to establish advisory avoidance areas under the RHS program, or some other approach may be used in the future. Chinook salmon PSC could be negatively impacted if the behavior changes fishermen use to stay below the chum salmon hard cap results in slower and/or less efficient fishing with the potential to divert pollock quota to the later aspect of the B season.

Increased Chinook salmon PSC under Alternative 2 or 3 due to changes in the timing of pollock harvests during the B season is the opposite trend from what the retrospective assessment shows in Table 3-65. This is not surprising because the reductions reported in Table 3-65 are based on a given chum salmon PSC limit and apportionment combination being met historically. The potential risk of creating an unintended negative consequence for Chinook salmon by extending the B season is illustrated in Figure 3-46 that shows the average weekly chum salmon and Chinook salmon PSC rates as well as the average pollock harvest from 2011–2023. The month of October typically aligns with statistical weeks 41 through 44. It is also important to note Chinook salmon returning to Western Alaska river systems are prevalent in both the A and B season fishery, so increased Chinook PSC in the later months of the B season has the potential consequence of increasing the bycatch compared to status quo.

The potential impacts to Chinook salmon PSC under Alternative 3 are similar to Alternative 2. However, the overall chum salmon PSC limit under Alternative 3 would be conditionally applied. Historical data indicate the PSC limit would have been in effect in 3 or 6 years under Option 1 and in 3 or 5 years under Option 2. If abundance levels in the future are similar to what was observed during status quo, an overall chum salmon PSC limit would not be in effect each year. The impacts to Chinook salmon PSC (either positive or negative) would be less than what is expected for Alternative 2. In years that an overall chum salmon PSC limit is not in effect, the impacts would be relatively neutral to status quo and similar to what was described for Alternative 2 in the years the PSC limit is in effect. If the overall chum salmon PSC limit set when one area fails to meet its thresholds under Option 1 is 100,000 chum salmon, a PSC limit of 75,000 chum salmon would be in effect in when two or more areas fail to meet their thresholds. In the years where a hard cap of 75,000 chum salmon is in effect the risk to Chinook salmon PSC would be greater.

While Chinook salmon PSC could increase under Alternatives 2 and 3, a scenario that becomes more likely as pollock catch is diverted later in the B season, the protections afforded to Chinook salmon under the provisions of amendment 91 and the more stringent regulations implemented under amendment 110 would not be diminished. In other words, the overall Chinook PSC limits and the performance standard, the RHS program for Chinook salmon avoidance managed under the IPAs, as well as vessel-level incentives to avoid Chinook PSC, would be maintained in regulation and continue to affect fishing behavior.

⁷⁸ See the At-Sea Processors Association's [Request for Emergency Action to Suspend Closure of the Winter Herring Savings Area](#).

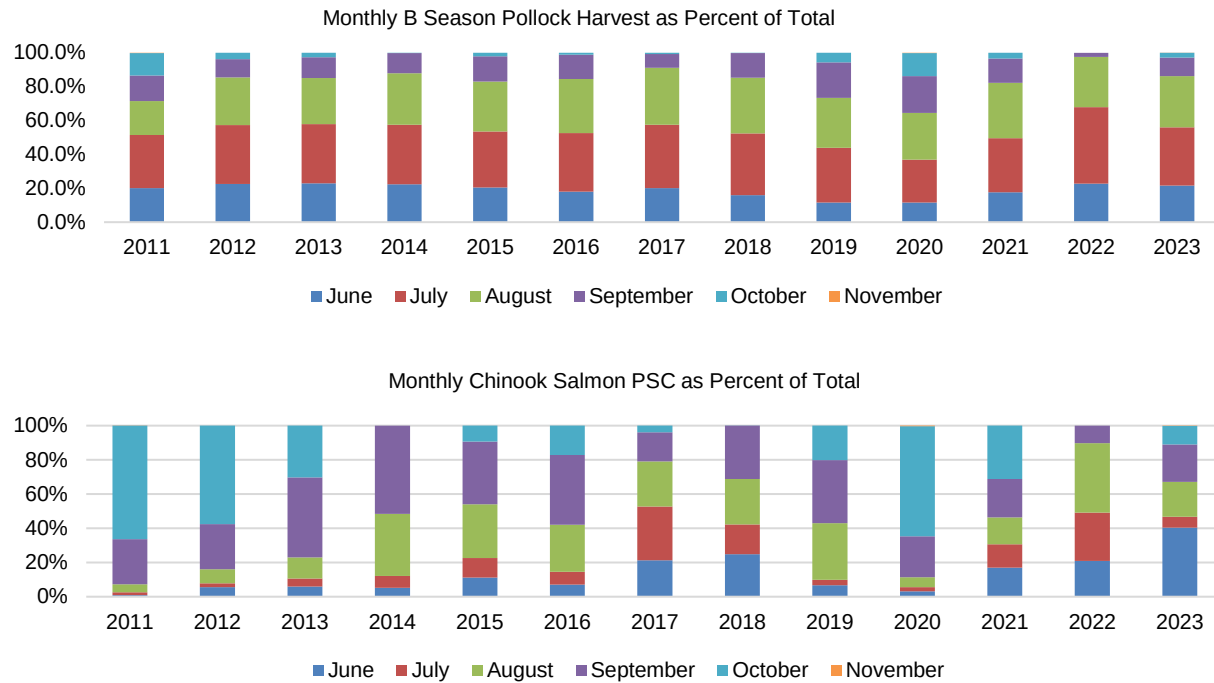


Figure 3-45 Amount of pollock (mt) harvested in each month as a percentage of the total B season harvest (top panel), and the number of Chinook salmon taken as PSC in each month as a percentage of the total B season bycatch (bottom panel), 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

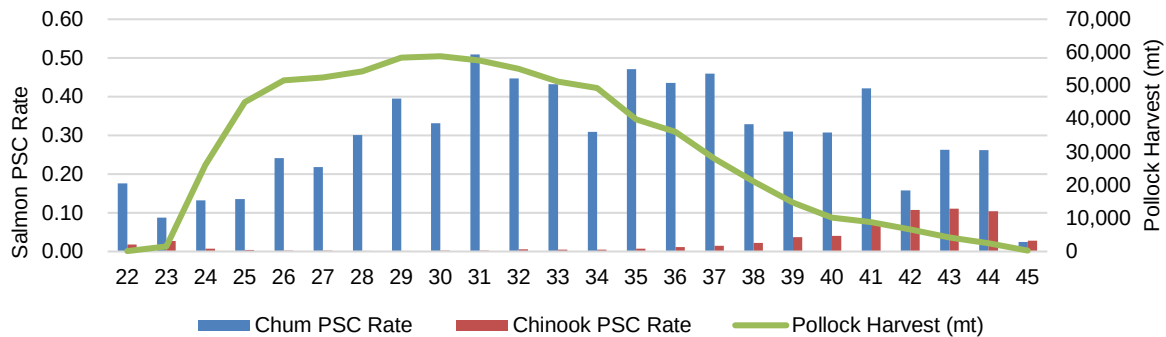


Figure 3-46 Comparison of the weekly fleet-wide weekly average chum salmon bycatch rate, Chinook salmon bycatch rate, and pollock harvest (mt), 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.4.1.3 Alternative 4

The impacts of Alternative 4 on Chinook salmon PSC would largely be expected to mirror status quo. The pollock fleet has operated under the IPAs since 2010, and the provisions under Alternative 4 largely reflect operations in recent years. Additionally, the IPAs would retain the priority for Chinook salmon closures that is intended to ensure Chinook salmon PSC is minimized. The Chinook threshold (0.35 Chinook/mt pollock) provides a benchmark whereby chum salmon closures cease. This restrains fleet movement under chum salmon closures to avoid any exacerbation of Chinook salmon PSC.

3.4.1.4 Alternative 5

Three different inseason corridor options are being considered under Alternative 5 but only one may be selected for implementation. Among all three options, the inseason corridor perimeter, the range of PSC limits (50,000–350,000 chum salmon), apportionment options, and closure window of June 10 – August 31 are the same. If the inseason corridor PSC limit is met at any point during the closure window, all or part of the corridor would close to the sector or cooperative that attained the corridor PSC limit. The three inseason corridor options differ from one another based on the number and location of stat areas inside that would close and the entity that would implement the closure.

3.4.1.4.1 Option 1

Certain elements of the Alternative 5 impact analysis relevant to Chinook salmon PSC were previously provided in this document and are not repeated here, namely the retrospective estimates on the amount of pollock catch displaced from the corridor (Table 3-14) and the date the corridor caps were met (Table 3-13). The impacts to Chinook salmon PSC under Option 1 would largely be driven by the fleet's reaction to an inseason corridor specified in regulation both in terms of preemptive changes in fishing behavior to avoid chum salmon PSC and after a closure occurs.

Potential for Chinook Salmon PSC Reductions

Chinook salmon encounters were typically greater inside the corridor compared to outside areas during the closure window of June 10 – August 31, as shown in Figure 3-47 that provides the number of Chinook salmon caught as bycatch inside (blue) and outside (orange) the corridor from 2011–2023. Figure 3-48 provides Chinook salmon PSC rates in a similar format. Even though these data suggest Option 1 could reduce Chinook salmon PSC, this outcome is not expected because the pollock fleet would respond to a time/area closure triggered by a chum salmon PSC limit. If vessels are able to carefully balance their operations while operating under an inseason corridor set in regulation, the impact to Chinook salmon PSC would be neutral. While the number of Chinook salmon incidentally taken in the future could be lower, there is no reason to expect it would be *due to* the behavior changes motivated by Alternative 5. This point applies to all three inseason corridor options and is addressed here first.

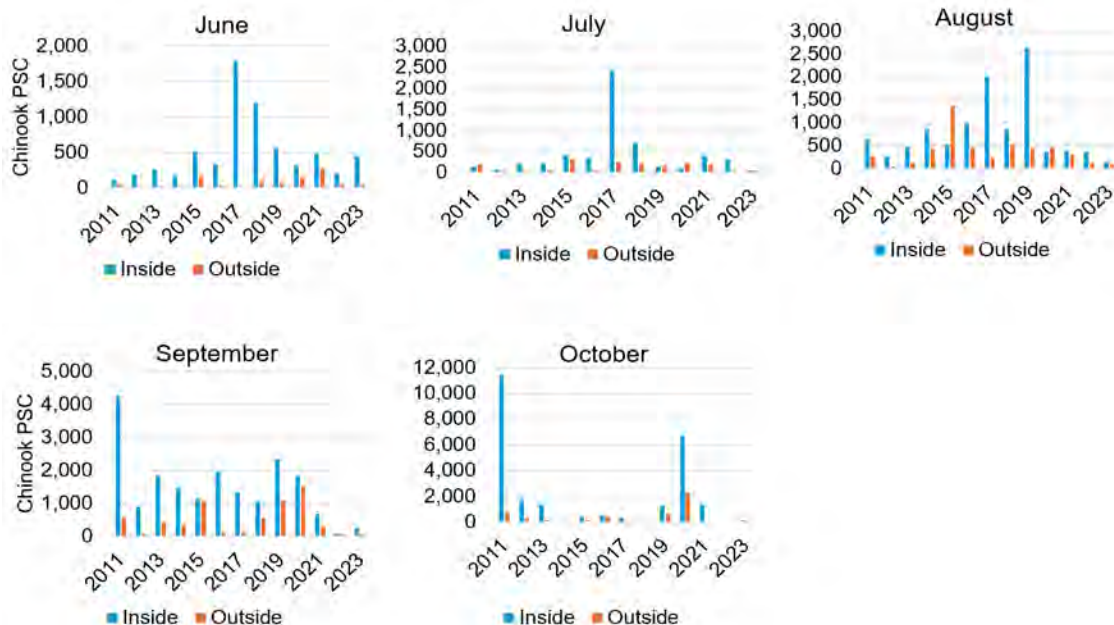


Figure 3-47 Number of Chinook salmon caught as bycatch in each month of the pollock B season inside the corridor (blue) and outside the corridor (orange), 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

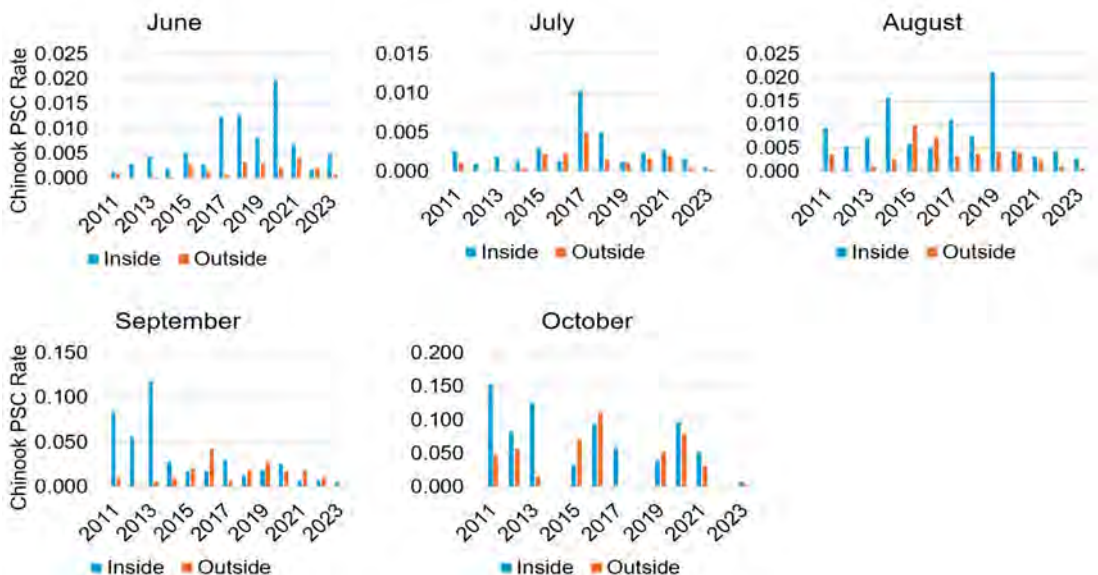


Figure 3-48 Chinook salmon PSC rate in each month of the pollock B season inside (blue) and outside (orange) the pollock B season, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Potential for Chinook Salmon PSC Increases

Alternative 5, Option 1 could have a negative impact to Chinook salmon if greater pollock catch is diverted to later months in the B season than otherwise would have occurred (similar to Alternative 2 or 3). An inseason corridor PSC limit of 50,000 chum salmon was shown to have displaced the greatest amounts of pollock, had the corridor PSC limit been in place from 2011–2023 without any changes in fishing behavior. As shown in Table 3-14, a 50,000 chum salmon PSC limit would have had the greatest impact for the inshore sector under the AFA apportionment (Option 4) at ~219,000 mt in 2019, for the

mothership sector using apportionment Options 2–4 at ~38,000 mt in 2021, for the CP sector using the 3- or 5-year average apportionments (Options 1 and 2) at ~111,700 mt in 2016, and for the CDQ sector using the 5-year average apportionment (Option 2) at ~46,500 mt in 2016. Note these estimates fall across various years for the sectors but they represent the amount of catch that would have needed to be recovered outside the corridor to fully utilize the TAC.

In the future, more quota could remain in September and October if vessels preemptively slow their pace of fishing, stand down for a period time if their cooperative/IPA requires it, and/or achieve lower CPUE outside the corridor once the PSC limit is met. These scenarios could increase Chinook salmon bycatch. Figure 3-49 helps the reader to conceptualize this by showing the weekly average Chinook PSC rate inside and outside the corridor compared to the weekly average pollock harvest in the same spatial strata.

Corridor chum salmon PSC limits analyzed at the mid-point and upper end of the range would have been less constraining for all sectors. All sectors would have met a 350,000-chum salmon PSC limit in 1–3 of the analyzed years. However, vessels may also take precautionary measures under higher PSC limits based on their perception of risk and the consequence of a corridor closure. Even if the fishing conditions in the future were similar to what occurred in years the PSC limit was not met, the fleet may slow the pace of their fishing in response to the multiple salmon PSC limits. In this way Chinook salmon PSC could be adversely impacted by an extension of the season.

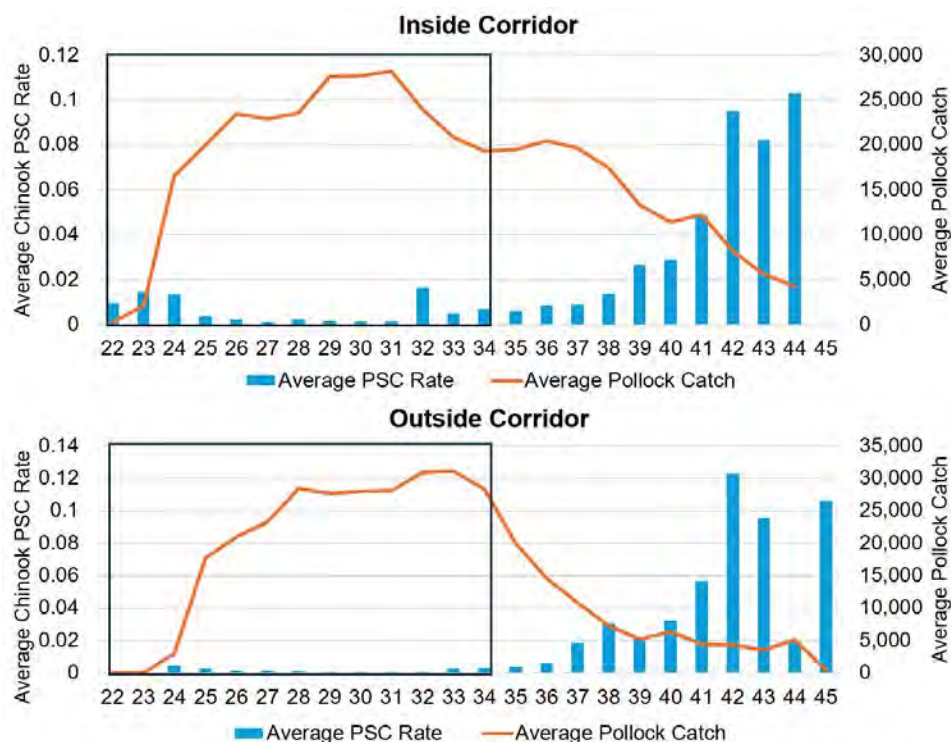


Figure 3-49 Distribution of the weekly average Chinook salmon PSC rate (blue) and pollock catch (orange) inside the inseason corridor (top panel) and outside the inseason corridor (bottom panel), 2019–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Black polygon represents the corridor closure weeks.

3.4.1.4.2 Suboption 1

Suboption 1 would close 29 of 40 stat areas inside the corridor to a cooperative or sector that attained its PSC limit from that date through August 31. Vessels impacted by the closure could continue fishing inside 11 stat areas exempted from closure inside the corridor and all outside areas through August 31. The potential impacts of Suboption 1 to Chinook salmon were analyzed using the Fleet Movement

Model. However, and prior to presenting the model results, Table 3-66 shows the number of Chinook salmon caught as bycatch inside the 29 stat areas that would close as well as the observed PSC rate (left) to the bycatch and PSC rates observed in the 11 stat areas exempt for closure (right) during the closure window for each analyzed year. This provides context for the reader and shows the Chinook PSC rates observed in each strata were typically comparable apart from 2019 when the rate inside the 29 areas to close was substantially greater than that which was observed inside the 11 exempted areas.

Table 3-66 Number of Chinook salmon caught as bycatch and Chinook PSC rates observed inside the 29 stat areas to close and the 11 stat areas exempt from closure during the closure window of June 10 – August 31, 2011–2023

Year	29 Stat Areas to Close		11 Stat Areas Exempt	
	Chinook PSC	Chinook PSC Rate	Chinook PSC	Chinook PSC Rate
2011	565	0.004	301	0.004
2012	320	0.003	204	0.003
2013	651	0.003	277	0.008
2014	346	0.002	864	0.007
2015	378	0.003	1,032	0.005
2016	831	0.003	783	0.003
2017	3,367	0.010	2,621	0.012
2018	1,425	0.009	1,247	0.007
2019	1,590	0.025	1,681	0.007
2020	373	0.007	388	0.004
2021	773	0.005	451	0.003
2022	424	0.002	425	0.003
2023	404	0.003	179	0.002

Source: NMFS Alaska Region CAS.

Figure 3-50 compares the status quo B season Chinook salmon bycatch (dark blue) to the new estimates of Chinook salmon PSC (light blue) under all analyzed cap amounts (lowest to highest) and apportionments (Options 1–4 moving left to right). Figure 3-51 provides the annual net change estimates for Chinook salmon PSC which represent the difference, either positive or negative, between the status quo PSC and new PSC estimate.

As shown, the impacts to Chinook salmon were projected to be variable. This is not surprising because the inseason corridor and closure provisions of Alternative 5 are designed to reduce chum and WAK chum salmon PSC. The model estimated the greatest impact in terms of bycatch *reductions* to have occurred in 2019 at 872 fish under a corridor PSC limit of 50,000 chum salmon and the AFA apportionment (Option 4). In contrast, the greatest impact in terms of bycatch *increases* would have occurred in 2016 at 225 Chinook salmon under a corridor PSC limit of 200,000 chum salmon using the 5-year average apportionment (Option 2).

The model results are likely correct in that implementing an inseason corridor under Suboption 1 would be expected to create variable outcomes for Chinook salmon in the future. However, the estimates should be interpreted cautiously. There were weeks when the model was unable to redistribute catch to outside areas because no fishing occurred outside of the corridor. Changes in PSC are not estimated in these weeks and so the estimates would be different from what is reported if the model could displace fishing effort. Additionally, the estimates do not account for potential changes in fishing behavior nor does the model account for variations in CPUE and whether equally good fishing could be found in the areas that remain open.

Compared to status quo, Suboption 1 could increase Chinook salmon PSC if the B season is extended. However, compared to Option 1, Suboption 1 would be less likely to increase Chinook PSC because the amount of pollock that would need to be recovered after a closure would be substantially less. Suboption 1 would also provide greater flexibility for vessels to balance their operations inseason for multiple PSC species.

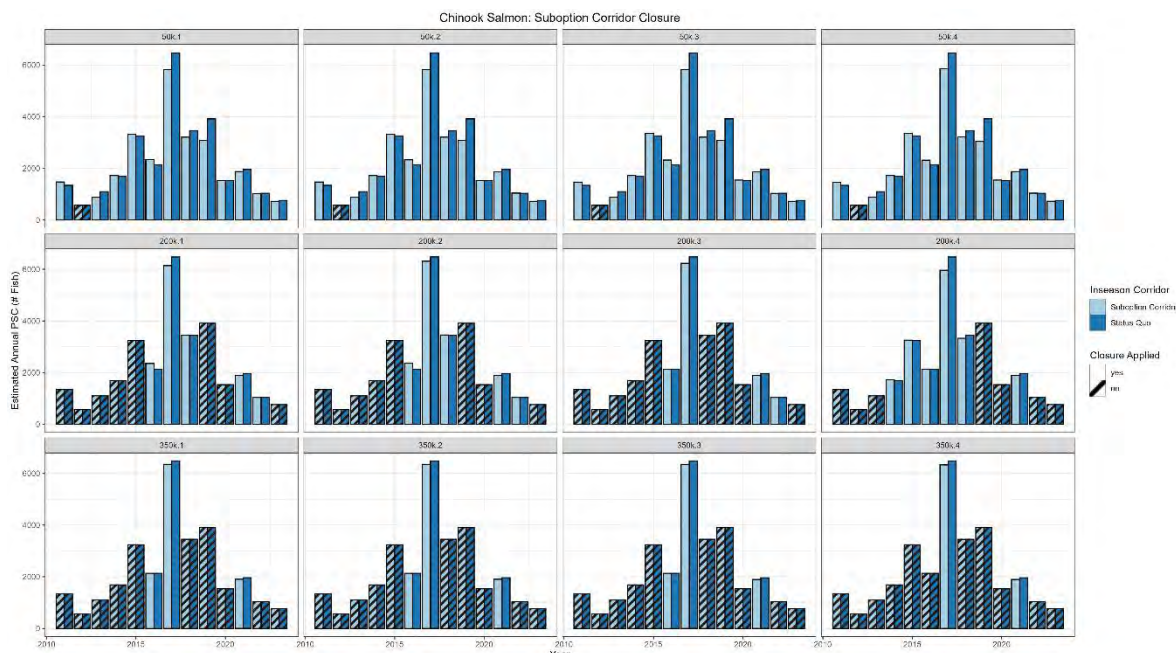


Figure 3-50 Estimated change in Chinook salmon PSC in the Bering Sea pollock fishery if displaced from 29 stat areas inside the inseason corridor under Suboption 1 of Alternative 5, 2011–2023; years where no closure was estimated for that apportionment are cross hatched in black

Source: NMFS Alaska Region CAS.

Notes: The analyzed corridor chum salmon PSC limits are shown in ascending order from 50,000 (50k) to 350,000 (350k); apportionment options are shown in ascending order from left to right. As an example, facet “50k.3” shows the estimates under a 50,000-chum salmon corridor PSC limit using apportionment Option 3 (pro rata).

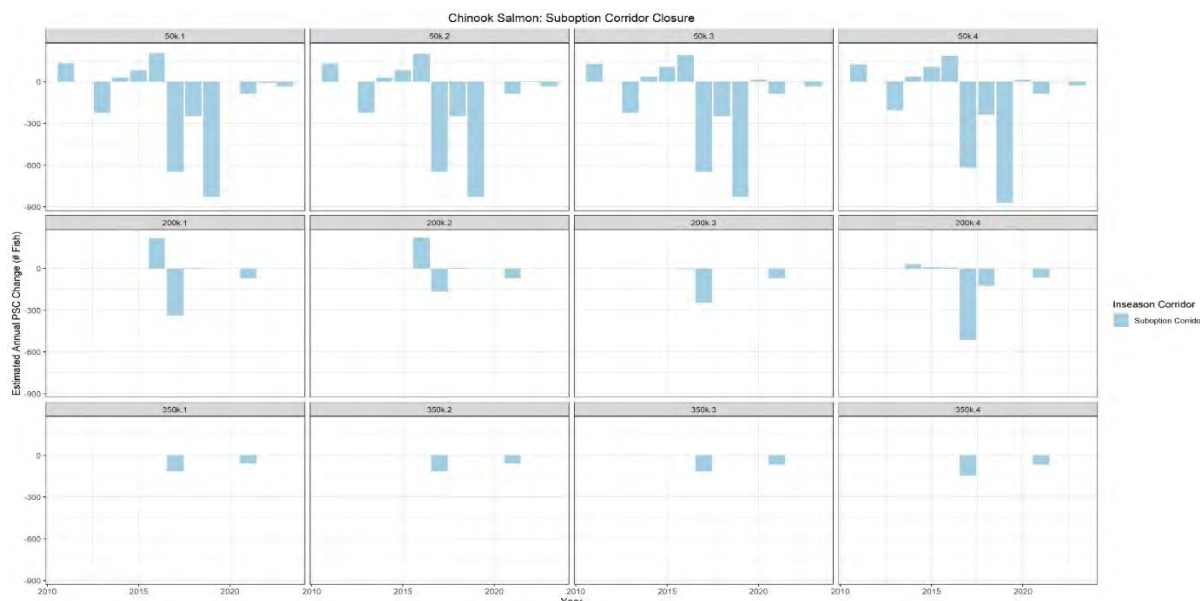


Figure 3-51 Annual net change estimates for Chinook salmon PSC under Suboption 1, Alternative 5

Source: NMFS Alaska Region CAS.

Notes: The analyzed corridor chum salmon PSC limits are shown in ascending order from 50,000 (50k) to 350,000 (350k); apportionment options are shown in ascending order from left to right. As an example, facet “50k.3” shows the estimates under a 50,000-chum salmon corridor PSC limit using apportionment Option 3 (pro rata).

3.4.1.4.3 Option 2

Under Option 2 between 19 and 29 of the corridor’s 40 stat areas would be closed to the cooperative sector that attained the corridor PSC limit. The stat areas that would be exempted from closure are at

present unknown, would be selected by the IPAs, and the areas selected could change over time. While regulations would require the IPAs select stat areas to close based on pollock CPUE, chum salmon PSC, and relevant genetics data, the analysis expects the IPAs would also consider distributions of Chinook salmon PSC and weigh the risks of closing various stat areas. This is because the IPAs have established incentives for vessels to avoid Chinook salmon PSC and the hard cap would continue to be in effect driving vessel's fishing behavior. For this reason, and because Option 2 provides the opportunity for the most inseason flexibility (*i.e.*, 19 stat areas *could close* compared to 29 or 40) and allows for the IPA's selections to be modified based on new data year-to-year, the outcomes for Chinook salmon PSC are largely expected to be close to neutral. Note this depends on how the IPAs balance and carefully weigh different criteria for determining closures using imperfect information preseason.

3.4.1.4.4 Option 3

Option 3 of Alternative 5 would implement an abundance-based threshold that would suspend the inseason corridor. Option 3 may be selected in conjunction with any option or element from Alternative 5, as well as Alternatives 2 or 4, but it may not be selected alongside Alternative 3. Yukon summer and fall chum salmon returns would need to be at or above the 75th percentile (Suboption 1) or the 90th percentile (Suboption 2) for the inseason corridor to be suspended. As with Alternative 3, these thresholds are based on the run reconstruction for each stock using data from 1992–2022).

As shown, the inseason corridor would have been suspended in 2 of 13 years (2014 and 2018) under Suboption 1 and in all 13 analyzed years under Suboption 2. If abundance is similar in the future, the inseason corridor would apply in most years. However, Option 3 would provide greater flexibility to the fleet to balance its operations against multiple constraining PSC species compared to Alternative 5 without Option 3 because the management measure would be in effect each year. In the future, if the inseason corridor is suspended, pollock catch would not be at risk of being displaced to the later months of the B season due to preemptive avoidance measures and/or a corridor closure. Option 3 would not confer greater impacts to Chinook PSC than what could be realized under any inseason corridor option (Option 1, Suboption 1, or Option 2) alone.

3.4.1.4.5 Option 4

Option 4 would modify the start date for the Winter HSA from September 1 to September 30 for the pollock fishery. Option 4 has the potential to change fishing behavior from status quo in years the herring PSC limit is met. In all other cases or years the limit is not attained, directed fishing for pollock is allowed inside the Winter HSA in September. Table 3-67 compares the observed September Chinook salmon PSC rates inside each HSA and all outside areas from 2011–2023. As shown, the September Chinook PSC rates inside the Winter HSA in years when fishing occurred in the area were variable. The 2017 September rate of 0.83 Chinook/mt was notably higher than other analyzed years. However, across all years it was typical for the September Winter HSA PSC rates to be lower than what was observed inside Summer HSA2 and comparable or lower than the observed rates in all other outside areas (again, apart from 2017). As such, Option 4 is expected to have relatively neutral impacts to Chinook salmon PSC. It is also possible that the additional flexibility provided by Option 4 could reduce Chinook salmon PSC by providing the fleet more flexibility to balance its Chinook PSC, especially in this later month when PSC encounters are known to increase.

Table 3-67 Bering Sea pollock fishery Chinook salmon PSC rate in the month of September inside the Herring Savings Areas and all other outside areas, 2011–2023

Year	Summer HSA1	Summer HSA2	Winter HSA	Outside Areas
2011	0.022	0.105	0.002	0.012
2012	0.033	0.069	0.003	0.003
2013	0.000	0.142	0.014	0.004
2014		0.031	0.029	0.010
2015		0.018	0.006	0.020
2016		0.019		0.017
2017		0.031	0.083	0.005
2018		0.014	0.003	0.018
2019		0.016	0.027	0.030
2020		0.025		0.019
2021		0.005	0.000	0.013
2022		0.009	0.026	0.003
2023		0.005		0.001

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Blank cells indicate pollock catch was not recorded inside the area during that week and year.

3.4.1.5 Combined Effects of Environmental Trends and Planned Actions on Chinook

Past and present human actions associated with Chinook salmon, including ecosystem change, subsistence, sport, personal use, commercial fisheries, and bycatch in the pollock fishery are described throughout this section and in numerous other documents (see NMFS, 2004; NMFS, 2011; NMFS, 2015). Reasonably foreseeable environmental trends and planned actions in the area that may have a cumulative impact with the proposed actions include authorization and prosecution of the Bering Sea pollock fishery and ecosystem change (see Section 3.1.6). In addition, Chinook salmon may be affected by the following.

Bycatch Management Tools

Although previously established in Federal regulation, the continued use of Chinook bycatch management tools in the Bering Sea pollock fishery constitutes a continued action in the area. For instance, Federal regulations at 50 CFR 679.21(f)(12)(iii)(E)(11) currently require for the use of salmon excluder devices, (with recognition of contingencies), in the A season for reducing Chinook bycatch. It is also common practice for vessels to continue to use an excluder in the B season.

The implementation of Chinook salmon PSC limits constitutes a past action; however, the industry-established process for ensuring catch of Chinook remains under these limits and the methods used to address the IPA requirements is an ongoing action. This would include the RHS program and data sharing agreement through Sea State to generate a system to incentivize the avoidance of Chinook salmon at all levels of abundance.

Subsistence and Commercial Chinook Salmon Fisheries

The ongoing fishing for Chinook includes the continued management of commercial, subsistence, sport, and personal use salmon fisheries, which is the same framework as what was described in Section 3.3.3 for chum salmon. Chinook salmon runs in Western Alaska have seen substantial declines over the past decade. Chinook salmon runs on the Kuskokwim River were the lowest on record from 2012 through 2014 and have remained below the historical average, resulting in restrictions to subsistence fisheries. Subsistence harvests of Chinook salmon on the Yukon River have declined since 2007 and commercial and sport harvests have declined since 1998. Commercial Chinook fisheries on the Yukon have seen tight restrictions and closures since 2008. On April 1, 2024, ADF&G and the Department of Fisheries and Oceans Canada signed a seven-year agreement to suspend commercial, sport, domestic and personal use fishing for Chinook on the Yukon River and Canadian tributaries. This means future in river removals will be limited to ceremonial subsistence use and the transmission of cultural knowledge until 2030, unless in-river abundance of Canadian-origin Chinook salmon is bilaterally projected to exceed 71,000 at the U.S./Canada border.

The interaction between reasonably foreseeable environmental trends and planned actions and the proposed alternatives is inherently considered in this section through the analysis of impacts on Chinook salmon. For instance, the expected impacts of a chum PSC limit on Chinook includes an assumption that the Bering Sea pollock fishery would be authorized and continue to be prosecuted, that existing bycatch management tools would continue included the required use of excluders during the A season, overall Chinook PSC limits, IPA requirements, and the use of the RHS system for in season avoidance.

As described throughout this section, potential impacts on Chinook PSC from the Alternative 2, 3 and 5 are unknown both in terms of magnitude and direction. The effects on Chinook PSC may vary based on the chum PSC limit amount, apportionment method, and pollock harvester's operational strategies. When considered with ongoing conditions and actions, such as the seven-year agreement on the Yukon River, if the action alternatives reduce Chinook PSC relative to status quo, noting the proposed alternatives are not designed for this intended purpose but rather to reduce chum and WAK chum salmon PSC, this may enhance the success of these in river effort to conserve the Chinook runs.

3.5 Herring

Pacific herring are widely distributed throughout the North Pacific and are an important subsistence food source. Commercial fisheries exist throughout state waters and primarily target herring roe and target fish returning to nearshore waters for spawning. ADF&G manages herring fisheries as separate stocks and uses a combination of different types of surveys and population modeling to set catch limits. Herring that spawn from Port Moller through Norton Sound are referred to as "eastern Bering Sea" herring, with the largest stock spawning in Togiak Bay. The second largest stock is in Norton Sound.

3.5.1 Effects of the Alternatives on Herring

3.5.1.1 Alternative 1

Herring that spawn along the eastern shore of the Bering Sea migrate to wintering areas near the western edge of the Bering Sea continent shelf, north and west of the Pribilof Islands (Tojo et al., 2007). During their annual migration, herring pass through areas in which groundfish trawl fisheries operate. As described previously, Pacific herring PSC in the BSAI groundfish trawl fisheries is managed by an annual PSC limit set at 1% of the spawning stock biomass. The herring PSC limit is published in the annual harvest specifications and apportioned to the trawl directed fishing categories (see 50 CFR 679.21(e)(3)(iv)(B) through (F)), and a fishery is accountable for its herring PSC on the basis of a fishing year (January 1 to December 31). Attainment of any apportionment triggers the HSA to close to that fishery based upon the timing of each area closure (Figure 3-52).

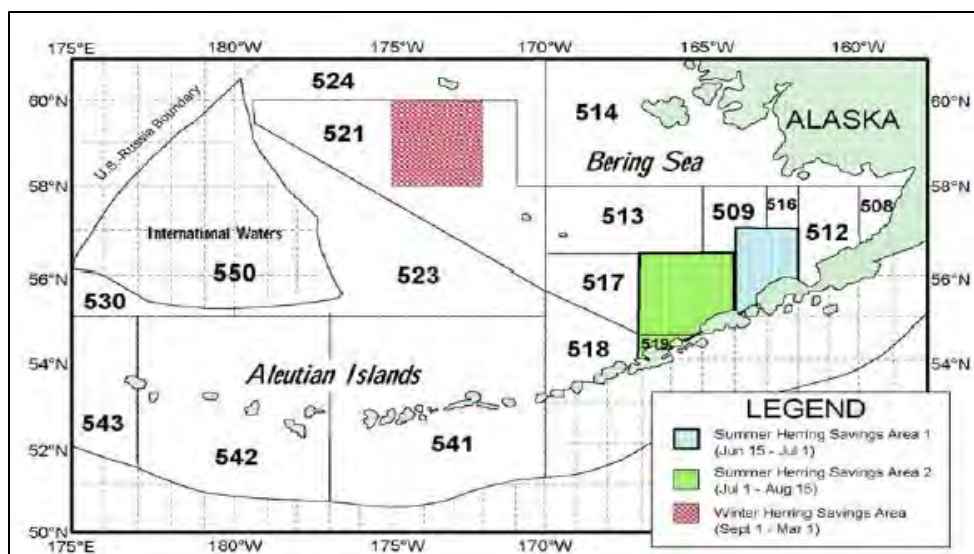


Figure 3-52 Herring Savings Areas

Note: The locations of the HSAs were based upon available herring migration data in the 1980s.

Table 3-68 compares the pollock fishery's herring PSC (mt) to the fishery's apportionment of the annual herring PSC limit in each year of the analyzed time series. As shown, the pollock fishery's annual herring PSC ranged from 151 mt in 2014 to 3,720 mt in 2020 from 2011–2023. During the analyzed period, the fishery met its herring PSC limit in 2012 and 2020.⁷⁹ While herring are encountered in both the A and B seasons, the bycatch tends to be higher during the B season although the 2020 A season was a notable exception.

The Togiak herring biomass has increased in recent years due to strong 2016- and 2017-year classes which has contributed to higher PSC in the pollock fishery in recent years (Joy et al., 2023). The 2017-year class is now approaching full size and maturity and should begin to age out of the population as natural mortality accrues in coming years. However, changing spatial distributions of herring biomass and/or changes in the distributions of directed pollock and flatfish fisheries could result in exceeding PSC limits when and if exceptionally large year classes occur in the future (Joy et al., 2023).

Table 3-68 Pollock fishery herring PSC (mt) compared to the fishery's apportionment of the limit (mt) and percent of the limit the fishery attained, 2011–2023

Year	Herring PSC (mt)	Pollock Fishery's Limit (mt)	% of Limit Attained
2011	346	1,737	19.9%
2012	2,167	1,600	135.4%
2013	959	2,165	44.3%
2014	151	1,776	8.5%
2015	1,386	2,242	61.8%
2016	1,425	2,151	66.2%
2017	956	1,800	53.1%
2018	307	1,662	18.5%
2019	1,080	2,313	46.7%
2020	3,720	2,299	161.8%
2021	1,698	2,472	69.0%
2022	1,678	3,400	49.0%
2023	3,059	3,066	99.7%

Source: NMFS Inseason. <https://www.fisheries.noaa.gov/alaska/commercial-fishing/fisheries-catch-and-landings-reports-alaska>

⁷⁹ A request for emergency action was submitted in 2020 to suspend the closure of the Winter HSA in order to allow the fishery to operate and achieve Optimum Yield rather than be pushed into areas of less productive fishing and potentially higher herring bycatch areas. The [Summer HSA2 was re-opened by NMFS in 2020](#) as well to prevent the underharvest of the 2020 pollock TAC.

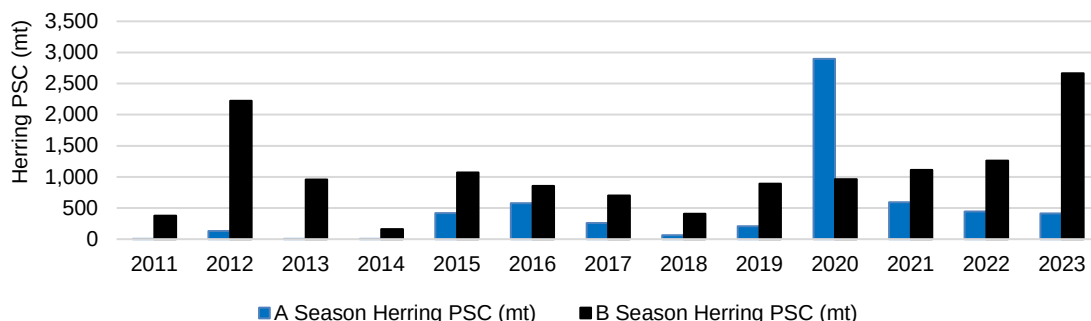


Figure 3-53 Comparison of the pollock fishery's Herring PSC (mt) during the A and B season, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.5.1.2 Alternative 2 or 3

Alternative 2 or 3 would implement an overall chum salmon PSC limit during the pollock B season. The overall chum salmon PSC limit would be apportioned among the sectors and fishing must cease if the PSC limit is met. An overall chum salmon PSC limit specified in Federal regulation under Alternative 2 or 3 will influence fishing behavior. Fishermen would work to constrain their PSC against the chum salmon hard cap as they are able to avoid the consequence of meeting it. The impacts to herring PSC under Alternative 2 or 3 would be driven by how the fleet responds to the chum salmon hard cap, which could create a wide range of interactions with herring.

Potential for Herring PSC Savings

Herring PSC would only be expected to be reduced *due to* Alternative 2 or 3 if the B season were to close earlier than it otherwise would because the overall chum salmon PSC limit is met. Any such reduction in herring PSC would be dependent on the amount of herring taken as PSC before the season closed. The retrospective analysis shows that an overall PSC limit of 100,000 chum salmon would have reduced herring PSC by an average of 223 mt to 259 mt across the years the limit was met, depending on the apportionment used (2011–2023). As would be expected, overall chum salmon PSC limits analyzed at the mid-point and upper end of the range were shown to have had less impact on herring PSC (Table 3-69).

Table 3-69 Estimates of fleet-wide herring PSC reductions (mt) as if the overall chum salmon PSC limits and apportionments were in place from 2011–2023

Year	100,000				325,000				550,000			
	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt. 1	Opt. 2	Opt. 3	Opt. 4
2011	216	217	217	156								
2012												
2013	165	169	169	170								
2014	31	31	31	26								
2015	60	60	60	59				13				
2016	56	47	47	105	11	4	4	0	0			
2017	418	417	418	418	19	19	19	19	19	19	19	2
2018	343	343	343	351	1	1	1					
2019	301	301	301	410	12	12	12	99				
2020	274	274	274	267	34	0	0	24				
2021	407	399	407	467	320	317	317	317	11	227	237	279
2022	293	293	293	481	0	0	0	0				
2023	116	177	177	199								

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Cells without a value indicate years when an overall chum salmon PSC limit and apportionment were not met. Cells with "0" values indicate at least one sector met the overall PSC limit and apportionment, but no herring PSC would have been saved.

Potential for Herring PSC to Increase

Herring PSC could increase under Alternative 2 or 3, similar to Chinook salmon PSC, prior to and regardless of whether the overall chum salmon PSC limit is met. The impacts to herring PSC would largely be driven by how the fleet reacts to an overall chum salmon PSC limit specified in regulation. It is assumed that pollock fishermen would not want to incur the costs of an early B season closure (Alternative 2 or 3), nor would fishermen want to lose access to the fishing grounds encompassed within the HSAs by reaching the herring PSC limit (status quo herring PSC management). Although the industry would take measures to avoid all PSC to the extent practicable, adding an overall chum salmon PSC limit would inherently limit the fleet's operational flexibility to avoid multiple PSC species that are temporally and spatially distributed throughout the B season.

The pollock fleet would need to make choices inseason on how to carefully balance their operations against multiple, constraining PSC limits. For instance, a sector experiencing greater herring encounters may need to decide whether to move vessels to new areas to avoid any further herring PSC while also maintaining low chum salmon PSC. Fleet managers have shared that the CV sectors could be moved onto the shelf where herring bycatch has recently been lower, but chum salmon and WAK chum salmon may be more prevalent.⁸⁰ Conversely, the fleet may balance its chum salmon PSC against the overall hard cap and inadvertently reach the herring PSC limit. Closing Summer HSA1 and HSA2 would require vessels to move out of these areas which encompass historically important fishing grounds. This could concentrate effort on the edge of the closure to continue fishing in the more productive grounds and closer to port. This proximity is particularly important for the inshore sector. Based on the location of the summer HSAs, a closure would likely move vessels northwest as they are able into genetic cluster 2 where chum salmon PSC rates have historically been higher. These potential tradeoffs in fleet movement to avoid chum salmon and herring PSC during the B season are illustrated in Table 3-70 which compares B season PSC rates in each HSA and all other fishing grounds.

Table 3-70 Comparison of B season herring PSC and chum salmon rates inside the Summer HSA1, Summer HSA2, the Winter HSA, and all outside areas, 2011–2023

Year	Summer HSA1		Summer HSA2		Winter HSA		All Outside Areas	
	Chum Rate	Herring Rate	Chum Rate	Herring Rate	Chum Rate	Herring Rate	Chum Rate	Herring Rate
2011	0.4398	0.00015	0.4868	0.00105	0.1217	0.0002	0.1777	0.00034
2012	0.1782	0.00018	0.0898	0.00129	0.0017	0.00042	0.0189	0.00555
2013	0.404	0.00001	0.4764	0.00015	0.0075	0.0003	0.1092	0.00206
2014	0.1395	0.00057	0.2969	0.0006	0.0861	0.00001	0.3407	0.00001
2015	0.1285	0.00159	0.4753	0.00328	0.0651	0.00001	0.2081	0.00007
2016	0.1148	0.00004	0.4006	0.00165	0.6184	0.00004	0.5245	0.00018
2017	0.271	0.00038	0.4335	0.00166	0.3234	0.00007	0.8375	0.00014
2018	0.095	0.00119	0.324	0.00117	0.0255	0.00001	0.6074	0.0001
2019	0.862	0.00182	0.4295	0.00223	0.1221	0.00002	0.4627	0.00012
2020	0.195	0.00119	0.5176	0.00367	0.1878	0.00039	0.4972	0.00038
2021	0.0969	0.01503	0.5913	0.00302	0.0514	0.00002	1.2953	0.00005
2022	1.7469	0.00002	0.5128	0.00326	0.4532	0.00197	0.2996	0.00094
2023	0.2442	0.00044	0.2117	0.00864	0.0613	0.00053	0.1663	0.00147

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

The implications for herring PSC under Alternative 3 are similar to Alternative 2. However, the overall chum salmon PSC limit under Alternative 3 would be conditionally applied. Historical data indicate the PSC limit would have been in effect in 3 or 6 years under Option 1 and in 3 or 5 years under Option 2. If abundance levels in the future are similar to what was observed during the status quo period, an overall chum salmon PSC limit would not be in effect each year. The impacts to herring or salmon PSC (either positive or negative) would be less than what is expected for Alternative 2. In years that an overall chum

⁸⁰ Personal communication, S. Martell.

salmon PSC limit is not in effect, the impacts to herring would be close to neutral compared to status quo, and similar to what was described for Alternative 2 in the years the PSC limit is in effect.

If the overall chum salmon PSC limit set when one area fails to meet its thresholds under Option 1 is 100,000 chum salmon, a PSC limit of 75,000 chum salmon would be in effect in when two or more areas fail to meet their thresholds. In the years where a hard cap of 75,000 chum salmon is in effect, there is greater potential for adverse effects to herring PSC because this cap amount is more constraining for the fleet compared to caps analyzed at higher amounts.

Overall, these dynamics make the potential impacts of an overall chum salmon PSC limit to herring uncertain both in their direction and magnitude. The potential for unintended adverse impacts (*i.e.*, PSC increases) would be greater as the over chum salmon PSC limit becomes more of a binding constraint (*i.e.*, a cooperative or sector is very concerned they will meet the hard cap). Operational choices would be made by the fleet on a season-by-season basis which would affect the potential outcomes.

3.5.1.3 Alternative 4

The effects of Alternative 4 on herring PSC are expected to largely be neutral compared to status quo, because the pollock fleet has operated under the RHS program for chum salmon avoidance and other IPA measures since 2010. Additionally, proposed provisions largely reflect recent fishing behavior.

3.5.1.4 Alternative 5

Three different inseason corridor options are being considered under Alternative 5 but only one may be selected for implementation. Among all three options, the inseason corridor perimeter, the range of PSC limits (50,000–350,000 chum salmon), apportionment options, and closure window of June 10 – August 31 are the same. If the inseason corridor PSC limit is met during the closure window, all or part of the corridor would close to the sector or cooperative that attained the corridor PSC limit. The three inseason corridor options differ from one another based on the number and location of stat areas inside that would close and the entity that would implement the closure.

3.5.1.4.1 Option 1

Option 1 would close the entire inseason corridor (*i.e.*, 40 of 40 stat areas) to a cooperative or sector that attained its corridor chum salmon PSC limit from the date the limit was met through August 31. The impacts to herring PSC under Option 1 would be driven by changes in fishing behavior, both prior to and after a corridor closure.

Across all analyzed years (2011–2023), the chum salmon bycatch rates were typically higher inside the corridor compared to outside areas in June, July, and August. Similar trends were observed for herring PSC (Figure 3-54). Based on these data, a corridor closure could have positive impacts to chum and herring PSC compared to status quo as the affected vessels would be prohibited from fishing inside the full corridor through August 31. Note that a more nuanced discussion on the interannual variability of chum salmon PSC rates inside and outside the corridor is available in Section 3.3.4.6.3 and not repeated here.

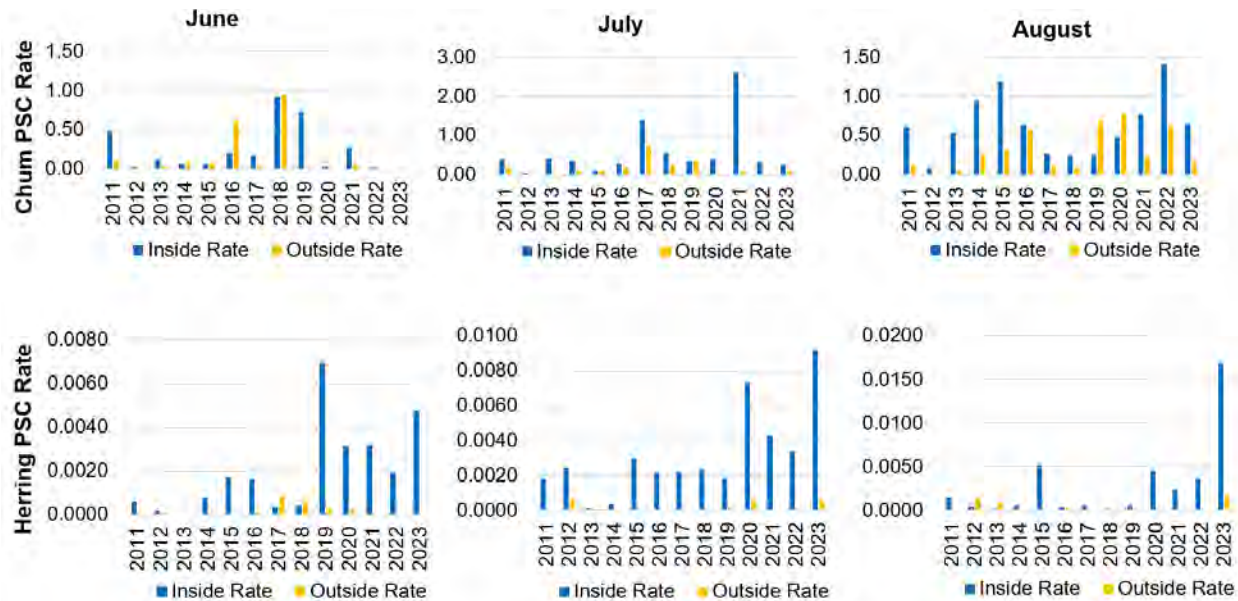


Figure 3-54 Comparison of the monthly chum salmon PSC rate (top) and herring PSC rate (bottom) inside the inseason corridor (left) and outside the inseason corridor (right) in June, July, and August, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

However, vessels would react to the inseason corridor and closure provisions under Option 1. Changing fishing behavior to avoid chum salmon PSC inside the corridor would have associated costs, and vessels' willingness to incur these costs depends on the perceived risk and consequence of a closure. Option 1 presents a large consequence for a sector that attains the corridor PSC limit if it has historical dependency on the corridor or values the operational flexibility the corridor provides. For instance, the fishing grounds inside the corridor have historically been important for the CV sectors and some inshore CVs are limited in their capacity to travel further distances to proactively fish outside of the corridor's perimeter. Given the greater herring PSC rates inside the corridor in June, July, and August compared to the fishing grounds outside the corridor since 2019 (Figure 3-54), if vessels were to fish inside the corridor and prioritize avoiding chum salmon, this could inadvertently increase herring PSC.

That being said, it is important to note an inseason corridor subsumes Summer HSA1 and HSA2 and so a corridor closure would effectively extend and expand the seasonal herring closures beyond current practice through August 31. All herring PSC taken by the fishery accrues to the herring PSC limit throughout the fishing year, regardless of where that PSC is caught or the sector it is attributed to. Prior to a corridor closure, Option 1 creates a strong incentive for vessels to avoid chum salmon which may become a priority for the fleet during the corridor closure window given the corridor represents a larger closure than Summer HSA1 or HSA2. Yet if the pollock fishery inadvertently triggered the HSA1 and HSA2 closures with closure windows of June 15 – July 1 and July 1 – August 15, respectively, large portions of the inseason corridor would close to all sectors.

Alternative 5 would create new incentives for chum salmon PSC avoidance and thus be expected to create a more complex and nuanced relationship between chum salmon and herring PSC avoidance in the future.

3.5.1.4.2 Suboption 1

Suboption 1 would close 29 stat areas inside the inseason corridor if the corridor chum salmon PSC limit were attained through August 31. After the closure, fishing may continue outside the corridor or inside the 11 stat areas exempted from closure. The potential impacts of Suboption 1 on herring are largely the same as Option 1. Table 3-71 shows the observed herring PSC rates in June, July, and August inside the 11 stat areas exempted from closure compared to the 29 stat areas that would close under Suboption 1. Across all

years, the herring PSC rate was greater inside the 11 stat areas exempted from closure in 11 of 13 years in June, all 13 years in July, and in 9 of 13 years in August. If Suboption 1 were selected and a corridor closure occurred, inshore and mothership CVs could concentrate their fishing effort in these 11 exempted areas to a greater degree than what occurs under the status quo because vessels would have less fishing areas available through August 31 and creates more uncertainty in the potential outcomes for herring PSC.

Herring PSC may increase if vessels continue fishing in select stat areas inside the corridor where herring PSC rates were higher (2011–2023). This unintended, negative impact could be exacerbated if a substantial amount of pollock catch was moved to these areas (Table 3-71). However, after the corridor closed because the chum salmon PSC limit was already met, vessels that choose to fish inside the 11 exempted stat areas may carefully watch their herring PSC against that limit to not risk triggering additional closures. This could result in neutral impacts on herring PSC. This suggests the incentives to avoid herring PSC under Suboption 1 after the chum salmon corridor PSC limit is met would be greater than what would be provided under Option 1, because there still may be some fishing opportunity open in the HSA1 and HSA2.

Table 3-71 Comparison of the pollock fishery's herring PSC rate inside the 29 stat areas to close and inside the 11 exempt stat areas under Suboption 1 in June, July, and August, 2011–2023

	29 Closed Stat Areas			11 Exempt Stat Areas		
	June	July	August	June	July	August
2011	0.00007	0.00064	0.00162	0.00213	0.00228	0.00097
2012	0.00003	0.00006	0.00055	0.00024	0.01742	0.00046
2013	0.00000	0.00010	0.00011	0.00000	0.00025	0.00087
2014	0.00035	0.00017	0.00072	0.00102	0.00095	0.00043
2015	0.00016	0.00005	0.00092	0.00440	0.00398	0.00631
2016	0.00020	0.00159	0.00011	0.00505	0.00264	0.00062
2017	0.00020	0.00045	0.00054	0.00146	0.00507	0.00058
2018	0.00029	0.00019	0.00003	0.00087	0.00424	0.00023
2019	0.00433	0.00371	0.00232	0.00962	0.00160	0.00025
2020	0.00314	0.00016	0.00165	0.00317	0.01612	0.00534
2021	0.00337	0.00077	0.00165	0.00292	0.00659	0.00329
2022	0.00092	0.00206	0.00109	0.00355	0.00860	0.00507
2023	0.00210	0.00163	0.00042	0.01544	0.01272	0.02850

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: The 0.00000 values in June 2023 both inside the 29 stat areas that would close and the 11 that would be exempted reflect the rounding that was used in formatting and not that herring PSC was not encountered. The June 2013 herring PSC rate in the 29 closed stat areas was 0.00000079 and 0.00000062 in the 11 stat areas exempt from closure.

3.5.1.4.3 Option 2

Option 2 would allow the IPAs to select between 19 and 29 stat areas to close to a sector that met its apportionment of the corridor PSC limit through August 31. The stat areas in the corridor that would be exempt from closure are at present unknown, would be selected by the IPAs, and the areas selected could change over time. While regulations would require the IPAs select stat areas to close based on pollock CPUE, chum salmon PSC, and relevant genetics data, the analysis expects the IPAs would also consider distributions of herring PSC and weigh the risks of closing various stat areas. The pollock fishery is incentivized to avoid herring PSC to the extent practicable to not risk losing access to the fishing grounds encompassed within the HSAs. For this reason, and because Option 2 provides the opportunity for the most inseason flexibility (*i.e.*, 19 stat areas *could* close compared to 29 or 40) and allows for the IPA's selections to be modified based on new data year-to-year, the outcomes for herring PSC are largely expected to be neutral. Note this depends on how the IPAs balance and carefully weigh different criteria for determining closures using imperfect information preseason and the actual conditions in a given year.

3.5.1.4.4 Option 3

Option 3 of Alternative 5 would implement an abundance-based threshold that would suspend the

inseason corridor. Option 3 may be selected in conjunction with any option or element from Alternative 5, as well as Alternatives 2 or 4, but it may not be selected alongside Alternative 3. Yukon summer and fall chum salmon returns would need to be at or above the 75th percentile (Suboption 1) or the 90th percentile (Suboption 2) for the inseason corridor to be suspended. As with Alternative 3, these thresholds are based on the run reconstruction for each stock using data from 1992–2022.

As shown, the inseason corridor would have been suspended in 2 of 13 years (2014 and 2018) under Suboption 1 and in all 13 analyzed years under Suboption 2. If abundance is similar in the future, the inseason corridor would apply in most years. However, Option 3 would provide greater flexibility to the fleet to balance its operations against multiple constraining PSC species compared to Alternative 5 without Option 3 because the management measure would be in effect each year. Option 3 would not confer greater impacts to herring PSC than what could be realized under any inseason corridor option (Option 1, Suboption 1, or Option 2) alone.

3.5.1.4.5 Option 4

Option 4 would modify the start date of the Winter HSA closure for the pollock fishery from September 1 to September 30. No other element of the Pacific herring PSC management framework specified in regulation at 50 CFR 679.21(e)(3)(iv)(B) through (F)) would be affected. Option 4 could impact herring by allowing the pollock fishery to continue directed fishing inside the Winter HSA throughout September *in a year when the herring PSC limit is met*. As discussed previously, directed fishing for pollock is allowed inside the Winter HSA in September if the fishery has not attained the herring PSC limit in that year. The herring PSC management framework is based on observer data from the 1990s indicating times and areas when migrating herring were more likely to be encountered by trawl fisheries (EA/RIR amendment 16a, NMFS 1991). Modifying the start date for the Winter HSA may diminish the incentive for the fleet to avoid herring PSC in a year when the herring PSC limit is not attained. Therefore, including Option 4 as an element of Alternative 5 could risk increasing herring PSC.

Figure 3-55 shows the amount of herring taken as PSC (mt) inside the Winter HSA, Summer HSA1, Summer HSA2, and all other outside areas from 2011–2023. Column height indicates the magnitude (mt) of PSC encountered in the area. The pollock fishery encountered the greatest amount of herring PSC in September in 2012 in the fishing grounds outside of the HSAs (outside areas). Herring PSC in the month of September has since decreased and remained relatively low across all analyzed areas.

Including Option 4 as an element of Alternative 5 is expected to result in impacts to herring PSC that are relatively neutral to status quo. Across the analyzed time series, the pollock fishery has only been prohibited from directed fishing inside the Winter HSA in September 2020 because the fishery attained the herring PSC limit earlier in that year. The regulatory change that would occur under Option 4 would not have had an effect in any other year. Additionally, the observed herring PSC tended to be lower inside the Winter HSA compared to other analyzed areas where fishing occurred. This suggests that allowing fishing to occur inside the Winter HSA may be a benefit to herring PSC in the future, if the pollock fishery attains its PSC limit.

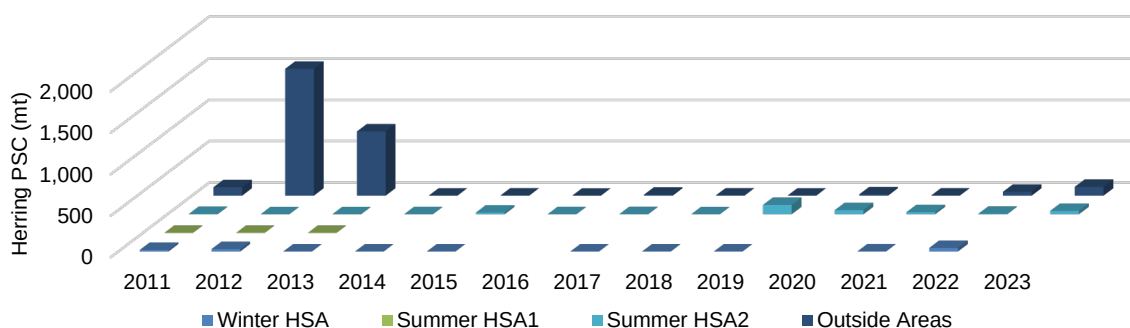


Figure 3-55 Herring PSC (mt) in the Bering Sea pollock fishery during the month of September inside the Winter HAS, Summer HSA1, Summer HSA2, and all remaining outside areas, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

3.5.1.5 Combined Effects of Environmental Trends and Planned Actions on Herring

The past and present human actions associated with Pacific herring are described throughout this section and in other documents incorporated by reference. Directed commercial fisheries have occurred in the past and/or continue to occur for herring, as well as bycatch in the Bering Sea pollock fishery and implementation of herring PSC limits and time/area closures. Reasonably foreseeable environmental trends and planned actions in the area that may have a cumulative impact with the proposed actions include authorization and prosecution of the Bering Sea pollock fishery and ecosystem change, described at the beginning of Chapter 3.

The combined effect of the trends and actions in the area with the proposed alternatives is inherently considered in the analysis of impacts on herring throughout this section. The potential impacts to herring PSC under Alternatives 2, 3, or 5 are uncertain in both magnitude and direction. A directed fishery for Togiak herring has not occurred in recent years and thus information to inform an age-structured assessment have not been available. The herring population in the eastern Bering Sea has been variable from 2017–2025 with an increasing trend from 2020–2023, followed by a decline in 2024 and 2025.⁸¹ Given this variability, concerns for the cumulative impacts on herring as a result of the alternatives in the herring population are limited and best estimated by the impacts of status quo.

3.6 Marine Mammals

Information on the status of marine mammal populations in Alaska can be found from the following published resources, which are incorporated by reference. Marine mammal stock assessment reports (SARs) are published annually under the authority of the Marine Mammal Protection Act (MMPA) for all stocks that occur in state and Federal waters of Alaska. Individual SARs provide information on each stock's geographic distribution, population status and trends and estimates of human-caused mortality and serious injury (M/SI). The MMPA also provides guidance for the [List of Fisheries \(LOF\)](#), an annually updated table which classifies Federally-managed commercial fisheries according to observed levels of M/SI. The BSAI pollock fishery is a Category II fishery. More information on that basis of this MMPA determination can be found on NMFS webpage.⁸²

⁸¹ [Letter from ADF&G](#) to the Council on mature biomass of Pacific herring (November 2024), available at archived eAgenda for the December 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3066>), at agenda item C1

⁸² <https://www.fisheries.noaa.gov/national/marine-mammal-protection/ak-bering-sea-aleutian-islands-pollock-trawl-fishery-mmpa-list>

Marine mammal stocks or distinct population segments (DPS)⁸³, including those currently listed as endangered or threatened under the ESA or depleted or strategic under the MMPA, that may be present in the Bering Sea can be found on NMFS webpage.⁸⁴ ESA Section 7 consultation was conducted for the Bering Sea groundfish fisheries in 2010 (NMFS 2010).

Effects to marine mammals from fisheries can occur from either direct or indirect interactions. For the action analyzed here, direct interactions are observable M/SI, whereas indirect effects would primarily occur in the form of competition for preferred prey (*e.g.*, herring, pollock). Indirect interactions occur over protracted periods and are often difficult to attribute to any single cause. Table 3-72 shows only the marine mammal DPS which are known to interact (directly or indirectly) with the BSAI pollock trawl fishery and includes the most recently reported information on each DPS's minimum population abundance and trend (increasing/decreasing), collected from SARs. For species that are listed to have indirect interactions with the BSAI pollock fishery, Table 3-72 also lists prey preferences. There are other marine mammals in the action that have no documented interactions with the pollock fishery and are not considered further in this analysis. For more information on critical habitat designations, population statuses, including years used in evaluation, and prey preferences, please refer to Appendix 3 of the February 2025 preliminary DEIS.⁸⁵

⁸³ Under the Endangered Species Act, a distinct population segment—or DPS—is “a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species.” Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (NOAA/NMFS, 1996) (61 FR 4722).

⁸⁴ <https://www.fisheries.noaa.gov/species-directory/marine-mammals> (last visited Aug. 8, 2025).

⁸⁵ The 2025 preliminary DEIS can be found on the Council's archived meeting page for the February 2025 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3071>), under agenda item C2.

Table 3-72 Marine mammals known to interact (directly or indirectly) with the BSAI pollock fishery. Minimum population estimates, trends and most recently available counts of M/SI caused by the BSAI pollock trawl fishery are reported from the most recently available SARs.

Species	Potential Impacts		Population		Prey groups affected by the BSAI pollock trawl fishery	M/SI count
	Direct	Indirect	Minimum Population Estimate	Trend		(5-year range)
Steller sea lion (<i>Eumatopias jubatus</i>), Western DPS	X	X	49,837	variable by region	salmon, pollock	33 (2017 - 2021)
Northern fur seal (<i>Callorhinus ursinus</i>), Eastern Pacific		X	628,616	neutral	salmon, pollock	0 (2017 - 2021)
Harbor seal (<i>Phoca vitulina</i>), Pribilof Islands	X	X	229	unknown	salmon, pollock	0 (2013 - 2017)
Harbor seal (<i>Phoca vitulina</i>), Bristol Bay	X	X	44,781	increasing	salmon, pollock	1 (2013 - 2017)
Ribbon seal (<i>Phoca fasciata</i>), Alaska	X	X	163,086	unknown	pollock, herring	1 (2014 - 2018)
Bearded seal (<i>Erignathus barbatus nauticus</i>), Beringia DPS	X	X	273,676	unknown	capelin	3 (2017 - 2021)
Spotted seal (<i>Phoca largha</i>), Alaska		X	5,254	unknown	pollock	0 (2017 - 2021)
Ringed seal (<i>Phoca hispida</i>), Alaska	X	X	158,507	unknown	salmon, pollock	1 (2017 - 2021)
Killer whale (<i>Orcinus orca</i>), Eastern North Pacific Alaska Resident		X	302	neutral	salmon	1 (2017 - 2021)
Pacific White-sided dolphin (<i>Lagenorhynchus obliquidens</i>), North Pacific	X	X	unknown	unknown	herring	2 (2017 - 2021)
Harbor porpoise (<i>Phocoena phocaena</i>), Bering Sea	X		5,713	unknown		0 (2017 - 2021)
Beluga whale (<i>Delphinapterus leucas</i>), Beaufort Sea		X	32,453	unknown	salmon, forage fish	0 (2017 - 2021)
Beluga whale (<i>Delphinapterus leucas</i>), Eastern Chukchi Sea		X	8,875	unknown	salmon, forage fish	0 (2017 - 2021)
Beluga whale (<i>Delphinapterus leucas</i>), Eastern Bering Sea		X	11,112	unknown	salmon, forage fish	0 (2017 - 2021)
Beluga whale (<i>Delphinapterus leucas</i>), Bristol Bay		X	1,645	neutral	salmon, forage fish	0 (2017 - 2021)
Humpback whale (<i>Megaptera novaeangliae</i>), Western North Pacific DPS	X		1,084	unknown		3 (2017 - 2021)
Humpback whale (<i>Megaptera novaeangliae</i>), Hawaii DPS	X		11,278	unknown		0 (2017 - 2021)
Humpback whale (<i>Megaptera novaeangliae</i>), Mexico DPS	X		unknown	unknown		1 (2017 - 2021)

Source: Young et al., (2023); Carretta et al., (2023); Proposed List of Fisheries for 2024 (88 FR 62748, September 13, 2023)

Notes: Further details on the information presented here is available in Appendix 3 to the February 2025 preliminary DEIS, which can be found on the Council's archived meeting page for the February 2025 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3071>), under agenda item C2.

3.6.1 Effects of the Alternatives on Marine Mammals

Table 3-73 Summary of effects on ESA-listed marine mammals in the Action Area

Alternative	Management Measure	Direct and Indirect effects on Marine Mammals
Alternative 1	Status quo	Present levels of marine mammal M/SI are considered minimal.
Alternative 2	Overall bycatch (PSC) limit for chum salmon	Potential effects may be no change from status quo or may be an increase or decrease in interactions with marine mammals, depending on how fishing patterns change (spatially, temporally).
Alternative 3	Chum salmon PSC limit with an associated Western Alaska chum salmon bycatch annual limit	Adverse effects of Alternative 3 are expected to be similar to those from Alternative 2 (see above).
Alternative 4	Additional regulatory requirements for Incentive Plan Agreements (IPAs) to be managed within the IPAs	No changes relative to the status quo would be expected.
Alternative 5	Corridor that would close through August 31 if associated caps are reached	If Option 1 extends fishing effort to later in the season, there could be increases or decreases in marine mammal interactions. Under Suboption 1, Option 2, and Option 3, due to the greater flexibility to fish within historically preferred parts of the fishing grounds, it is expected that direct and indirect effects on marine mammals would be largely the same as status quo. Option 4 is not anticipated to result in greater herring PSC than status quo and thus would likely result in impacts similar to the status quo. Under any option or suboption, if fishing shifts to areas with lower CPUE, there may be additional fishing during the year that could increase interactions with marine mammals.

The marine mammal stocks known to have direct and/or indirect interactions with the BSAI pollock trawl fishery is available in Table 3-72. Direct interactions with the fishery are most commonly in the form of entanglement in fishing gear, whereas indirect interactions are mainly from prey competition.

The BSAI pollock trawl fishery is a 100% observed fishery. As such, there is a high degree of certainty that observed direct interactions of marine mammals with the BSAI pollock trawl fishery are representative of total interactions. Therefore, this analysis does not provide additional consideration other marine mammals occurring in the action area that have no documented interaction with the pollock fishery.

The indirect effects of prey competition are hard to quantify and may be mediated by other processes (*e.g.*, trophic interactions, population dynamics) that are influenced by a numerous factors including environmental variability, population dynamics, and fishery competition. Further, most marine mammals occurring in the Bering Sea (Table 3-72) are known to consume a wide variety of prey species.

For purposes of discussing the potential effects of each alternative, we assume that increases in fishing effort would have commensurate increases in direct interactions with marine mammals and similarly decreases in fishing effort would have commensurate decreases in direct interactions with marine mammals. However, if fishing effort moved to areas with fewer preferred prey species (*e.g.*, pollock, salmon, or herring), fewer marine mammals may also be present. Indirect effects on prey availability for marine mammals with increasing or decreasing fishing levels are not as linear as direct effects but generally for marine mammals that rely on pollock or chum salmon to meet metabolic needs, large

changes in total pollock catch will affect overall metabolic energy budgets for these marine mammals. None of the alternatives under considerations are expected to increase the overall harvest of pollock, other groundfish, herring, or forage fish (*i.e.*, potentially reduce the abundance available to marine mammals overall). However, if it results in shifts in the spatial/temporal distribution of harvest, it is possible there could be marginal indirect impacts to marine mammals relative to the status quo.

3.6.1.1 Alternative 1

Under the status quo, chum salmon bycatch would continue to be managed under the IPAs, as described in Section 2.2. No shift of effort beyond the status quo inter-annual variability, which is influenced by many factors, including the presence and timing of pollock and PSC on the fishing grounds, would be expected. The status quo direct and indirect impacts on marine mammals in the Bering Sea are described under the subheading titled “Interaction with Bering Sea Pollock Fisheries” for each species in Appendix 3 of the preliminary DEIS.⁸⁶ The data from 2017-2021 indicates that, although the pollock fishery does have occasional interactions that result in marine mammal serious injury or mortality, the overall level of impact is minimal. For direct impacts, which include entanglement/capture in fishing gear, on average in the most recent 5-year period, for all species except Steller sea lions, fewer than one mortality per marine mammal species per year occurred. For fur seals, spotted seals, harbor porpoise, and beluga whales, no mortalities were attributed to the Bering Sea pollock fishery in the most recent 5-year period. For Steller sea lions, an annual average of approximately seven mortalities occurred. However, in the context of the Western stock of stellar sea lion population estimate of approximately 50,000, which is the stock of the greatest concern, most likely to be encountered by the pollock fishery, and the basis of the Category II List of Fisheries designation, impacts from the pollock fishery are also expected to be minimal.

Through the harvest of pollock and salmon catch, the pollock fishery also indirectly impacts marine mammal population through prey competition. In this category of indirect impacts, of most potential concern are potential impacts to WPS Steller sea lion. However, management measures that limit harvest of pollock in the areas and times most important to Steller sea lion foraging would remain in place. Therefore, given the significant biomass of pollock, and limited incidental catch of other species, no measurable impacts related to prey competition are expected. Therefore, managing the Bering Sea pollock B season under Alternative 1 is not expected to change the effects of the status quo fishery on marine mammals.

3.6.1.2 Alternative 2 or 3

Chum salmon PSC limits for Alternatives 2 and 3 may result in no change to the status quo or may change fishing patterns to avoid chum salmon PSC. This could result in reduced fishing effort, changes in fishing patterns, or seasonal changes in the timing of the fishing to increase chum salmon avoidance. If a groundfish fishery reduces total fishing effort in specific fisheries to conserve chum salmon PSC, then less potential may exist for marine mammal interactions or harvesting of potential prey items of marine mammals. If a groundfish fishery increases the duration of fishing in areas with lower concentrations of chum and equivalent or greater concentrations of marine mammals species, there may be more potential for marine mammal interactions, compared to the status quo, if this increased fishing activity overlaps temporally and geographically with areas used by marine mammals. The relative distribution of pollock and marine mammals during any year is unknown. Existing regulations in place to reduce interactions between the pollock fishery and marine mammals would remain in place.

If a groundfish fishery reduces fishing effort in specific fisheries to conserve chum salmon PSC, shifts in the location or timing of fishing may occur. However, there is already considerable interannual variability in the patterns of fishing across the EBS groundfish sectors, as environmental conditions and avoidance

⁸⁶ The 2025 preliminary DEIS can be found on the Council's archived meeting page for the February 2025 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3071>), under agenda item C2.

of PSC species have caused vessels to adjust their fishing patterns. Due the fleet's preference to fish in familiar locations that optimizes fishery performance, any shift in fishing location or timing is unlikely to occur outside of the existing footprint of the groundfish fisheries. Because we expect that any geographic or temporal changes to fishing effort would occur within the current boundaries of the fishery, increased direct interactions with marine mammals would be unlikely.

If there were reduced fishing effort due to an early closure of the fishery to one or more cooperatives or CDQ groups, there would be potential decreases in direct interactions with marine mammals. Further, there may be decreased competition between the fisheries and marine mammals that feed on pollock. Shifts in effort that result in greater herring bycatch could increase competition with marine mammals that feed on herring. However, as described in Section 3.5.1., minimal impacts to herring bycatch amounts are expected and herring bycatch amounts would continue to be constrained by the existing herring PSC limit, and associated triggers of herring savings areas (see Section 3.5). Absent a substantial reduction in total pollock catch or increase in herring bycatch, which are generally not anticipated outside of the lowest PSC limits which could lower pollock harvest in some years and could have the potential to marginally increase the availability of prey from some marine mammals, changes in the indirect effects on marine mammals under Alternatives 2 and 3 are expected to be minimal.

3.6.1.3 Alternative 4

Under Alternative 4, no significant geographic or temporal changes in fishing effort are expected. Therefore, if Alternative 4 were adopted, no changes to the effects on marine mammals relative to the status quo would be expected.

3.6.1.4 Alternative 5

Alternative 5 would include an inseason corridor with closure provisions—if the corridor chum salmon PSC limit were attained some or all of the corridor would close to directed fishing through August 31. Vessels affected by a closure could continue fishing in areas exempt from closure and return to fish inside the corridor on September 1 through November 1 (50 CFR 679.23(e)(2)).

3.6.1.5 Option 1

A chum salmon PSC limit that creates a risk of a closure under Alternative 5, Option 1, would likely impact where the inshore catcher vessels fish and when. A temporary closure under Alternative 5, Option 1, may extend fishing later into the B season, which may affect marine mammals present on the fishing grounds during late fall. The analysts expect that geographic changes to fishing effort in response to a temporary closure under Option 1 would likely occur within the historic fishery footprint. However, Alternative 5, Option 1 does create the greatest potential for a northward shift of the distribution of the fleet during the closure period, if one occurs. Whether this displaced effort would change interactions with migratory marine mammals is indeterminable given the spatial and temporal resolution of available information on observed animal movements and uncertainty about precisely where any displaced fishing effort would occur. As for Alternatives 2 and 3, Alternative 5, Option 1, could result in additional direct and indirect effects if fishing effort shifts to or concentrates in regions closer to known Steller sea lion rookeries or haul outs. However, existing management measures for ESA-listed species such as Steller sea lions would remain and would be expected to help mitigate the risk of increased interactions.

A temporary area closure could reduce the risk of marine mammal direct interactions earlier in the season by effectively pausing fishing effort within the corridor until September 1 once the cap is reached. A temporary area closure may also decrease harvest of marine mammal prey. Therefore, taken together, effects on marine mammal interactions under Alternative 5, Option 1, are expected to be minimal.

3.6.1.6 Suboption 1 and Option 2

Under Suboption 1 and Option 2, a temporary closure of the Corridor Area may result in greater effort within the stat areas excluded from the closed area. As these options increase the fleet's ability to continue to fish within statistical areas that it has historically fished), it is not expected that the interactions with marine mammals or competition for marine mammal prey would be measurably different from status quo.

The impacts on marine mammals under Alternative 5 may also depend on the extent to which, to avoid a closure, or in response to a closure, of the corridor area vessels increase the number of hauls needed to achieve the TAC, and/or increase the time spent traveling the fishing grounds. Prior to a closure, vessels may increase avoidance efforts, including by increasing the number of test tows. Increased hauls, whether to achieve the TAC or test for pollock aggregation and PSC presence, increases the risk of marine mammal interaction. After a closure, the retrospective analysis of Option 1 revealed that, at lower PSC limits, substantial pollock harvest could be displaced outside of the corridor area. For inshore CVs to still achieve the TAC, they may be required to travel further distances between deliveries. Greater vessel travel increases opportunities for marine mammal interactions in the form of vessel strikes. However, if fewer vessels participated due to the decreased viability for small or inefficient vessels (*i.e.*, more quota was consolidated onto fewer vessels as described in Section 4.3.5), the total amount of vessel traffic for the fishery may remain similar to status quo conditions. Furthermore, vessel strikes have not been documented in the pollock fishery. Therefore, in summary, no substantive change in impacts from these combinations of alternatives and options would be expected.

3.6.1.7 Option 3

Relative to Option 1 of Alternative 5, by releasing the fleet from the corridor-specific PSC limit in years of high abundance, Option 3 of Alternative 5 also creates greater flexibility for the fleet (primarily CPs and mothership CVs) to fish throughout its historic fishing grounds. As such, it is anticipated that if Option 3 was adopted as part of Alternative 5, it would result in direct and indirect effects on marine mammals would be minimal and more similar to the status quo.

3.6.1.8 Option 4

Although Option 4 involves a change in the start date of the Herring Savings Area, it is not anticipated to result in a material change in the volume of herring PSC (see Section 3.5.1). It may provide another area for pollock vessels to fish in the northwestern Bering Sea in years when it would have otherwise been closed as a result of reaching the limit. However, since this area has only been closed in one year from 2011-2023, this area being open in September largely reflects status quo conditions. Therefore, Option 4 would not likely change the status quo impacts on marine mammals by changing the direct or indirect impacts of herring availability as prey.

3.6.1.9 Combined Effects of Environmental Trends and Planned Actions on Marine Mammals

Past and present actions that have had effects on marine mammals populations include direct interactions (*e.g.*, commercial harvests, customary and traditional hunting, incidental takes in commercial fisheries through entanglement with gear during fishing and after abandonment) and indirect interactions (*e.g.*, trophic interactions affecting prey availability, physiological stressors affecting overall health) which may be driven by a variety of processes including ecosystem change, oil spills, and fishing gear avoidance.

Reasonably foreseeable environmental trends and planned actions in the area that may have a combined effect with the proposed actions include authorization and prosecution of the Bering Sea pollock fishery and ecosystem change, described at the beginning of Chapter 3. In addition, marine mammals may be affected by the following.

Fisheries Management Changes

Of the Federal fisheries operating in the BSAI, the sablefish and turbot fisheries are expected to change in future years. The sablefish fishery has been steadily changing the gear used, as boats have switched from hook-and-line gear to longline pot gear. The Bering Sea Greenland turbot hook-and-line fishery recently allowed the use of longline pot gear. While switching the turbot fishery from hook-and-line to longline pot gear is motivated by prolific whale depredation of baited hooks in the HAL Greenland turbot fishery, marine mammals are rarely taken in the fishery; from 2017 to 2021, no M/SI events were reported (Freed et al., 2023). Similarly, no marine mammal mortalities were reported under the sablefish hook-and-line fishery and one sperm whale mortality was observed under longline pot gear (2017–2021; Freed et al., 2023). *Reduced* marine mammal interactions with the sablefish and turbot fisheries are not expected to result in a noticeable decline in M/SI events because these fisheries already have very low take rates. Furthermore, these changes are less likely to affect species that remain close to shore as the sablefish and turbot fisheries occur offshore. Generally, as more fisheries change to pot gear it is expected that there will be a slight reduction in the number of marine mammals taken in fisheries as marine mammals interact less with pot gear than hook-and-line gear (NMFS, 2022).

Marine Debris

The most commonly observed interaction between marine mammals and marine debris is through entanglement, often from packing bands or in remnants of fishing gear that has been discarded or lost. Marine debris may also affect marine mammals through ingestion, but this is less commonly observed as without necropsy, this cannot be confirmed. While there are numerous marine debris cleanup efforts, the continued ubiquity of plastics means this threat is likely to persist in the future.

Alaska Native Subsistence Hunting

Section 119 of the MMPA allows NMFS and the US Fish and Wildlife Service to establish co-management agreements with Alaska Native Organizations (ANOs) and tribally authorized co-management bodies. Methods for determining harvest allocations are based on population viabilities and are not expected to change.

Vessel Traffic

Shipping routes through the Arctic could be accessible for longer periods of time, potentially remaining open through the winter season in some years. These opportunities for global shipping could lead to increased vessel traffic through the Bering Sea. Some marine mammals (*i.e.*, large whales) are more prone to vessel strike incidences than other marine mammal species, whereas others are more sensitive to noise, or the disturbance caused by passing vessels (*i.e.*, hauled out seals).

Ice Seal Critical Habitat

Section 4(b)(6)(C) of the ESA requires the Secretary to designate critical habitat concurrently with listing a species as threatened or endangered unless it is not determinable at that time. At the time of ESA listings for the arctic ringed seal stock and the Beringia DPS of bearded seal, NMFS announced intent to designate critical habitat in separate rulemakings, as the respective critical habitats were not then determinable. On May 2, 2022, NMFS issued a final rule to designate an area in the Bering, Chukchi, and Beaufort seas as critical habitat for both populations (87 FR 19180).⁸⁷

The impacts of these reasonably foreseeable environmental trends and planned actions combined with the potential impacts of the proposed actions relative to marine mammals were considered. Under the more

⁸⁷ On September 26, 2024, the U.S. District Court for the District of Alaska vacated the critical habitat designations for ringed seal and bearded seals under the ESA and remanded the rules to NMFS for further consideration (*State of Alaska v. Nat'l Marine Fisheries Serv.*, Case No. 3:23-cv-00032-SLG, 2024 WL 4298114 (D. Alaska Sept. 26, 2024)). NMFS and the Center for Biological Diversity separately appealed that decision. Since that time, NMFS moved to dismiss both appeals, and the Ninth Circuit has dismissed NMFS's. There may be further updates on the status of critical habitat designations for these two species by the time NMFS completes NEPA review for this proposed action.

constraining chum salmon PSC limits analyzed under Alternatives 2, 3 and 5, to avoid triggering a closure, the fleet may shift more effort later in the season and/or to different parts of the fishing grounds. In that event, there is potential for either an increase or decrease in marine mammal interactions. It is not expected that the proposed action along with identified related effects will cumulatively result in adverse effects on marine mammals. The Bering Sea pollock fishery will continue to be 100% observed or 100% electronically monitored and should any significant changes occur as a result of this action (although not expected), NMFS will be able to track, monitor, and respond. Therefore, this action, when considered with of the above actions, is not expected to have significant effects on marine mammal populations.

3.7 Seabirds

Alaska's waters support extremely large concentrations of seabirds. Over 80 million seabirds are estimated to occur in Alaska annually, including 40 million to 50 million individuals from the numerous species that breed in Alaska (Table 6-19; USFWS, 2009). An additional 40 million to 50 million individuals do not breed in Alaska but spend part of their life cycle there. These include short-tailed and sooty shearwaters and three albatross species: the black-footed albatross, the Laysan albatross, and the endangered short-tailed albatross (Table 6-19; USFWS, 2009). Some seabirds and their eggs provide important subsistence foods for Alaska Native communities, including those in coastal Western Alaska (AMBCC, 2024).

Seabird life history includes low reproductive rates, low adult mortality rates, long life span, and delayed sexual maturity. These traits make seabird populations extremely sensitive to changes in adult survival and less sensitive to fluctuations in reproductive effort. The problem with attributing population changes to specific impacts is that, because seabirds are long-lived animals, it may take years or decades before relatively small changes in survival rates result in observable impacts on the breeding population (Eich et al., 2016).

Seabirds may be vulnerable to ecosystem variability. Unobserved mortality events (UME) following marine heat waves have occurred since 2015, which include:

- 2015: approximately 4,000,000 common murres in Gulf of Alaska; the 2014–2016 marine heat wave drove anomalous ocean conditions and ecosystem-level impacts on forage fish (Renner et al, 2024).
- 2019: 10,000 short-tailed shearwaters washed ashore in southeastern Bering Sea. Starvation appears to be the proximate cause of mortality (Kaler & Kuntz. 2022).

Additional UMEs may have occurred since 2015, but are still being assessed. UMEs are of concern for coastal communities that rely on ocean resources for their nutritional, cultural, and economic well-being and can also signal issues with the state of subarctic and Arctic oceans (Kaler & Kuntz, 2022).

Seabirds are indicators of secondary productivity and shifts in prey availability that may similarly affect commercial fish populations. Trends in seabird reproductive success were mixed on the Pribilof Islands in 2023, with higher reproductive success for both fish-eating and plankton-eating species on St. George Island than on St. Paul Island. Species that experienced recent population losses (least auklets and common murres) do not appear to be rebounding to historic numbers. On St. Paul Island common and thick-billed murres had very low egg abundance early in the season, therefore no subsistence harvest took place in 2023. Community observations throughout the summer reported eventually seeing “a lot” of murre eggs, though murres seemed to experience nest failure later in the summer. Overall, reproductive success was mixed across species, but generally higher for species on St. George Island. This may indicate differences in local availability of zooplankton and small schooling forage fish in feeding areas utilized by seabirds of each island. No major seabird die-off events were observed in 2023 (Siddon et al., 2023).

3.7.1 Effects of the Alternatives on Seabirds

Table 3-74 Summary of the effects of the on seabirds

Alternative	Management Measure	Impacts to Seabirds
Alternative 1	Status quo	Reported mortalities by gear and wire interactions in the Bering Sea pollock fishery are small. Indirect effects (<i>e.g.</i> , prey reduction or prey habitat disturbance) are not measurable.
Alternative 2	Overall bycatch (PSC) limit for chum salmon	An early closure of the season that results in less fishing effort throughout the season would likely decrease gear entanglement and wire collisions and thus have a beneficial effect. PSC limits that result in substantial physical or temporal shifts in fishing effort may result in an increase or decrease in gear entanglement and wire collisions. Given the relatively small amount of reported mortalities resulting from gear entanglement, any resulting increase in mortalities relative to the status quo is likely to be small.
Alternative 3	Chum salmon PSC limit with an associated Western Alaska chum salmon bycatch annual limit	Adverse effects of Alternative 3 are expected to be similar to those from Alternative 2 (see above).
Alternative 4	Additional regulatory requirements for Incentive Plan Agreements (IPAs) to be managed within the IPAs	No change in effects relative to the status quo.
Alternative 5	Corridor that would close through August 31 if associated caps are reached	Constraining caps that result in substantial shifts in the location of effort on the fishing grounds may result in an increase or decrease in the number of interactions with seabirds. Information is unavailable to predict the magnitude or directional change of this possible effect.

This proposed action involves management of and analysis of direct and indirect effects on seabird bycatch in the Bering Sea pollock fishery, which used pelagic trawl gear. Any changes to the Bering Sea pollock fishery could change the status quo potential for direct take (mortality) of seabirds. However, prey availability changes could also be closely associated with changes in seabird take levels. In other words, if seabirds taken in Bering Sea pollock fishery decrease year over year, greater prey may be available, and the opposite would also be true. Therefore, for the purpose of this analysis, all indirect effects on seabirds will be addressed by focusing the analysis on potential changes in seabird takes (direct effects).

3.7.1.1 Alternative 1

Direct Effects: Gear and Vessel Interactions

Direct effects may include incidental take (lethal) in fishing gear and vessel strikes. Seabirds can interact with trawl fishing vessels in several ways. Birds foraging at the water surface or in the water column are sometimes caught in the trawl net as it is brought back on board. In addition to getting caught in the fishing nets of trawl vessels, some species strike cables attached to the infrastructure of vessels or collide with the infrastructure itself. Indirect takes may occur if seabirds ingest and become entangled in marine plastics, become oiled during oil spills caused by marine accidents, or their colonies are predated by invasive mammals introduced by accident (the Norway rat is a particular concern) (NMFS, 2007).

Implementation of a restructured observer program in 2013 has allowed for the collection of data on incidental takes (NMFS 2015). All seabird take values included in this section are reported as estimates

and are not actual numbers of seabirds. For a detailed explanation of seabird bycatch estimation procedures please refer to Seabird Bycatch Estimates for Alaskan Groundfish Fisheries (NMFS, 2020).

The average annual estimate of incidental take of seabirds by the Bering Sea pollock fishery was 115 birds per year from 2011 through 2023 (NMFS, 2024a). Northern fulmars comprised the majority of this take, with shearwaters, kittiwakes, and murre also occurring slightly more frequently than other species. With the exception of Northern Fulmars, which had an annual average bycatch of 101 animals, the annual average bycatch of all other seabird species was 5 individuals or fewer. Observers have recorded no short-tailed albatross or black-footed albatross takes in BSAI trawl gear but have observed Laysan albatross mortalities. In 2018, 80 Laysan albatross were recorded in the BSAI trawl fisheries, but none were recorded in the Bering Sea pollock fishery (NMFS, 2021).

The seabird bycatch estimates for trawl gear do not account for mortality by net entanglements or cable strikes. Trawl-cable strikes are most likely to result in mortalities of large-winged birds such as albatrosses. Seabird mortality from interactions with gear may exceed those measured in the standard observer sampling (Melvin et al., 2011). The probability of seabird collisions with third wires or other trawl vessel gear in the EEZ off Alaska cannot be assessed. Staff are currently using the vessel collision information component of observer notes to summarize interactions by species, regions, and other factors (NMFS, 2024a).

Table 3-75 Estimated seabird bycatch in the BSAI pollock trawl fishery based on observer standard species composition sampling, 2011–2023

Species/ Species Group	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total	Annual avg.
Laysan Albatross	0	0	0	0	0	0	0	0	3	8	0	0	0	11	1
Short-tailed Albatross	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-footed Albatross	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Fulmar	214	90	123	51	112	84	109	41	105	96	103	128	56	1,185	101
Shearwaters	3	12	1	3	6	9	0	0	11	1	7	12	3	68	5
Gull	1	0	3	0	0	3	0	0	0	0	0	0	0	7	1
Kittiwake	0	0	0	0	0	0	0	0	13	3	7	0	3	26	2
Murre	14	0	3	3	0	6	1	0	0	0	0	0	0	27	2
Auklets	0	0	4	0	0	0	0	0	0	0	0	4	0	8	1
Other Alcid	0	0	0	0	0	0	0	0	6	0	0	0	0	6	1
Cormorant	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0
Storm Petrels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Birds	0	0	0	0	6	6	0	0	3	0	0	0	3	18	1
Total	232	102	134	57	127	108	110	41	141	108	117	144	65	1,359	115

Source: NMFS catch accounting system

Notes: Does not include mortalities caused by cable strikes.

Indirect Effects: Disturbing Prey Availability

Under the status quo, indirect effects of the Bering Sea pollock fishery on seabirds may include reductions in prey (seabird prey, such as forage fish, caught in nets) abundance and availability, discharge of processing waste and offal, contamination by oil spills, presence of nest predators on islands, and disposal of plastics, which may be ingested by seabirds (NMFS, 2007). It can also disturb the benthic habitat of seabird prey species, such as clams, benthic fish, and crab.

Trawl fisheries may reduce, or disperse, the biomass of prey species available to seabird populations. Vessel activity may also displace or interfere with normal seabird foraging. This may be a particular concern when both birds and vessels are attracted by particular “hot spots” such as sites of upwelling, fronts, and shelf breaks. Detailed conclusions or predictions cannot be made regarding the effects of forage fish bycatch on seabird populations or colonies. Due to little or no overlap between the fisheries and foraging seabirds, based on either prey size, dispersed foraging locations, or different prey, the potential impact of the entire groundfish fisheries on seabird prey availability was limited (NMFS, 2007). Vessels may also create seabird feeding opportunities by the discard of fish or fish processing wastes (offal) (NMFS, 2007; Bicknell et al., 2013).

Table 3-76 Seabirds in the Bering Sea: foraging habitats and common prey species

Species	Foraging habitats	Prey
Short-tailed albatross	Surface seize and scavenge	Squid, shrimp, fish, fish eggs
Black-footed albatross	Surface dip, scavenge	Fish eggs, fish, squid, crustaceans, fish waste
Laysan albatross	Surface dip	Fish, squid, fish eggs and waste
Spectacled eider	Diving	Mollusks and crustaceans
Steller's eider	Diving	Mollusks and crustaceans
Black-legged kittiwake	Dip, surface seize, plunge dive	Fish, marine invertebrates
Murrelet (Kittlitz's and marbled)	Surface dives	Fish, invertebrates, macroplankton
Shearwater spp.	Surface dives	Crustaceans, fish, squid
Northern fulmar	Surface fish feeder	Fish, squid, crustaceans
Murres spp.	Diving fish-feeders offshore	Fish, crustaceans, invertebrates
Cormorants spp.	Diving fish-feeders nearshore	Bottom fish, crab, shrimp
Gull spp.	Surface fish feeder	Fish, marine invertebrates, birds
Auklet spp.	Surface dives	Crustaceans, fish, jellyfish
Tern spp.	Plunge, dive	Fish, invertebrates, insects
Petrel spp.	Hover, surface dip	Zooplankton, crustaceans, fish
Jaeger spp.	Hover and pounce	Birds, eggs, fish
Puffin spp.	Surface dives	Fish, squid, other invertebrates

Source: Dragoo et al., 2020; NMFS 2022.

Most of the pollock fishery's bycatch of forage fish is smelt, for which there is a ban on directed fishing. The pollock fishery also catches Pacific herring, a species that some seabirds feed on and for which there is a PSC limit set at 1% of the herring spawning stock biomass that prevents substantive reductions in herring biomass. Therefore, it is unlikely that the pollock fishery's limited catch of forage fish relative to abundance would appreciably impact forage fish abundance or the availability of prey to seabirds.

Effects of BSAI Groundfish Fisheries on ESA-listed Seabirds

The impact of Alaska's groundfish fisheries (Federal and state), including the BSAI pollock fishery, on ESA-listed seabirds was analyzed in a 2021 USFWS biological opinion (NMFS, 2021). Three species of seabirds are currently listed as either threatened or endangered; the short-tailed albatross *Phoebastria albatrus* (endangered), Alaska-breeding population of Steller's eider *Polysticta stelleri* (threatened), and Spectacled eider *Somateria fischeri* (threatened). Two other populations of Steller's eider occur in waters off Alaska, but only the Alaska-breeding population is listed under the ESA.

Table 3-77 Seabirds that NMFS monitors for interactions with the BSAI pollock fishery and their status

Type	Common Name	ESA Status	Type	Common Name	ESA Status
Albatross	Black-footed	Not Listed	Guillemot	Black*	Not Listed
	Short-tailed	Endangered		Pigeon*	Not Listed
	Laysan	Not Listed	Eider	Common	Not Listed
Fulmar	Northern fulmar*	Not Listed		King	Not Listed
Shearwater	Short-tailed	Not Listed		Spectacled	Threatened
	Sooty	Not Listed		Steller's	Threatened
Storm petrel	Leach's	Not Listed	Murrelet	Marbled	Not Listed
	Fork-tailed	Not Listed		Kittlitz's	Not Listed
	Pelagic	Not Listed		Ancient	Not Listed
Cormorants	Red-faced	Not Listed	Kittiwake	Black-legged*	Not Listed
	Double-crested	Not Listed		Red-legged*	Not Listed
Gull	Glaucous-winged*	Not Listed	Auklet	Cassin's*	Not Listed
	Glaucous*	Not Listed		Parakeet*	Not Listed
	Herring*	Not Listed		Least*	Not Listed
	Short-billed(Mew)*	Not Listed		Whiskered*	Not Listed
	Bonaparte's*	Not Listed		Crested*	Not Listed
	Slaty-backed*	Not Listed	Tern	Arctic*	Not Listed
Murre	Common*	Not Listed	Puffin	Horned*	Not Listed
	Thick-billed*	Not Listed		Tufted*	Not Listed
Jaeger	Long-tailed*	Not Listed			
	Parasitic*	Not Listed			
	Pomarine*	Not Listed			

The USFWS consulted with NOAA Fisheries Alaska Region under Section 7 of the ESA on the effects of the groundfish fisheries on these species. In its 2021 ESA Biological Opinion, USFWS determined the groundfish fisheries off Alaska are likely to adversely affect short-tailed albatross, Spectacled eider, and the Alaska-breeding population of Steller's eider, but they are not likely to jeopardize their continued existence (USFWS, 2021). It was also determined that the groundfish fisheries off Alaska are not likely to adversely affect designated critical habitat of the Alaska-breeding population of Steller's eider and Spectacled eider. USFWS provides the following incidental total take in the BSAI groundfish fisheries for short-tailed albatross, Spectacled eider, and threatened Alaska-breeding population of Steller's eider:

- The reported take should not exceed six albatrosses in a floating 2-year period.
- The reported take should not exceed 25 Spectacled eiders in a floating 4-year period.
- The reported take should not exceed three Steller's eiders in a floating 4-year period.

If any of these takes were exceeded, NMFS is required to contact USFWS and reinitiate formal consultation.

Managing the Bering Sea pollock B season at status quo under Alternative 1 would not be expected to have any change in the minimal impacts of the pollock trawl fishery on seabirds in the action area. The BSAI pollock fishery's estimated total seabird bycatch was 1,359 animals over 13 years with an annual average of 115 seabirds from 2011–2023 (Table 3-75). These seabird take estimates are small in comparison to Bering Sea seabird population estimates which range in millions of birds (Suryan et al.

2016). Observers have not recorded takes of ESA-listed seabirds in the Bering Sea pollock fishery in the analyzed period. Under the status quo alternative, it is reasonable to conclude that the impacts would continue to be similar. Effects on seabirds under Alternative 1 are therefore not expected to increase or decrease outside of recently observed ranges. However, observers are not able to monitor all seabird mortality associated with trawl vessels.

3.7.1.2 Alternative 2 or 3

PSC limits for Alternatives 2 and 3 may result in no change to the status quo or may change fishing patterns to avoid chum salmon PSC. This could result in reduced fishing effort, changes in fishing patterns, or seasonal changes in the timing of the fishing to increase chum salmon avoidance to reduce the risk of reaching the PSC limit and triggering a fishery closure. Alternatively, higher fishing effort may occur if vessels fish areas with less productivity in order to avoid bycatch. If a groundfish fishery reduces fishing effort in specific fisheries to conserve chum salmon PSC, then the incidental take of seabirds may decrease. If a groundfish fishery increases the duration of fishing in areas with lower concentrations of chum salmon, there may be more potential for seabird incidental take, compared to the status quo, if this increased fishing activity overlaps temporally and geographically with areas used by seabirds. Conversely, if there is increased fishing effort in lower productivity areas as a result of this action, there may also be fewer seabirds present, and the rate of seabird interactions could decrease.

Shifts in the location or timing of fishing may occur as a result of Alternative 2. However, there is already considerable interannual variability in the patterns of fishing across the Bering Sea groundfish sectors, as environmental conditions and avoidance of PSC species have caused vessels to adjust their fishing patterns. Any shift in fishing location or timing is unlikely to occur outside of the existing footprint of the groundfish fisheries. However, shifts in the existing footprint of the groundfish fisheries may change over time due to many factors such as ecosystem change, bycatch avoidance, and shifting fish distributions, making this difficult to assess.

As discussed above, seabird take estimates in the Bering Sea pollock fisheries are already small, compared to seabird population estimates, and are unlikely to increase to a level that would have a population-level effect on any individual seabird species. The possible exception to this is the incidental take of ESA-listed species of seabirds. But the take of ESA-listed seabird species in Bering Sea groundfish fisheries are the subject of incidental take statements in the 2021 Biological Opinion and, therefore, are already closely monitored. Specifically, observers have not recorded take of ESA-listed seabirds in the Bering Sea pollock fishery. Therefore, effects on seabird incidental takes under Alternatives 2 and 3 are expected to be largely consistent with the impacts of Alternative 1, and not expected to occur beyond the scope analyzed in previous ESA documents.

3.7.1.3 Alternative 4

Under Alternative 4, no significant geographic or temporal changes in fishing effort are expected. Therefore, if Alternative 4 were adopted, no changes to the status quo effects on seabirds would be expected.

3.7.1.4 Alternative 5

Similar to Alternatives 2 and 3, PSC limits associated with any of the Alternative 5 options may result in no change to the status quo (Alternative 1) or may change fishing patterns to avoid chum salmon PSC. This could result in changes in fishing locations or changes in the timing of fishing within the season. If a closure were to result in lower CPUE, then more tows could occur. Substantially increased tows may increase the risk of greater seabird bycatch. Although it is unknown how closure areas will spatially or temporarily shift the fleet, Suboption 1, Option 2, and Option 3 provide the fleet with greater flexibility to continue to fish within historic fishing grounds, which relative to Option 1 would likely result in seabird

bycatch more similar to status quo. Although Option 4 involves a change in the start date of the Herring Savings Area, it's not anticipated to result in a material change in the volume of herring PSC (see Section 3.5.1.4.5). Therefore, it would not likely change the status quo impacts on this prey species of some seabirds.

Due to fluctuations in seabird distributions, it is not possible to predict how a possible shift of fishing effort to later in the B season may impact the potential for incidental takes of seabirds. Based on low estimates of observed seabird mortalities, displaced fishing effort within the historical fishery footprint is unlikely to result in changes to the status quo effects on seabird populations. The proposed action does not change the regulated gear use in the fishery (*i.e.*, pelagic trawl) so the rate of take is expected to remain the same, but total take may be different depending on how the length of the fishing season (*i.e.*, fishing effort) is changed by this action in any given year. Due to a lack of information, analysts are unable to evaluate the effects of these alternatives on incidental takes by cable strikes.

There are two potential effects on ESA-listed seabird species of a significant shift of fishing effort occurs northward. Large numbers of short-tailed albatross have been observed on the northwestern Bering Sea shelf break, near the border with Russia (USFWS, 2021). The 2021 USFWS Biological Opinion contains a number of conservation recommendations for vessels operating in areas within which a short-tailed albatross is in the vicinity (USFWS, 2021). No short-tailed albatross interactions with the pollock fishery have been recorded over the last 13 years (Table 3-75).

Further, shifts of the fleet northward in response to a closure could increase the potential for interaction with the threatened Spectacled eider. Spectacled eider annually migrate from their summer range (generally north of 65° N, or near Norton Sound) to areas south of St. Lawrence Island in the fall to overwinter. There has been no recorded interaction between pollock trawl vessels and the Spectacled eider over the last 13 years (Table 3-75). However, in late summer/fall the eiders are very patchy in distribution. Most of the population may occur in less than 5% of the critical habitat area at any given time. Thus, when a flock is encountered it may be very large and any interaction could disproportionately affect large numbers (USFWS, 2021). The 2021 USFWS Biological Opinion contains a number of conservation recommendations for groundfish vessels operating in areas that are traversing in or near critical habitat of Spectacled eiders (USFWS, 2021). Historically, the critical habitat of Spectacled eiders and the pollock fishing grounds have had little to no overlap. Except for Alternative 5, Option 1, there are generally flexibilities to allow fishing in the corridor area or a subset of it (*i.e.*, historical and generally preferred fishing grounds) up to and after the potential closure period, so it is unlikely there would be a major northward shift if fishing effort that could substantially increase potential overlap with Spectacled eiders. Even under Alternative 5, Option 1, there is a strong incentive for most vessels to operate close to ports and processors in the Aleutian Islands to minimize travel time and costs to the extent possible, as discussed throughout Section 4.3. Therefore, impacts in excess of the status quo are not anticipated.

3.7.1.5 Combined Effects of Environmental Trends and Planned Actions on Seabirds

Past and present actions that have had effects on seabird populations include commercial harvests (*e.g.*, harvest of short-tail albatross colonies in Japan), incidental catch in fisheries operations, vessel strikes, subsistence harvest, changes in prey availability, ingestion of fish processing waste and discards, oil spills (*e.g.*, Exxon Valdez), and introduction of mammalian predators (*e.g.*, arctic fox and rats) and ingestible plastics (*e.g.*, pellets and fragments) into seabird habitat. In addition, since 2015, there have been multiple unusual mortality events of seabirds, the causes of which are uncertain, but may relate to changes in prey availability or biotoxins associated with warming waters (Kaler & Kuntz, 2022).

Reasonably foreseeable environmental trends and planned actions that may have a cumulative impact with the proposed actions include authorization and prosecution of the Bering Sea pollock fishery and ecosystem change, described at the beginning of Chapter 3. In addition, seabirds may be affected by

ecosystem-sensitive management, fisheries rationalization, traditional management tools, and private actions. Ecosystem-sensitive management, rationalization, and traditional management tools are likely to *increase protection* to seabirds by evaluating the potential effects of proposed actions to these species more in management decisions and by improving the management of fisheries through the restructured Observer Program, catch accounting, seabird avoidance measures, and vessel monitoring systems. Changes in the status of species listed under the ESA, the addition of new listed species or critical habitat, and results of future Section 7 consultations may require modifications to groundfish fishing practices to reduce the impacts of these fisheries on listed species and critical habitat. Additionally, since future BSAI groundfish TACs will be set with existing or enhanced protection measures, we expect that the effects of the fishery on the harvest of prey species and disturbance will not increase significantly in future years.

Actions by other Federal agencies, state agencies, and persons that may result in adverse or beneficial effects on seabirds include the following.

Marine Debris

Plastics are one type of marine debris known to impact seabirds across the Pacific Ocean (Hyrenbach et al., 2020; Padula et al. 2020; Rapp et al., 2017) and within Alaskan waters (Nevins et al., 2005; Padula et al., 2020). Seabirds consume plastics because birds often misidentify plastics as potential food sources. While there are numerous marine debris cleanup efforts, the continued worldwide use of plastics means that this threat will continue to seabird populations.

Pink Salmon as Competition for Sea Bird Prey

In years of great abundance, salmon may exploit prey resources more efficiently than their competitors. In odd years when pink salmon are most abundant due in large part to hatchery production, they can initiate cascading effects on the pelagic marine food web (Batten et al., 2018), which may negatively impact salmonids, forage fishes, whales and seabirds (Ruggerone et al., 2023). Least auklets consume greater amounts of copepod prey and tufted puffins eggs hatching timing shifts in odd years, when pink salmon are in greater abundance (Ruggerone et al., 2023). A biennial pattern in seabird reproductive success has been also attributed to a negative relationship with years of high pink salmon abundance (Springer and van Vliet, 2014) (NMFS 2023).

Pink salmon populations are widely distributed throughout epipelagic waters across the North Pacific Ocean and may be interacting with GOA and Bering Sea species. Overall abundance has increased since the 1970s, reaching unprecedented levels during 2005–2021. Approximately 82 million adult pink salmon annually originated from hatcheries between 2005–2021 (Ruggerone et al., 2023).

Docks, Harbors, Roads, and Bridge Construction

Docks, harbors, and other coastal construction projects are commonly permitted in the region and tend to occur along shorelines in sheltered bays which provide feeding habitat for marine birds. Many of these structures, such as docks and piers, often have a positive effect on seabirds as smaller bait fish tend to concentrate around the structure resulting in a higher foraging success. These activities tend not to occur near steep shoreline cliffs, which provide high-density areas for seabird nesting, thus, there are little to no expected effects on seabird nesting habitat. Overall, there is expected to be a negligible effect from these types of projects on seabird populations.

Mining Operations

Mining operations tend to occur in the headwater areas of rivers and streams. While these headwater areas provide habitat for some species of seabirds such as loons, ducks, and murrelets, marine birds using this area are at low densities and are expected to move to adjacent habitat; thus, there is expected to be no effect on marine birds from expanded mining operations in the eastern Bering Sea.

Subsistence Harvests

Direct mortality by subsistence harvest is likely to continue, but these harvests are tracked and considered in the assessment of seabirds. For more information on the co-management of subsistence harvest of seabirds by the Alaska Migratory Bird Co-Management Council, see www.alaskamigratorybirds.com.

Increased Marine Traffic

Increased marine traffic could affect short-tailed albatrosses, Spectacled eiders, and Steller's eiders through disturbance, collisions, and more significantly from accidental fuel spills. In the Chukchi and Beaufort Seas, decline in the extent of Arctic sea-ice in the summer and increase in the length of the ice-free season has prompted interest in shipping within and through Arctic waters via the Northwest Passage. Ships operating, or that could operate in the action area, include military vessels, pleasure craft, cruise ships, barges, scientific research vessels, and vessels related to oil, gas, or mineral development. Thousands of vessels transit the Great Circle Route through the Aleutian Islands each year and the level of use is expected to double in the next several decades. The risk of oil spills in the Bering and Chukchi Seas is also increasing. As sea-ice recedes due to increasing temperatures, the potential for increases in Arctic shipping continues to grow. (USFWS, 2021).

The potential for an additional adverse effect on seabird populations as a result of any of the alternatives, when considered with the effects of past and present actions and the reasonably foreseeable environmental trends and planned actions listed above, is low. From 2010 to 2019, of the seabird populations that breed in Alaska, only glaucous-winged gulls showed increasing population trends (6%), whereas 38% of species/species groups were stable, and 56% declined (Dragoo et al., 2020). Mass mortality events caused by the effects of ecosystem change on seabird prey may continue for some species. The likelihood and degree of spatial and temporal shifts in fishing effort in response to the proposed alternatives is unknown. However, it is unlikely that fishing effort would be uniformly redistributed into areas with different average seabird abundances or densities. In addition, the observer program will continue to monitor take of seabirds and any shifts in the number or location of take can be analyzed moving forward.

3.8 Habitat

Fishing operations may change the abundance or availability of certain habitat features used by managed fish species to spawn, breed, feed, or grow to maturity. These changes may reduce or alter the abundance, distribution, or productivity of species. The effects of fishing on habitat depend on the intensity of fishing, the distribution of fishing with different gears across habitats, and the sensitivity and recovery rates of specific habitat features.

A description of the Bering Sea habitat dynamics and a list of habitat protection and closures areas is provided below. Briefly, the Bering Sea is a high-latitude sea made up of the outer, middle, and inner shelf based on bathymetric contours. The benthic habitat is diverse though most of the seafloor is made up of sand and silt.

Description

The Bering Sea is a semi-enclosed, high-latitude sea. Three fronts, the outer shelf, mid-shelf, and inner shelf, follow along the 200-, 100-, and 50-m bathymetric contours, respectively (Stabeno et al., 2016). This creates four oceanographic domains: the deep water (more than 200 m), the outer shelf (200 to 100 m), the mid-shelf (100 to 50 m), and the inner shelf (less than 50 m). The Bering Sea broad continental shelf, making up 44 percent of the total 2.3 million sq. km area, is one of the most biologically productive areas of the world (NPFMC, 2024b). The eastern Bering Sea (EBS) contains approximately 300 species of fish, 150 species of crustaceans and mollusks, 50 species of seabirds, and 25 species of marine mammals (Livingston & Tjelmeland, 2000).

The large spatial scale and relatively flat bathymetry affect the current patterns across the EBS. The main sources of water flow from the North Pacific onto the EBS through Unimak Pass and onto the Bering Slope via canyons (Stabeno et al., 2016). There is net water transport eastward along the north of the Aleutian Island chain and a turn northward at the continental shelf break and at the eastern perimeter of Bristol Bay. Eventually, EBS water exits northward through the Bering Strait, or westward and south along the Russian coast, entering the western North Pacific via the Kamchatka Strait. A typical water transit time from Unimak Pass to Bering Strait is >13 months (Stabeno et al., 2016). The EBS encompasses a diverse variety of benthic (*i.e.*, on the seafloor) habitats. Much of the continental shelf is shallow, flat, and composed of soft, unconsolidated sediments (Smith and McConnaughey, 1999, Rooper et al., 2016). The sediments are a mixture of the major grades representing the full range of potential grain sizes of mud (subgrades clay and silt), sand, and gravel (see Appendix A, Table 1 and Figure 1, Salmon FMP). The EBS seafloor is primarily sand and silt, with sand predominating in waters less than 60 m depth. Overall, the portion of finer-grade sediments increases and average grain size decreases with increasing depth and distance from shore. The distribution of benthic sediment types in the EBS shelf is related to depth (see Appendix A, Figure 2, Salmon FMP).

Detailed habitat information can be found in Appendix A of the FMP for the Salmon Fisheries in the EEZ Off Alaska (Salmon FMP, NPFMC, 2024a) and Appendix D of the FMP for the Groundfish of the BSAI Management Area (BSAI Groundfish FMP, NPFMC, 2024b).

Essential Fish Habitat

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” (50 CFR 600.10) For the purpose of interpreting the definition of essential fish habitat: “waters” includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle.

In 2005, NMFS and the Council completed the EIS for EFH Identification and Conservation in Alaska (NMFS, 2005). The EFH EIS evaluated the long-term effects of fishing on benthic habitat features, as well as the likely consequences of those habitat changes for each managed stock, based on the best available scientific information. The EFH EIS also described the importance of benthic habitat to different groundfish species and the past and present effects of different types of fishing gear on EFH. The Council and NMFS updated the available habitat information, and their understanding of the impacts of fishing on habitat, through periodic 5-year reviews of the EFH components in the Council fishery management plans (NMFS, 2012, NMFS, 2024b).

The iterative 5-year review cycle supplemented the 2005 EIS with reviews in 2010, 2017, and 2023 (NMFS, 2012, Simpson et al., 2017, NPFMC, 2023). These 5-year reviews have not indicated findings different from those in the 2005 EFH EIS with respect to fishing effects on habitat, although new and more recent information has led to the refinement of EFH for a subset of Council-managed species. Maps and descriptions of EFH for groundfish species are available in the applicable FMPs. The updates from the 2023 EFH 5-year Review are summarized in the draft *Essential Fish Habitat 2023 5-year Review Summary Report* (NPFMC, 2023) and were implemented in the Salmon FMP and the BSAI Groundfish FMP, as well as three other North Pacific FMPs, with an EFH Omnibus amendment package (NMFS, 2024b).

The affected environment for this DEIS is identified as EFH for five species of Pacific salmon (NPFMC, 2024a), 26 species of BSAI groundfish (NPFMC, 2024b), five species of BSAI crabs (NPFMC, 2024d), and weathervane scallops (NPFMC, 2024e). The Pacific salmon species are Chinook, chum, coho, pink, and sockeye salmon. In alphabetical order, the BSAI groundfish species are Alaska plaice, Alaska skate,

Aleutian skate, arrowtooth flounder, Atka mackerel, Bering skate, blackspotted rockfish, Dover sole, dusky rockfish, flathead sole, Greenland turbot, Kamchatka flounder, mud skate, northern rock sole, northern rockfish, octopus, Pacific cod, Pacific ocean perch, rex sole, rougheye rockfish, sablefish, shortraker rockfish, shortspine thornyhead rockfish, southern rock sole, walleye pollock, and yellowfin sole. The BSAI crab species are blue king crab, golden king crab, red king crab, snow crab, and Tanner crab.

The EFH information levels for Pacific salmon species are Level 1, meaning general distribution data are available for some or all portions of the geographic range. Level 1 EFH information is available for all freshwater and marine life history stages of chum salmon: eggs, larvae, freshwater and estuarine juveniles, marine juveniles, immature and mature marine adults, and freshwater adults. Habitat associations are also included in EFH descriptions and include diet and prey, locations, bottom types, and oceanographic features. For example, maturing marine adult chum salmon diets include fish, squid, euphausiids, amphipods, copepods, and gelatinous zooplankton (NPFMC, 2024a). Additional detailed information and figures can be found in Appendix A of the Salmon FMP.

Habitat Protections and Closure Areas

The action area overlaps with several habitat protection and areas and other time/area closures for fisheries management.

Habitat Areas of Particular Concern (HAPCs)

HAPCs are specific sites within EFH that are of particular ecological importance to the long-term sustainability of managed species, are of a rare type, or are especially susceptible to degradation or development. HAPCs are meant to provide greater focus to conservation and management efforts and may require additional protection from adverse effects.⁸⁸

The action area has one identified HAPC: Skate Nursery Areas. In 2015, through amendment 104 of the BSAI Groundfish FMP, NMFS designated six areas of skate egg concentration as HAPC without any additional associated regulatory measures.⁸⁹ Per the final rule, these areas encompass approximately 82 square nautical miles of habitat, or less than 0.1% of the total area of the BSAI. The Council did not recommend regulations to limit fishing in the proposed HAPC because there was no evidence of adverse effects from fishing on skate populations within Skate Nursery Areas that would need to be addressed through regulation.

Gear, Time, and Area Restrictions

Habitat Conservation Areas in the BSAI regions have gear restrictions, as described in 50 CFR 679.22 (coordinates can be found in the BSAI Groundfish FMP). One, the Pribilof Island Habitat Conservation Area, is closed to all trawl gear and fishing with Pacific cod pot gear. The use of nonpelagic trawl gear in the directed fishery for pollock is prohibited (see 50 CFR 679.24(b)(4)). The Chum Salmon Savings Area and Red King Crab Savings Area (RKCSA) have gear-specific closures focusing on mitigating impacts to species. The Chum Salmon Savings Area is closed to directed pollock fishing with trawl gear from August 1 to August 31, with caveats (see Section 3.5 in the BSAI Groundfish FMP). Even when a Chum Salmon Savings Area is triggered, it only applies to vessels who choose not to participate in an IPA and has not applied in recent years (see Section 2.2). The RKCSA is closed to nonpelagic trawl fishing year-round. There is also the Nearshore Bristol Bay Trawl Closure Area which is closed to all trawling year round, with a small subarea open seasonally.

⁸⁸ A description of the HAPC Process is available on the Council's webpage - https://www.npfmc.org/wp-content/uploads/hapc_process092010.pdf.

⁸⁹ Amendment 104 to the BSAI Groundfish FMP can be found at <https://www.fisheries.noaa.gov/action/amendment-104-fmp-groundfish-bering-sea-and-aleutian-islands-management-area>.

3.8.1 Effects of the Alternatives on Habitat

The direct effects of the alternatives described below are the estimated benthic habitat disturbance under the fishing effects model (Zaleski et al., 2024). Therefore, for each alternative, the analyst evaluated for a new estimate of the amount of benthic habitat disturbance using the fishing effects model. Because such information is unavailable, a qualitative description of how the alternative may result in changes to benthic disturbance relative to the status quo is provided.

Table 3-78 Summary of the effects on essential fish habitat

Alternative	Management Measure	Impact on EFH in the Bering Sea
Alternative 1	Status quo	No changes to the current effects of the pollock trawl fishery on benthic habitat in the Bering Sea would be expected. Prosecuted under status quo, the impacts of the pollock fishery on EFH are estimated to be minimal and temporary
Alternative 2	Overall bycatch (PSC) limit for chum salmon	Effects are dependent on the type of change, if any, to fishing activity in response to exceeding PSC limits. Shorter fishing seasons can reduce the estimated habitat disturbance from fishing gear bottom contact. Increased fishing in different areas due to spatial shifts can increase the estimated benthic habitat disturbance from fishing gear.
Alternative 3	Chum salmon PSC limit with an associated Western Alaska chum salmon bycatch annual limit	Similar to Alternative 2.
Alternative 4	Regulatory requirement to added up to six additional chum salmon bycatch provisions in Incentive Plan Agreements (IPAs) to further prioritize WAK salmon bycatch reduction	No changes to the effects relative to the status quo would be expected since they align with current operational strategies.
Alternative 5	Corridor that would close through August 31 if associated caps are reached.	A qualitative assessment of changes in habitat disturbance from fishing gear assumes similar estimates of bottom contact would occur if fishing effort shifted spatially but not temporally in response to corridor closures. Similar to Alternatives 2 and 3, if an Alternative 5 option results in increases to the duration of fishing, that would increase estimates of bottom contact. The shift in fishing effort may have different impacts quantitatively to EFH designated for different species, but without projected vessel tracks, we are unable to do that assessment.

3.8.1.1 Alternative 1

Managing the Bering Sea pollock B season at *status quo* would not be expected to have any change in the fisheries effects on benthic habitat in the action area. Effects on EFH under Alternative 1 are outlined below under the current management strategy.

Effects of the Bering Sea pollock fishery on EFH

Fishing gear can impact habitat used by a fish species for the processes of spawning, breeding, feeding, or growth to maturity. The EFH regulations base the evaluation of the adverse effects of fishing regulated under FMPs on EFH on a ‘more than minimal and not temporary’ standard (see 50 CFR 600.815(a)(2)(ii)). The effects of fishing on habitat depend on the intensity of fishing, the distribution of fishing with different gears across habitats, and the sensitivity and recovery rates of specific habitat features.

During the 2023 EFH 5-year Review, analysts used the fishing effects model to estimate habitat disturbance from bottom contact by fishing gear used in Federally managed fisheries (Zaleski et al.,

2024). These estimates represent the impacts from fishing under status quo management. Gear parameters were included in the fishing effects model to incorporate the nominal width and bottom contact adjustments for different gear types (Appendix 2, Zaleski et al., 2024). Model results representing the estimated disturbance of species core EFH areas were provided to groundfish and crab stock assessment authors for all FMP species in the BSAI Groundfish FMP, the GOA Groundfish FMP (NPFMC, 2024c), and the BSAI Crab FMP (NPFMC, 2024d) to compare with life history parameters. None of the stock assessment authors concluded that fishing effects on their species were more than minimal and not temporary, and therefore no author recommended elevating their species to the plan teams and the SSC for possible mitigation to reduce fishing effects to EFH. None of the stock assessment authors recommended any change in management with regards to fishing within EFH at the time of the fishing effects evaluation. The Council reviewed these results in February 2023 and approved updating the FMPs with this information, along with the entire omnibus amendment package, in December 2023⁹⁰ (Zaleski et al., 2024).

For some stocks, including EBS red king crab, snow crab, and Tanner crab, SAs flagged insufficient information to make a quantitative assessment on fishing effects. The SSC reviewed the evaluations and did not find that the available information indicated fishing effects on the EFH for these crab species were more than minimal and not temporary.⁹¹

A time series of estimated habitat disturbance from fishing gear was developed from 2003, when widespread VMS data became available, through August 2022. A brief discussion of the use of this time series as an ecosystem indicator can be found in the 2023 EBS Ecosystem Status Report (Siddon 2023). In brief, the southern Bering Sea experienced the highest estimated percentages of habitat disturbance compared to the northern Bering Sea, Aleutian Island, and GOA regions, however the time series showed a decline in disturbance from 2003 (Figure 115 in Siddon et al., 2023). This decline could represent gear modifications, shifts in gear types, and/or changes in effort.

The effects of the gear from Federally managed fisheries on salmon EFH were not evaluated during the 2023 EFH 5-year Review. However, during the 2017 EFH 5-year Review, the Council had concluded that the effects of fishing on EFH in a holistic manner did not meet the threshold of more than minimal and not temporary based on the analysis with the fishing effects model, and that conclusion was applied to the EFH for the marine life history stages of salmon species. They also concluded the effects of fisheries on freshwater spawning EFH of salmon are considered minimal and temporary in nature given minimal effort (except recreational and subsistence fisheries) in freshwater spawning and rearing areas (Appendix A, Salmon FMP).

In sum, under the status quo, the impacts of the pelagic trawl gear used by the Bering Sea pollock fishery on EFH is expected to continue to be the same or similar minimal degree currently estimated. We note that the fishing effects evaluation described above is a comprehensive analysis looking at impacts of all gear types, not only pelagic trawl gear, and that enables cumulative impacts from multiple fishing events in the same area to be considered. (Because of the combination of gear types, it is not a direct comparison to impacts from pelagic trawl fishing alone.) Nevertheless, a time series of estimates of disturbance, from all gear types combined, in the EBS showed a declining trend from about 2009–2022 (Figure 115 in Siddon et al., 2023) and if this downward trajectory of gear impacts on benthic habitat continues, it could imply that estimates of overall disturbance would decrease or maintain minimal effects over time.

Fishery-Prey Interactions

Fisheries can have direct impacts on populations, through both the removal of commercially targeted and bycatch species. Commercial fisheries bycatch includes salmon species, and some prey species targeted by salmon in later, marine life history stages including squid, capelin, and herring. Prey species are

⁹⁰ December 2023 Council motion on C5 EFH FMP Amendments, available at archived agenda for December 2023 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3019>), agenda item C5.

⁹¹ See 2022 Evaluation of Fishing Effects report, Section 4.2 (Zaleski et al., 2024).

considered an EFH component and an adverse impact to prey species is an adverse impact to EFH. However, the catch of these prey species is relatively small compared to their overall population sizes (see Fisheries Catch and Landings reports for Forage Fish, Grenadier, and Squid).⁹²

3.8.1.2 Alternative 2 or 3

PSC limits for Alternatives 2 and 3 may result in no change to the location or timing of fishing patterns to avoid chum salmon PSC or may result in the closure of the pollock fishery if the PSC limit is reached. Greater fishing effort may occur if vessels fish areas with less productivity in order to avoid bycatch, and higher or lower encounters with other PSC species (*e.g.*, Chinook) may occur if vessels move to areas with higher or lower abundance of nontarget species.

If the pollock fishery reduces fishing effort to conserve chum salmon PSC, the estimated minimal impacts to benthic habitat from gear contact under the fishing effects model would be expected to stay the same or decrease. However, if the pollock fishery increases the duration of fishing in areas with lower concentrations of chum salmon, the impacts to habitat would be expected to increase due to greater overlapping instances of bottom contact, though the susceptibility and recovery rates of the geological and biological habitat features influence the overall estimates of disturbance (see Appendix 3 in Zaleski et al., 2024).

Shifts in the location or timing of fishing may also occur as a result of Alternatives 2 and 3. However, there is already considerable interannual variability in the patterns of fishing across the BSAI groundfish sectors, as environmental conditions and avoidance of PSC species have caused vessels to adjust their fishing patterns. Any changes in fishing areas as a result of these alternatives is expected to remain within the existing footprint of the fishery. However, any shifts in fishing location or timing outside of the existing footprint are further analyzed below in Alternative 5 (Section 3.8.1.4). Similar to the status quo, Alternative 1, shifts in the existing footprint of the groundfish fisheries may change over time due to many factors such as ecosystem change, bycatch avoidance, and shifting fish distributions, making this difficult to assess. Therefore, effects on EFH under Alternatives 2 and 3 are expected to be minimal and temporary in nature.

Alternatives 2 and 3 may change the interactions of fisheries with salmon prey species. Similar to the anticipated changes in estimates of habitat disturbance, longer fishing seasons may result in more prey species removals while shorter seasons may lead to less interactions. This is dependent on where fishing effort may shift in order to avoid chum salmon bycatch and is difficult to predict. Nevertheless, the rate of bycatch in the pollock fishery is relatively small and not likely to be the source of an adverse impact to the prey component of salmon EFH.

3.8.1.3 Alternative 4

Managing the Bering Sea pollock B season with additional regulatory requirements for IPAs would not be expected to have any change in the estimated effects of pollock trawl gear on benthic habitat since they largely align with current operational strategies. The amount of estimated contact would stay the same as status quo (Alternative 1), being minimal and temporary in nature and interactions with salmon prey species is expected to be the same.

3.8.1.4 Alternative 5

If, in response to the adoption of any of the options under Alternative 5, the fleet changes fishing effort by effort length or shifting locations, that could impact habitat disturbance. Below we broadly discuss impacts to habitat if fishing effort increases (either through longer fishing trips or longer hauls), if fishing effort timing stays the same, and/or if fishing locations shift. Expected fleet behavioral changes are

⁹² Available at <https://www.fisheries.noaa.gov/alaska/commercial-fishing/fisheries-catch-and-landings-reports-alaska>

included in the analysis of chum salmon impacts (Section 3.3.4.6). We also summarize potential impacts of these changes in fishing activity on EBS crab EFH areas. The changes in habitat disturbance differ for some of the crab species, with possible increased disturbance to blue king crab and snow crab EFH, decreased disturbance to red king crab EFH, or no net difference to Tanner crab EFH.

Implementing corridor caps and closures under Alternative 5 may result in a change in fishing effort of location and timing. Greater fishing effort could result outside the proposed corridors. The Alternative 5 Fleet Movement Model uses areas where fishing effort historically occurred outside of the proposed corridors. If, in response to a corridor closure, vessels move solely to those historic locations, benthic disturbance in those areas may increase while benthic disturbance in the corridors would decrease. Under Option 1, vessels may move northwest outside the corridor or choose to stand down (see Section 3.3.4.6). Moving northwest would shift the estimates of bottom contact but not necessarily increase the estimates of overall area contacted. A stand down would reduce fishing impacts for the period of no fishing. Pre-closure under Option 1, the inshore sector may slow the pace of fishing. If the duration of fishing increases, that would increase the estimates of bottom contact under the fishing effects model similar to the effects of Alternatives 2 and 3. Again, the susceptibility and recovery rates of the geological and biological habitat features influence the overall estimates of disturbance (Zaleski et al. 2024). Without projected vessel tracks, it was not possible to run the fishing effects model to quantitatively analyze impacts on EFH; nonetheless, effects on EFH from prosecuting the pollock fishery under Alternative 5 are expected to be similar to the effects of fishing under the status quo, or greater if fishing effort increases.

Although a quantitative analysis was not feasible, we qualitatively assessed whether adoption of Alternative 5 would result in any changes in impacts to EBS crab species EFH. First, we overlaid the 40 stat areas from Option 1 on species distribution model (SDM) maps for crab summer distributions (Laman et al., 2022, NPFMC, 2024d). We then examined where closures in the combined clusters 1 and 2 (Option 1) and the smaller 75% area (Suboption 1) will change fishing effort. Finally, we evaluated how the changes in fishing effort may overlap with identified crab EFH. A closure area made up of a portion of the 40 stat areas, either in Option 1, Suboption 1, or Option 2, is expected to have similar impacts and draw the same basic conclusions, though we note that the area of Option 2 will depend on which areas are selected in the IPAs.

The SDM maps show modeled EFH for each species. The definition of EFH area in Alaska is the area containing 95% of the occupied habitat (NMFS 2005). In the most recent update to EFH maps for crab and groundfish species, four areas were identified containing 95%, 75%, 50%, and 25% of occupied habitat. As they decrease, each of the lower quantiles describes a more focused partition of the total EFH area. The area containing the upper 75% of occupied habitat is referred to as the “principal EFH area”. The top 50% of occupied habitat is referred to as the “core EFH area”, and that is the area that is the subject of the fishing effects evaluation (Zaleski et al., 2024). The top 25% of occupied habitat is referred to as “EFH hot spots” (Laman et al., 2022).

Again, under status quo, it is estimated that the benthic habitat disturbance from the pelagic trawl fishery is minimal and temporary. The following is an evaluation of how changes of fishing activity overlap with crab EFH with corridor closures when a PSC apportionment is exceeded under Alternative 5.

Blue King Crab EFH

The 40 stat areas of the Option 1 corridor largely do not overlap with the EBS blue king crab EFH (Figure 3-56 A). The main blue king crab EFH area that would experience a reduction in potential fishing effects from a closure of the Option 1 corridor is the portion that overlaps with the upper north corner of the corridor. A closure under Option 1 may shift fishing effort northward toward an area with more blue king crab core and principal EFH. This might cause a minimal increase in estimates of habitat disturbance for EBS blue king crab.

A closure under Option 1, Suboption 1 would similarly not overlap blue king crab EFH, so there would likely be no reduction in blue king crab habitat disturbance under either option. Depending on where effort shifts, it could increase estimates of habitat disturbance to blue king crab EFH.

Red King Crab EFH

All proposed corridors partially overlap the red king crab core EFH area, with eight of the easternmost stat areas overlapping red king crab EFH hot spots (Figure 3-56 B). If fishing effort shifts outside of the proposed corridors, estimates of disturbance to red king crab EFH would likely decrease. The majority of the red king crab hotspot area in or near Bristol Bay is outside of the combined corridors, but that area is also largely protected by the Nearshore Bristol Bay Trawl Closure area (NPFMC, 2024d).

Snow Crab EFH

Snow crab EFH hotspots and core EFH areas are mostly located in the northern part of the EBS and roughly track with the historic extent of the cold pool over the EBS shelf (Laman et al., 2022). The closure area under Option 1 overlaps with the southern range of snow crab EFH, including portions of snow crab principal EFH (Figure 3-56 C). Under Option 1, if vessels move north to patches of snow crab core EFH area, increased estimates of snow crab habitat disturbance could be expected, though movement farther north to snow crab EFH hot spots is not likely.

In contrast, under Option 1, Suboption 1 vessels could still fish within stat areas overlapping principal snow crab EFH areas. That could result in less of a shift towards the EFH hotspots modeled northwest of the corridors.

Tanner Crab EFH

Much of the EBS Tanner crab EFH hotspots in the southern EBS overlap the Option 1 corridor area (Figure 3-56 D). Under Option 1, depending on the direction of its shift, fishing effort could still overlap the band of Tanner crab EFH hotspots (yellow band, Figure 3-56 D) that track the outer shelf towards Pervenets Canyon (Laman et al., 2022). As a result, Option 1 may result in no net change in estimates of Tanner crab habitat disturbance. There is a possibility that, on a small scale, areas with concentrated effort of fishing events would have less time for benthic habitat features to recover from disturbance, so cumulative impacts may be greater in those locations.

Under Option 1, Suboption 1, the proposed corridor, although smaller than under Option 1, still overlaps with a large portion of the Tanner crab EFH hotspots in the southern Bering Sea. However, under Suboption 1, a larger area of Tanner crab EFH hotspots would remain open to fishing activity year round due to the exclusion from the corridor of ADF&G statistical areas 675630, 675700, 685630, and 685700. If, during a Suboption 1 corridor closure, fishing effort were to remain in those stat areas, there may be no net change in estimates to Tanner crab habitat disturbance.

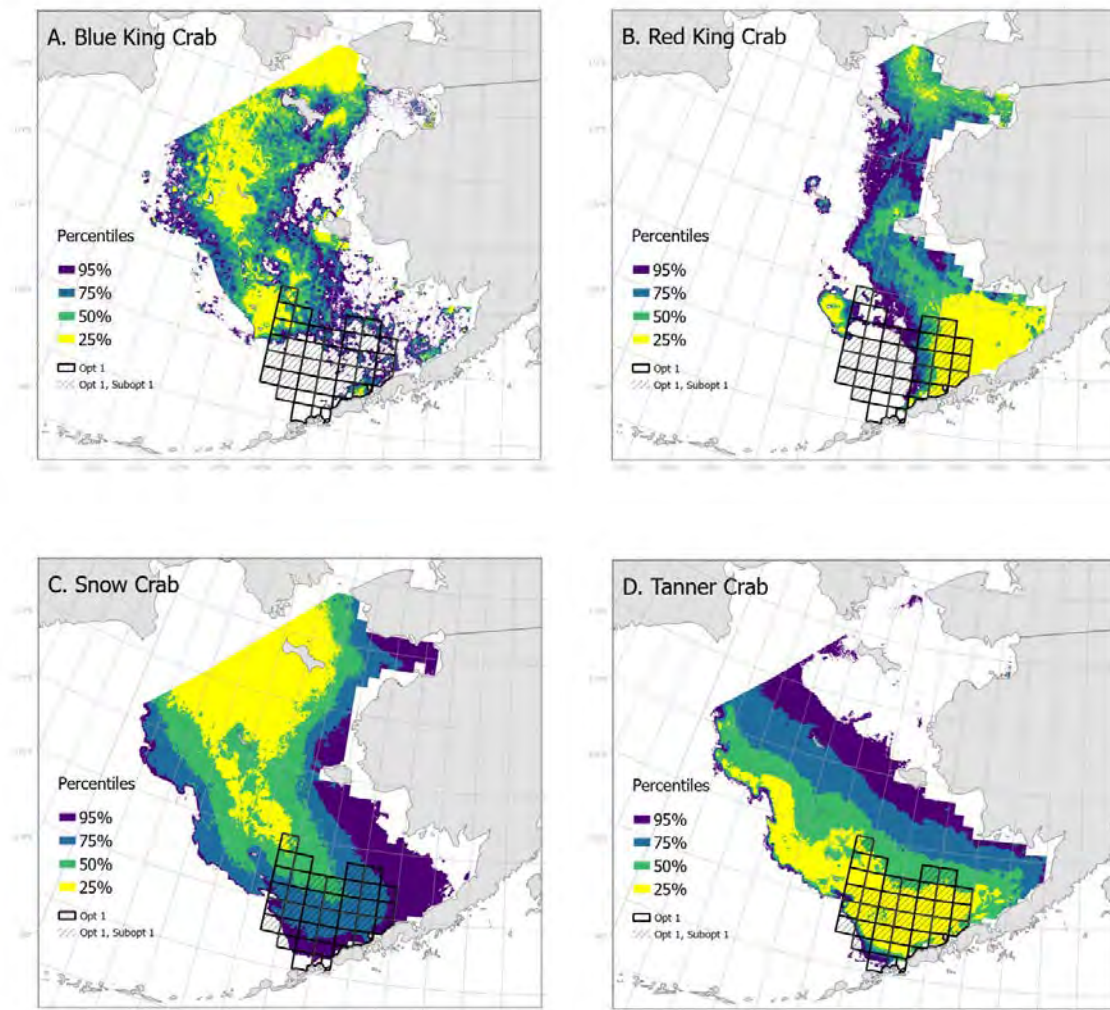


Figure 3-56 Summer EFH of crab species for all life history stages by percentile (polygons from yellow to purple) for (A) blue king crab, (B) red king crab, (C) snow crab, and (D) Tanner crab (Laman et al. 2022, NPFMC 2024). Using the phrases to refer to the percentiles, EFH hotspots (25th percentile) are shown in yellow, core EFH areas (50th percentile) are shown as the combination of green and yellow, principal EFH areas (75th percentile) are shown as the combination of blue, green, and yellow, and the full EFH area for each species in everything through purple. The overlaid grid is the area in Option 1 (all squares) and Option 1, Suboption 1 (crosshatched squares).

3.8.1.5 Combined Effects of Environmental Trends and Planned Actions on Habitat

Authorization and prosecution of the Bering Sea pollock fishery and broad ecosystem changes, as described at the beginning of Chapter 3, may have foreseeable impacts on habitat. In addition, past and present actions that have had effects on EFH include vessel noise pollution, domestic and transboundary mining operations, fishing gear contact with benthic habitat, fishery removals of prey species, regime shifts as a result of ecosystem change (Eisner et al., 2014), and changes to water quality as a result of ecosystem change. These actions are also likely to continue to have effects into the future and are discussed further below. Past and present actions that have had effects on EFH include vessel noise pollution, domestic and transboundary mining operations, fishing gear contact with benthic habitat, fishery removals of prey species, regime shifts as a result of ecosystem change (Eisner et al., 2014), and changes to water quality as a result of ecosystem change.

Vessel Noise Pollution

Motorized vessels provide a large proportion of anthropogenic noise in marine habitats (Popper & Hawkins, 2019). These include fishing vessels, large ships, and personal or recreational craft. Most vessels produce predominantly low frequency sounds from onboard machinery and cavitation at propeller blades (Ellison et al., 2012, Ross, 1993). Vessel noise production is increasing with increasing vessel traffic, particularly in busy shipping lanes, and vessel noise can increase the ambient noise levels over wide areas of the ocean (Hildebrand, 2009, Ellison et al., 2012). Low frequency noise in fish habitats may cause temporary shifts in behavior (de Jong et al., 2020), though low frequency noise, in of itself, has not been shown to result in fish mortality (Table 2 for noise thresholds, Popper & Hawkins, 2019). Short-term behavioral changes may not lead to long-term impacts to fitness or survival (Bejder et al. 2009; Popper & Hawkins 2019). However, there may be unanticipated localized impacts as vessel use increases in certain high-traffic areas.

Domestic and transboundary mining operations

Current and proposed mining operations in Alaska and the Yukon can adversely impact downstream nearshore and marine EFH. Impacts from mining include heavy metal contaminants, stream dynamic changes, and permanent habitat loss (Limpinsel et al., 2023). The Eagle Gold Mine in the Yukon is a transboundary mine that provides an example, because it experienced a heap leach facility failure in June 2024, with cyanide introduced into the Yukon River watershed which drains into the Bering Sea.

The additional direct and indirect effects of the proposed alternatives on EFH, when considered with the effects of past and present actions and the reasonably foreseeable environmental trends and planned actions listed above, are expected to be minimal. This is because, as described above, any anticipated changes in estimated disturbance to EFH from the pollock fishery prosecuted under the *status quo* is little, though changes in estimated disturbance that may be observed after the action depends on the location and timing of fishing effort shifts.

3.9 Ecosystem

When preparing this section, the analysts considered the potential effects the proposed action would have *at the ecosystem level*. This analysis is thus of a different scale than other portions of this DEIS that discuss individual resource categories. Broader ecosystem changes in the Bering Sea where the pollock fishery operates as a result of this action are possible compared to the status quo, because there is the potential for lower realized catches of pollock during the B season. This scenario is most likely under Alternative 2 or 3 that have the potential to curtail the B season fishery. The proposed alternatives could also indirectly affect Western and Interior Alaska ecosystems in terms of reduced chum and WAK chum salmon bycatch (see Section 4.5.5.3.2).

3.9.1 Effects of the Alternatives on the Ecosystem

3.9.1.1 Alternative 1

NMFS and the Council annually assess the status and trends of ecosystem components, which range from physical oceanography to biology and human dimensions, to support ecosystem-based fishery management (Siddon et al. 2024). This assessment summarizes and synthesizes climate and fishing effects (historic and future) on the eastern Bering Sea shelf and slope regions from an ecosystem perspective and is incorporated here by reference. Alternative 1 would retain current chum salmon PSC regulations and it is expected the pollock fishery would continue to operate within the parameters observed under the status quo (*e.g.*, gear, timing of the fishery, spatial distribution, among other factors). No change in how this fishery is prosecuted beyond the status quo inter-annual variability, which is influenced by many environmental conditions, would be expected. For more information on the status of the Bering Sea ecosystem, see Siddon et al., 2024.

3.9.1.2 Alternative 2 or 3

Alternative 2 and 3 would include an overall limit on chum salmon PSC. If the limit (cap) was reached, pollock fishing must cease. When thinking about potential ecosystem impacts to fishing below the pollock TAC, it is important to keep in mind both the immediate and longer-term impacts as well as the direct and indirect impacts.

Immediate impacts of reducing catches below the pollock TAC could result in higher adult pollock biomass in the areas fished during the B season. The direct impacts of lower pollock catches would vary depending on the trophic relationship to pollock (*i.e.*, prey or predator), and be influenced by the amount of B season TAC left unharvested. Also, the current season structure would shift the catches to earlier in the B-season—a period when the fish size tends to be smaller and have lower yields per fish (low recovery rates).

Future impacts of reduced fishing could affect stock dynamics and density dependence processes. For example, higher stock sizes could affect the average size of pollock due to prey limitation (and hence density-dependent reductions in somatic growth). Smaller-sized adult pollock may have lower reproductive potential yet cause higher density-dependent mortality and increased cannibalism. Higher levels of adult pollock biomass have historically resulted in lower levels of recruitment. Following the 2014–2021 warm period, the balance of the EBS ecosystem has shifted and there is increased variability on conditions leading to recruitment success for pollock. However, pollock have been shown to be adaptable to changing conditions and remain at a high stock status. There may be some competition on pelagic and zooplankton productivity from increasing pollock biomass which may prove to be a competitive advantage over other pelagic considerations such as salmon.

Prey of pollock includes zooplankton such as euphausiids and copepods as well as zoeal stages of benthic crab species. An increased biomass of pollock in the short-term (*i.e.*, until stock dynamics and density dependence kick in) would result in higher predation pressure on zooplankton. Depending on the increase in pollock, this could result in prey depletion - either locally or more broadly across the shelf depending on timing (immediate year B season footprint versus X number of years later if the population expands over the shelf).

Predators of pollock include piscivorous seabirds (age-0 and juvenile), larger fish (including adult pollock), and marine mammals such as fur seals (adult pollock). Near-term impacts of lower catches could result in additional prey availability to predators of adult pollock (*e.g.*, fur seals). Longer-term impacts will depend on stock dynamics and density-dependence and are harder to predict. Historical patterns suggest that higher levels of adult biomass may not increase the abundance of juvenile pollock as a prey resource for seabirds and other ecosystem components.

Pollock are pelagic foragers and likely impact the standing stock of zooplankton availability over the shelf. Higher pollock biomass due to lower fishing could result in greater consumption of zooplankton and therefore reduce krill and copepods available to planktivorous predators. Pelagic planktivorous predators include planktivorous seabirds, herring, salmon, and baleen whales (*e.g.*, NARW, humpback whales).

Another consideration is what the indirect impacts might be to the benthic components of the ecosystem. Higher pollock biomass could increase consumption in the pelagic zone and hence result in less production settling to the benthic habitat and available to flatfishes, crabs, etc.

3.9.1.3 Alternative 4

Alternative 4 would include additional regulatory provisions for the salmon bycatch IPAs related to chum salmon avoidance with an emphasis on WAK chum salmon avoidance. It has been previously discussed throughout this DEIS that these regulatory provisions largely reflect industry current operations and thus are not anticipated to have effects on the ecosystem relative to Alternative 1.

3.9.1.4 Alternative 5

Alternative 5 would not be expected to result in different impacts on the ecosystem than what is currently observed under the status quo. Alternative 5 would implement an inseason corridor with closure provisions. If the corridor chum salmon PSC limit were attained, some or all of the inseason corridor would close to the cooperative or sector that met the cap through August 31. Fishing may continue outside of closed areas during this period, which is one element that distinguishes Alternative 5 from Alternative 2 or 3.

The analysis expects that vessels affected by a corridor closure would continue to fish in open areas as long as they were able and desired to do so. This scenario would result in some amount of fishing effort being redistributed for a period of time. Even so, more effort may shift outside of the corridor area prior to and after a closure the footprint of the B season pollock fishery would not be expected to substantially change under Alternative 5, because the fleet would continue to target good aggregations of pollock in historically common locations and other regulatory closure areas limit where vessels could shift effort to.

4 Regulatory Impact Review

Chapter 4 evaluates the expected costs and benefits, as well as the distributional impacts of proposed regulatory amendments to change chum salmon bycatch reduction measures in the Bering Sea pollock trawl fishery. This analysis is a Regulatory Impact Review (RIR), which is required under Presidential Executive Order (EO) 12866 (58 FR 51735: October 4, 1993).

The requirements for all regulatory actions specified in EO 12866 are summarized in the following Statement from the EO:

In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and Benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

EO 12866 requires that the Office of Management and Budget (OMB) review proposed regulatory programs that are considered to be “significant.” A “significant regulatory action” is one that is likely to:

- Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in this Executive Order.

4.1 Methods Used for the Impact Analysis

The framework for an RIR is described in general terms in EO 12866. More specific guidance and oversight is provided by the Office of Information and Regulatory Affairs within the OMB, which is part of the Executive Office of the President. Its primary analytic guidance is provided in *Circular A-4*⁹³.

A Benefit Cost Analysis (BCA) is a specific type of economic analysis that compares the expected benefits and costs of an action, typically in monetary terms. The BCA is the primary framework used for the regulatory analysis and this approach drives many of the required elements of the RIR. As described further in Section 4.6, certain types of impacts are not part of a BCA calculation, such as changes in employment or many types of tax revenue. However, EO 12866, as well as National Standards also require consideration of distributional economic and social impacts on a finer scale. As such, the RIR analysis describes benefits and costs at a disaggregated level whenever possible. This allows for an understanding of potential distributional impacts and includes a broader discussion of other impact categories which may not be included in a net benefits calculation but are important for achieving National Standards and consideration in decision-making. Section 4.6 is intended to focus only on net

⁹³ U.S. Office of Management and Budget. 2003. Circular A-4: Regulatory Analysis.

benefits to the Nation, therefore it excludes the evaluation of distributional impact found in the boarder analysis.

The EO 12866 guidance documents outline the necessary elements of an RIR:

Describe the need for regulatory action: The analysis should contain a clear explanation of the need for regulatory action, including a description of the problem that the agency seeks to address. The purpose and need statement for the chum salmon bycatch management measures considered is included in Section 1.1 of this document and not repeated here.

Define the baseline: The second step of the RIR includes defining the baseline. An RIR evaluates the benefits and costs of the proposed regulatory actions relative to the ‘no action’ alternative. This baseline is intended to be the best assessment of the way the world would look absent the proposed regulatory action. This includes evolution of the seafood market, environmental conditions, and global factors. While there is an expectation of many changing factors in the time horizon considered (~ 20 years after implementation), there is substantial uncertainty in how these many external factors may change. Each section of the EA and RIR provides a summary of the current conditions for each resource component. If there is no clear indication of how conditions may change in the future, these conditions are assumed to continue into the future.

Set the time horizon: OMB guidance for EO 12866 highlights that the time horizon for analysis should begin when the regulatory action is implemented and ends when those effects are expected to cease. Given the effects of the proposed action alternatives (Alternatives 2-5) may continue indefinitely, there is no clear end to the analytical time horizon. However, the further out in time considered, the more uncertain the effects from the proposed actions with the possible interaction of future environmental, social and economic conditions. Guidance suggests a “rule of reason” is appropriate and the agency should consider for how long it can reasonably predict the future and limit its analysis to this time period. Under many resource categories this analysis relies on retrospective data to qualitatively anchor expectations about future costs and benefits. Given rapidly changing environmental conditions, operational costs, and seafood markets predictions of future impacts are on a short- to medium- term timeframe (*i.e.*, likely no more than 20 years). However, the Council process allows for continuous adaptive management, which includes outlets for systematically updated information such as annual cooperative reports, IPA reports, and mandatory program reviews for limited access privilege programs (such as AFA). These items on the Council’s meeting agenda as well as “staff tasking” allows for public comment opportunities that may suggest initiation of new action should conditions or impacts in the future deviate from those predicted in the analysis.

Identify a range of regulatory alternatives: The alternatives designed to address the purpose and need statement are listed in Section 2.2 and in more depth through Chapter 2. In addition, Section 2.1 describes the history of the alternatives were iteratively developed. Section 2.9 includes alternatives that were considered, but not analyzed further.

The remaining steps of an RIR include:

- Identify the consequences of the regulatory alternatives,
- Quantify and monetize the benefits and costs,
- Discount future benefits and costs,
- Evaluate non-quantified and non-monetized benefits and costs, and
- Characterize uncertainty in benefits, costs, and net benefits.

In order to provide cohesion in the data and methods, these components of the analysis are separated as costs and benefits. The analysis is organized first with the baseline description and expected effects relative to the alternatives on the Bering Sea pollock industry and communities. This analysis (Section

4.3) primarily focuses on the potential cost categories associated with the proposed management alternative and attempts to address all five bullets above related to cost categories to the extent possible, in addition to other required elements of the RIR. This is followed by a baseline description and expected effects relative to the alternatives on Western and Interior Alaskan fisheries, Tribes, communities, and ecosystems that rely on chum salmon (Section 4.5). This section of the analysis highlights possible benefits, although depending on the alternative considered, it is possible an alternative may offer neutral or negative benefits (*i.e.*, if there is an expectation of an increase or no effect on WAK chum salmon bycatch). As described further in Section 4.5, many of the potential benefits are not able to be quantified and none are able to be monetized. In line with guidance from *Circular A-4*, the potential benefits are then described qualitatively where appropriate.

4.1.1 Communities Engaged in or Dependent on B Season Pollock

The analysis of community engagement and dependence on B season pollock uses quantitative fishery information to identify patterns of engagement (or participation) in the Bering Sea pollock fishery. The distribution and relative magnitude of community engagement was captured using a vessel's ownership address listed in the Alaska Commercial Fisheries Entry Commission (CFEC) vessel registration files. This is an indicator of the distribution and magnitude of ownership ties to a particular community and/or region, and it can be used as a proxy for economic activity in the community that is associated with the fishery/sector that may be potentially affected by one or more of the proposed alternatives. The listed ownership address was also used to be consistent with other SIAs prepared for FMP amendment analyses for the Council, and because prior SIAs have described the problematic nature of the existing vessel homeport data (NPFMC, 2021). That being said, some caution is warranted for how vessel ownership information is interpreted because it is not unusual for these vessels to have complex ownership structures that involve more than one entity in more than one community or region. Additionally, the community identified by ownership address may not directly indicate where a vessel spends most of its time, purchases services, or hires its crew from.

To understand the distribution and relative magnitude of community engagement in the Bering Sea pollock fishery through the shore-based processing component, shore-based processors were identified in data provided by AKFIN using the F_ID (intent to operate), SBPR (shore-based processor), and FLTR (floating processor codes). This approach provides information based on the operating location of the plant, rather than other indicators such as company ownership address. The physical location of a plant can be a relative indicator of the local volume of fishery-related activity, and a rough proxy for the relative level of associated employment and local government revenues.

This portion of the analysis also includes a series of tables used to identify patterns of community dependence on the pollock fishery for communities affiliated with the various sectors by ownership address and those Alaska communities where shore-based processing occurs, noting the analysts acknowledge that "dependence" is a complex concept with economic and social dimensions that could be considered in multiple ways. For communities affiliated with the Bering Sea pollock fishery by vessel ownership address, economic dependence is characterized by comparing the gross ex-vessel or first wholesale revenues earned from the pollock fishery to the total revenues generated by the same vessels in all other fisheries (species, gear, and areas). The same general procedure is used for the shore-based processing component.

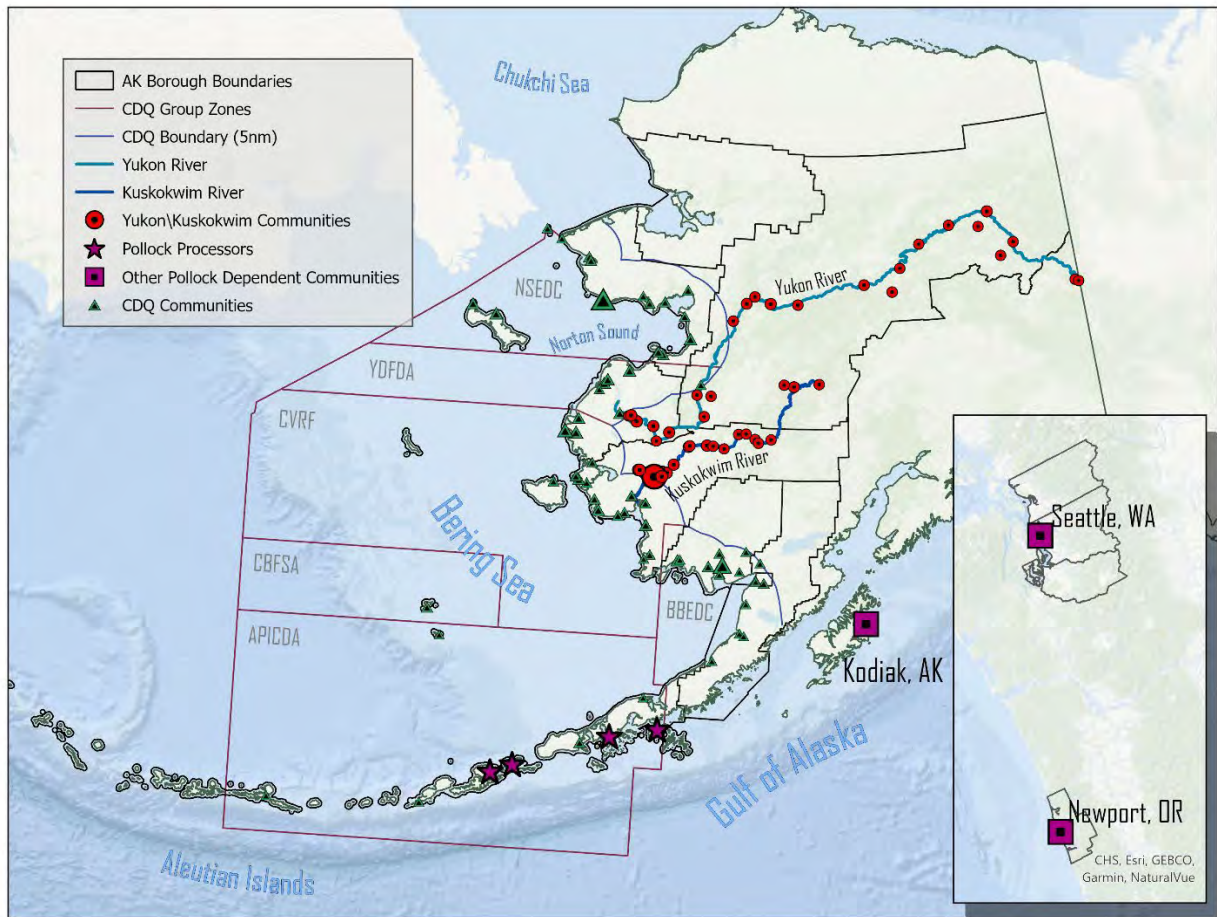


Figure 4-1 Community and regional footprint of the proposed action showing communities engaged in or dependent on B season pollock, CDQ regions, CDQ communities, as well as communities across the Yukon and Kuskokwim River based on community population size

4.1.2 Estimating Taxable Revenue

The State of Alaska levies two fishery resource taxes and shares a portion of these tax revenues with qualified local governments in Alaska. The State's **Fisheries Business Tax (FBT)** is typically paid by the first processor of fish, or the exporter of unprocessed fish, on the raw fish landed in the state. The current tax rates are 3% for fishery resources processed at shoreside plants and 5% for those processed at floating processors. The State's **Fishery Resource Landing Tax (FRLT)** is levied at a 3% rate on fishery resources that are processed outside the 3-mile limit but, within the U.S. EEZ, and first landed in Alaska. This tax is levied whether the product is destined for local consumption or shipment abroad. Under Alaska Statute (AS) 43.77, CPs and motherships are required to pay this tax at a rate that is equivalent to rates paid by catcher vessels and shore-based processors under the FBT (AS 43.75).

The analysts have prepared estimates of the FBT and FRLT levied on B season pollock by deriving the estimated taxable value of the fishery. These values were provided by AKFIN and are based on the value of unprocessed landings (the ex-vessel price for inshore deliveries). The State determines the unprocessed value for CP production by multiplying a statewide average price per pound of unprocessed fish (derived from ADF&G data) by the unprocessed weight. Next, a 3% tax rate representing the FBT was applied to the estimated taxable value of Bering Sea pollock from inshore cooperatives and the inshore open access fishery in applicable years. A 3% tax rate representing the FRLT was applied to the estimated taxable

value of Bering Sea pollock for the CDQ, CP, and mothership sectors. As described previously, CDQ pollock has historically been harvested by AFA affiliated CPs except for 2016 when one mothership CV harvested a relatively small amount of CDQ pollock.

Incorporated cities and organized boroughs may also levy their own local taxes on the unprocessed value of fishery resource landings made in the relevant jurisdiction. The municipalities in which an AFA inshore processor is located and accepted B season deliveries during the analyzed period include the Cities of Unalaska/Dutch Harbor (2%), King Cove (2%), and Akutan (1.0% in 2011-2012 and 1.5% from 2013-2023). The Aleutians East Borough, in which Akutan and King Cove are located, also levies a local fish tax of 2%.

The Alaska DOR deposits all revenue from the FBT and the FRLT into the State's General Fund, and 50% of those shared revenues are subject to revenue sharing with local governments in the following way: 1) If the landings occur in an incorporated city within an organized borough, the 50% shareable amount is divided between the city and the borough; 2) If the landings occur outside of an incorporated city but still within an organized borough, the entire 50% shareable amount accrues to the borough; 3) If the landings occur in an incorporated city within an unorganized borough, the 50% shareable amount accrues to the city; 4) If the landings occur in neither an incorporated city nor an organized borough, the 50% shareable amount is distributed through an allocation program administered by the Alaska Department of Commerce, Community, and Economic Development (DCCED).⁹⁴

4.1.3 Estimating Forgone Revenue and Revenue at Risk

Under a chum salmon PSC limit, as proposed under Alternative 2 and 3, the B season would end early for a sector that reaches its apportionment of that limit. In order to estimate the economic effect of an early closure, analysts consider the retrospective fishing patterns of each sector relative to the different chum salmon PSC limits and apportionments, as described in Section 3.1.4. Weekly data from the NMFS Alaska Region CAS were used to approximate if and when the potential PSC limit would have been reached by sector from 2011-2023. The amount of pollock harvested after that date would have been "forgone" if these chum salmon PSC limit had been in place in that year, and no fishing behavior changed.

Similarly, **"Forgone gross revenue" refers to the gross revenue from pollock (and other marketable groundfish species caught concurrently) that may have been forgone due to an early closure of the B season.** Considering potentially forgone revenue under a PSC limit has been the primary quantitative method used in many previous bycatch analyses in the North Pacific to scale the expected economic effects on the directly regulated fishing sector.⁹⁵

As described further in Section 3.1.4.2, these estimates are intended to be a frame of reference for consideration of impacts. However, based on expected changes in fishing behavior motivated by the implementation of a chum salmon PSC, a more accurate prediction of future impacts may be more or less than these retrospective assessments. The analysis assumes that if these limits were in place in the future, to the extent possible, fishing would be altered prior to meeting these proposed caps. Therefore, in the case of forgone pollock and the associated revenue, the **forgone gross revenue values provide an upper bound to consider along with the qualitative considerations of avoidance activity.**

The relationship between avoidance costs and potentially forgone revenue is illustrated in Figure 4-2. If there is a perceived risk of reaching the PSC limit, pollock harvesters would be expected to alter their

⁹⁴ DCCED first allocates the revenues raised statewide in proportion to the share of statewide pounds of fish and shellfish processed in each of the 19 fisheries management areas (FMA) during the preceding calendar year, and then within an FMA by a formula that may vary by FMA (State of Alaska Department of Revenue, 2023).

⁹⁵ For example, estimating 'potentially forgone revenue' or the similar method of relying on retrospective data for a specific area for 'revenue at risk' was the primary quantitative analytical method for the Regulatory Impact Review in Amendment 91 (NPFMC, 2009), the chum salmon action in 2012 (NMFS 2012), Amendment 110 (NMFS, 2016), and the recent analysis on the Red King Crab Saving Area (NPFMC, 2024).

harvest strategies to the extent they are able, to avoid a closure and minimize losses associated with potentially forgone gross revenue. Because the analysts assume that the fleet would respond to the risk of a closure, it is expected that avoidance costs would occur prior to any forgone revenue⁹⁶ (as illustrated in Figure 4-2). However, forgone revenue could occur in addition to avoidance costs if efforts were unsuccessful in avoiding chum salmon. Alternatively, avoidance techniques (with the associated costs) could prevent a sector from reaching the limit, in which case revenue may not be forgone. The impact of a chum salmon PSC cap under Alternative 2 is dependent on the sector/ vessel's perception of risk and the likelihood that they may reach their apportionment of a chum salmon PSC limit during the B season.

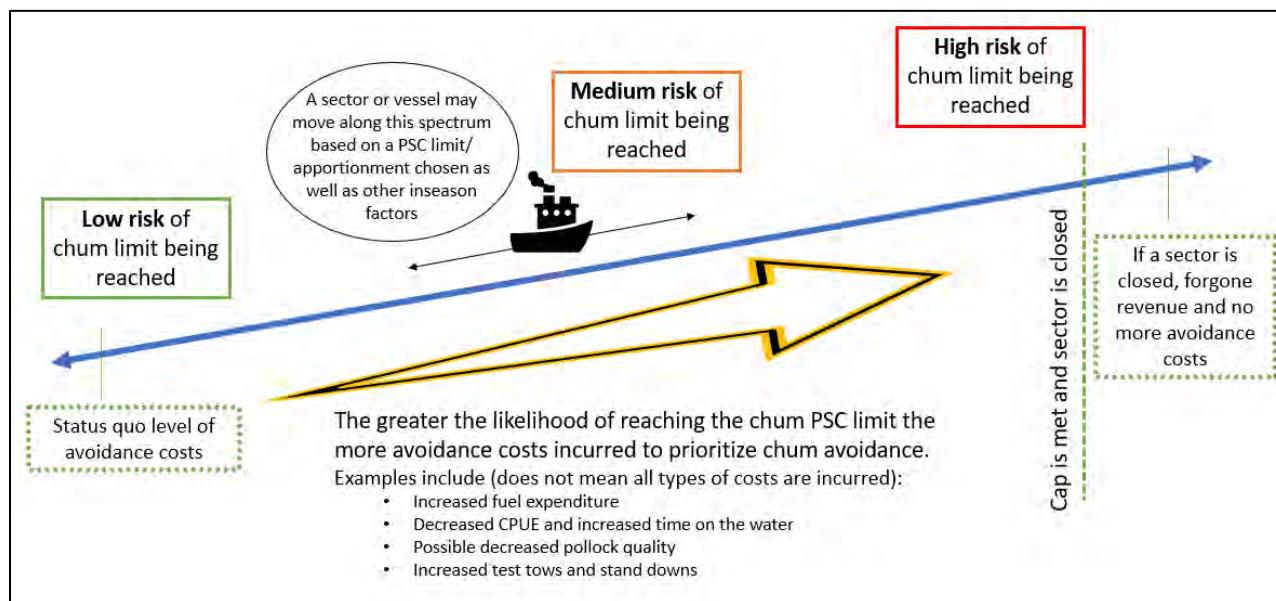


Figure 4-2 Types of costs/reduced benefits that could occur under a chum salmon PSC limit based on the risk of reaching the limit

Under an inseason corridor cap (Alternative 5, Option 1), a similar method is used to estimate “**revenue at risk**”. In this alternative, reaching the chum salmon PSC limit would not directly curtail fishing seasons or catch limits and the target species could theoretically be recovered elsewhere. Thus, a new term is used to describe the economic impacts as opposed to “forgone revenue”. **Revenue at risk refers to the gross revenues from pollock (and other marketable groundfish species caught concurrently) that were derived from fishing in the specified corridor area, after the point in the B season when the sector would have hypothetically been closed out of an area, based on retrospective data.** Similar to the forgone revenue estimates, revenue at risk is intended to be a frame of reference for consideration of direct gross revenue impacts. However, fisheries would likely shift effort to other areas and in most cases, it would be expected that this catch would be made up in other areas and/or after the area reopens. Thus, **loss of this full amount of revenue at risk represents an unlikely maximum adverse impact from closed areas on gross revenues.** It is primarily included to demonstrate the scale of pollock catch and revenue that would need to be ‘made up’ outside of the closure area to minimize the economic effects of the regulatory action.

Under Alternative 5, Suboption 1 and Option 2, there are more opportunities for pollock catch to be recovered outside of the closed corridor. Revenue at risk values are able to be provided for Suboption 1 to allow for a comparison with the potentially displaced pollock catch and revenue under Option 1. Stat

⁹⁶ Although the general expectation is that avoidance costs would occur prior to any forgone revenue, some research has demonstrated that the level of avoidance costs may or may not respond in a linear way to a constraining chum salmon PSC limit (e.g., Murphy et al., 2021). Additionally, due to the way chum is encountered on the fishing grounds, it is possible a cooperative could be incurring status quo fishing costs but suddenly reach their limit due to a “lighting strike” tow. This would essentially be due to misjudging where they were on the risk spectrum.

areas that are exempt from closure under Option 2 would be identified preseason by the IPA. Thus, the analysis is not able to provide estimates for the amount of pollock fishing displaced or associated revenue. Instead the analysis uses a qualitative approach to evaluate this additional flexibility based on historical catch in the 40 stat areas.

4.2 Bering Sea Pollock Fishery Description

The Bering Sea directed pollock fishery was managed as an open-access fishery prior to 1999. In 1998, Congress enacted the AFA to rationalize the fishery by limiting participation and allocating specific percentages of the Bering Sea pollock directed fishery TAC among the sectors. After first deducting an incidental catch allowance for pollock caught in other groundfish fisheries and 10% of the TAC for the CDQ Program, the AFA allocates 50% of the remaining TAC to the inshore sector; 40% to the CP sector; and 10 % to the mothership sector.

The AFA also allowed for the pollock industry to develop cooperatives. Ten cooperatives were developed as a result of the AFA. Seven inshore cooperatives were formed: the Akutan Catcher Vessel Association, Arctic Enterprise Association, Northern Victor Fleet Cooperative, Peter Pan Fleet Cooperative, Unalaska Fleet Cooperative, UniSea Fleet Cooperative, and the Westward Fleet Cooperative. The Arctic Enterprise Association has not been active since 2008, and the Peter Pan Fleet Cooperative was not active in 2024. Inshore CVs are not required to join a cooperative, and those that do not are managed by NMFS under the inshore open access fishery. Two offshore cooperatives formed, and one mothership cooperative was formed. A purpose of the cooperatives is to further subdivide each sector's pollock allocation among the vessels in the cooperative through private contracts, manage their allocations to ensure individual vessels and companies do not harvest more than their quota of pollock, and facilitate transfers of pollock among their cooperative members and enforce contract provisions.

The Bering Sea pollock TAC is also apportioned among two fishing seasons: 45% to the A season (occurring January 20 to June 10) and 55% to the B season (occurring June 10 to November 1).⁹⁷ Regulations at 50 CFR 679.20(a)(5)(i)(B) prohibit reallocations of pollock among the sectors, but NMFS may add any remaining portion of a sector's A season allocation to its B season allocation. Additionally, regulations at 50 CFR 629.20(a)(5)(iii)(B)(4) allow the Regional Administrator to reallocate some or all of the projected unused Aleutian Island directed pollock fishery allocation or Aleutian Island CDQ pollock to the directed pollock fishery in the Bering Sea subarea.

4.2.1 Bering Sea Pollock Fleet

From 2011–2023, the number of vessels participating in the pollock fishery from all sectors ranged between 89 (2023) and 107 (2012) (Table 4-1). The number of vessels participating in each sector has declined over time but the sectors nearly all of the TAC has been utilized during the same period. CDQ pollock has been harvested by CPs, except for 2016 when one CV delivering to a mothership participated in the fishery.

Ports of Delivery

B season pollock deliveries from inshore CVs were made at ports in Unalaska/Dutch Harbor, Akutan, and King Cove. CPs and motherships primarily offload product in Dutch Harbor. Section 4.2.1.4 provides additional information related to fishery engagement and dependence for these communities and others.

⁹⁷ Prior to the 2017 amendment 110 to the BSAI Groundfish FMP, 40% of the Bering Sea pollock TAC was apportioned in the A season and 60% was apportioned in the B season. A purpose of this management change was to provide additional flexibility in the seasonal apportionments of the Bering Sea pollock TAC to allow for more pollock to be harvested if desirable in the A season when Chinook salmon bycatch rates have historically been lower.

Value and Diversification

Table 4-3 provides the gross ex-vessel and first wholesale revenue associated with the pollock B season fishery. On average, the B season fishery generated \$290 million (in 2022 \$) in gross ex-vessel revenue and \$906 million (in 2022 \$) in gross first wholesale revenue.⁹⁸ In addition to Bering Sea pollock, AFA vessels rely on a number of other fisheries for revenue. An AFA vessel's relative reliance on Bering Sea pollock can be meaningful when considering the proposed actions, as B season pollock makes up a varying proportion of total revenue for participating vessels and vessels can therefore be impacted by new management measures differently.

The AFA CV fleet is more diversified outside of Bering Sea pollock than the CP fleet, but there is wide variation among vessels in both fleets, in part due to their status relative to the AFA sideboards (Table 4-4 and Table 4-5). AFA "sideboards" set different restrictions on participation in other fisheries for AFA-eligible vessels to protect non-AFA participants. Typically, one half of the CVs generate >90% of their annual revenue from AFA pollock fishing (A and B seasons combined; Table 4-4). The other half of the CVs derive revenue from the BSAI Pacific cod trawl fishing (these vessels are part of the newly implemented Pacific Cod Trawl Cooperative, PCTC Program), the Central GOA Rockfish Program, and other GOA fisheries such as pollock and flatfish. In addition, some of the AFA CVs earn revenue fishing in the U.S. west coast (Washington, Oregon, and California), especially in the Pacific whiting fishery.

Of the 16 unique CPs that participated during the 2011–2022 time period, 14 earned 80% or more of their fisheries revenue through AFA and CDQ pollock fishing in the BSAI (A and B seasons combined). Twelve unique CPs also participated in BSAI Pacific cod or yellowfin sole in this time period and 11 unique CPs earned a portion of their revenue in fisheries off the U.S. west coast.

Table 4-1 Number of vessels by sector participating in the Bering Sea pollock fishery by sector, 2011–2023

Year	CDQ	CP	Mothership	Inshore	Total
2011	15	15	14	80	104
2012	16	14	15	81	107
2013	15	15	14	79	103
2014	16	16	15	78	107
2015	16	14	15	79	102
2016	15	14	15	81	104
2017	16	14	14	77	103
2018	15	14	14	73	99
2019	13	13	15	73	96
2020	12	13	15	76	98
2021	11	13	14	74	97
2022	12	13	13	71	94
2023	13	13	11	69	89

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: Vessels counts are not additive. There is overlap between CVs that are dual-qualified to participate in the inshore and mothership sectors, and the CPs harvesting CDQ pollock and AFA pollock.

⁹⁸ For reference, ex-vessel price is the market price paid to fishermen for their catch when it is delivered to a processor. This is the appropriate metric to understand the significance of the B season fishery for inshore CVs. The first wholesale price is the market price of the primary processed fishery product when sold by a processor to an entity outside of their affiliate network. This is the appropriate metric to understand the scale of revenue entities that support both harvesting and processing earn from the B season fishery. These values include revenue from any other marketable groundfish species that is caught incidentally to pollock.

Table 4-2 Annual Bering Sea pollock TAC and landings in millions of mt (left) as well as the initial B season TAC and landings in mt (right), 2011–2023

Year	Annual (A and B Season)			B Season		
	TAC	Landings	% Utilized	TAC	Landings	% Utilized
2011	1.25	1.2	96.0%	730,918	689,636	94.4%
2012	1.2	1.2	100.0%	700,560	709,825	101.3%
2013	1.25	1.24	99.2%	736,920	734,733	99.7%
2014	1.27	1.26	99.2%	745,128	754,067	101.2%
2015	1.31	1.29	98.5%	757,704	783,075	103.3%
2016	1.34	1.32	98.5%	775,056	795,461	102.6%
2017	1.35	1.33	98.5%	713,785	762,423	106.8%
2018	1.36	1.35	99.3%	724,049	758,742	104.8%
2019	1.4	1.38	98.6%	742,764	781,435	105.2%
2020	1.42	1.34	94.4%	757,651	716,224	94.5%
2021	1.38	1.35	97.8%	729,025	753,506	103.4%
2022	1.1	1.07	97.3%	583,825	588,914	100.9%
2023	1.3	1.27	97.7%	687,500	713,649	103.8%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Notes: The initial B season pollock allocation shown above does not include amounts of reallocated pollock from the Bering Sea or Aleutian Islands Incidental Catch Allowances or any rolled over amount of A season pollock.

Table 4-3 Gross ex-vessel and first wholesale revenue (in millions of 2022 \$) for groundfish harvested during the B season pollock fishery by sector, 2011–2023

Year	Gross Ex Vessel Revenue				Total	Gross First Wholesale Revenue				Total
	CDQ	CP	Mothership	Inshore		CDQ	CP	Mothership	Inshore	
2011	\$30.10	\$114.30	\$29.90	\$137.10	\$311.50	\$102.80	\$389.70	\$102.10	\$410.70	\$1,005.30
2012	\$34.20	\$118.80	\$29.70	\$148.50	\$331.20	\$111.10	\$386.00	\$95.50	\$440.00	\$1,032.70
2013	\$30.80	\$107.80	\$27.10	\$134.50	\$300.30	\$95.10	\$332.20	\$83.50	\$393.50	\$904.30
2014	\$32.10	\$110.80	\$27.50	\$138.90	\$309.30	\$98.70	\$342.50	\$85.10	\$406.10	\$932.50
2015	\$32.00	\$111.90	\$27.80	\$140.60	\$312.30	\$100.70	\$351.90	\$87.50	\$381.00	\$921.10
2016	\$29.70	\$104.40	\$25.70	\$128.90	\$288.70	\$104.40	\$366.30	\$90.40	\$397.80	\$958.90
2017	\$26.60	\$95.10	\$23.40	\$121.40	\$266.50	\$97.40	\$346.80	\$85.60	\$354.80	\$884.50
2018	\$29.70	\$103.60	\$26.20	\$134.80	\$294.30	\$92.70	\$321.70	\$81.30	\$387.40	\$883.00
2019	\$29.00	\$103.20	\$25.50	\$128.60	\$286.20	\$103.80	\$367.40	\$90.20	\$414.00	\$975.50
2020	\$23.60	\$92.60	\$25.40	\$124.10	\$265.80	\$76.60	\$298.40	\$81.20	\$333.70	\$789.90
2021	\$28.20	\$97.90	\$24.70	\$125.40	\$276.30	\$90.80	\$313.80	\$78.90	\$351.90	\$835.50
2022	\$27.50	\$94.30	\$24.00	\$118.30	\$264.20	\$85.10	\$291.90	\$74.60	\$346.20	\$797.80
2023	\$26.90	\$92.60	\$23.20	\$119.70	\$262.30	\$85.20	\$293.50	\$73.80	\$399.80	\$852.40

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN

Table 4-4 CVs harvesting Bering Sea pollock in the B season by categorical percent of total revenue, 2011–2023 (number of vessels)

Revenue as a % of Total	AFA B Season	AFA	BSAI Pcod	GOA Rockfish Program	Other GOA	WOC
<.1%	5	0	28	75	68	67
.1-10%	8	1	23	13	5	8
10-20%	6	7	16	4	4	8
20-30%	3	6	8	1	4	0
30-40%	9	6	1	0	3	0
40-50%	12	6	1	0	4	1
50-60%	45	1	1	0	2	5
60-70%	5	3	3	0	2	2
70-80%	0	5	2	0	1	2
80-90%	0	15	2	0	0	0
90-100%	0	43	8	0	0	0

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Notes: other GOA = GOA fishing outside of the Rockfish Program, primarily GOA pollock and flatfish; WOC = WA, OR, CA fisheries

Table 4-5 CPs harvesting Bering Sea pollock in the B season by categorical percent of total revenue, 2011–2023 (number of vessels)

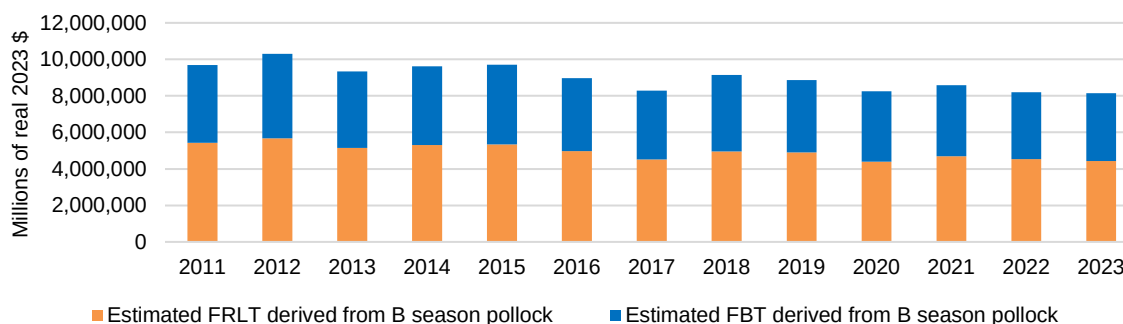
Revenue as a % of Total	AFA B Season	AFA	B Season CDQ Pollock	CDQ Pollock	AFA + CDQ Pollock	Other BSAI	WOC
<.1%	1	1	2	1	1	5	6
.1-10%	2	2	10	5	2	9	4
10-20%	0	0	2	6	0	0	7
20-30%	1	0	2	2	0	0	0
30-40%	4	0	1	2	0	0	0
40-50%	9	1	0	0	0	0	0
50-60%	0	0	0	1	0	0	0
60-70%	0	3	0	0	0	0	0
70-80%	0	9	0	0	0	0	0
80-90%	0	1	0	0	7	0	0
90-100%	0	0	0	0	7	3	0

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Notes: other BSAI = Pacific cod and yellowfin sole; WOC = WA, OR, CA fisheries

4.2.1.1 Bering Sea Pollock Fishery Tax Revenue

The Bering Sea pollock fishery generates tax revenue that is collected by the State of Alaska in the form of a Fisheries Business Tax (FBT) levied on deliveries made to shore-based processing facilities and a Fisheries Resource Landings Tax (FRLT) levied on CP and mothership production. Tax revenue derived from the pollock fishery contributes to State, regional, and local economies.⁹⁹ Figure 4-3 shows the estimated revenue earned from the FBT and FRLT levied on B season pollock from 2011–2023. The estimated taxable value of the FBT ranged between \$3.66 million (2022) and \$4.61 million (2012). The estimated taxable value of the FRLT levied on B season pollock ranged from \$4.40 million (2020) to \$5.68 million (2012).

**Figure 4-3 Estimates of Fisheries Business Tax (FBT) and Fishery Resource Landing Tax (FRLT) Revenues for B season harvests of AFA and CDQ pollock, 2011–2023**

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

Incorporated cities and organized boroughs may also levy local taxes on the unprocessed value of fishery resource landings made within the relevant jurisdiction. AFA inshore processors that accepted B season deliveries from 2011–2023 include the Cities of Unalaska, King Cove, and Akutan. The City of Unalaska and King Cove levy a 2% local raw seafood tax. In 2011 and 2012, Akutan levied a 1.0% local tax which was subsequently increased to 1.5% in 2013. Additionally, Akutan and King Cove are located within the Aleutians East Borough, and the Borough levies a local seafood tax of 2.0%. Figure 4-4 shows the

⁹⁹ The Alaska community of Kodiak was excluded from this portion of the analysis because a) there is no AFA qualified processing plant in the community of Kodiak, and b) it is not a common practice for CPs to offload or transfer Bering Sea pollock products processed at-sea in Kodiak (personal communication, J. Bonney). As such, it is not anticipated the City of Kodiak, or the Kodiak Island Borough, would generate a significant amount of fishery-related tax revenue from the Bering Sea pollock fishery.

estimated taxable value of both State and local taxes levied on B season pollock which ranged from a low of \$11.20 million in 2023 to a higher of \$13.88 million in 2012.

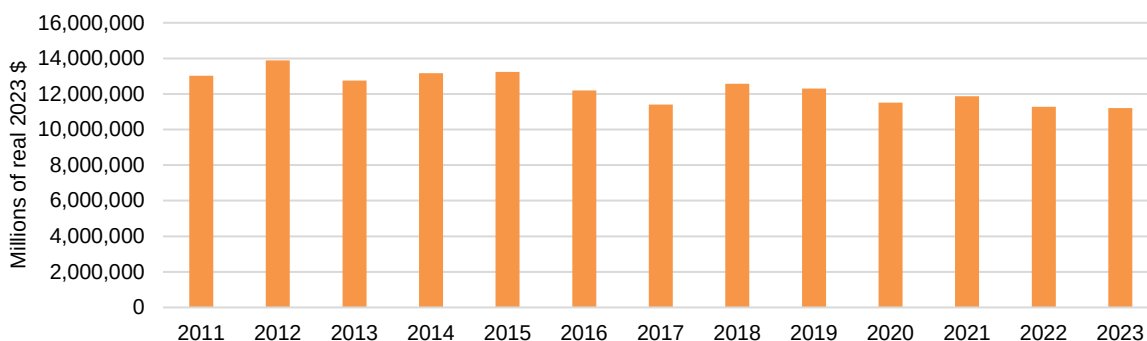


Figure 4-4 Estimated State and local tax revenues (FBT, FRLT, and City Raw Seafood) for Bering Sea pollock, 2011–2023

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

The Alaska Department of Revenue deposits all revenue from the FBT and the FRLT into the State's General Fund, and 50% of those revenues are subject to revenue sharing with local governments.¹⁰⁰

Figure 4-5 shows estimates on the State and local taxes levied on B season pollock that have accrued to the City of Unalaska, the City of Akutan, King Cove, and Aleutians East Borough as a community grouping, and the State of Alaska. While the volume of landings made by each cooperative is available in the annual cooperative reports, the value of these landings is not. As such, the analysis treats these data as confidential for communities with a single processing entity.

The community grouping of Akutan, King Cove, and the Aleutians East Borough derived significant public revenues from direct fishery-related taxes levied on deliveries of B season pollock during the baseline period. The estimated revenue generated from the B season pollock fishery for this community grouping ranged between \$2.02 million (2023) and \$2.60 million (2019). Unalaska also derived substantial public revenues from fishery-related taxes levied on B season pollock, ranging between \$5.00 million (2020) and \$6.41 million (2012).

¹⁰⁰ The Department of Commerce Community and Economic Development first allocates the revenues raised statewide in proportion to the share of statewide pounds of fish and shellfish processed in each of the 19 fisheries management areas (FMA) during the preceding calendar year, and then within an FMA by a formula that may vary by FMA (NMFS, 2014).

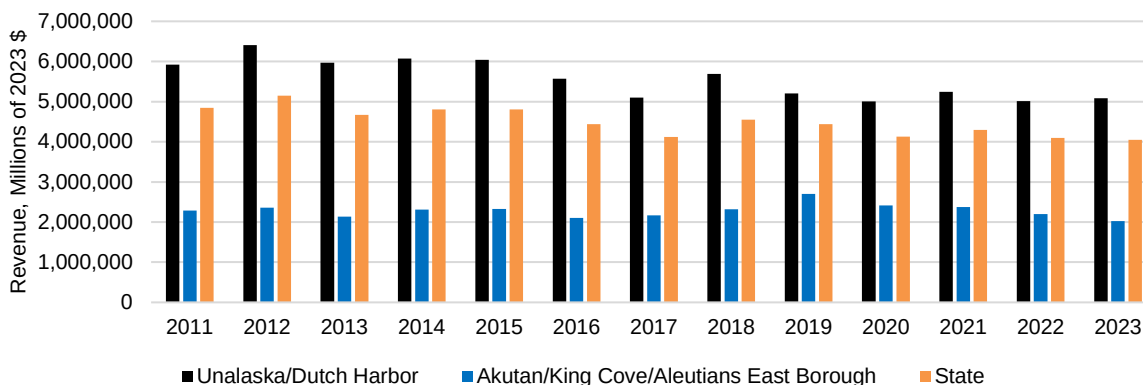


Figure 4-5 Total estimated State and local tax revenues (FBT, FRLT, and City Raw Seafood) generated from the B season pollock fishery by locale, 2011–2023

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

4.2.1.2 Market Profile for Pollock Products

This section contains information on pollock products and markets, which is relevant to understanding the existing and dynamic conditions for the pollock fishery under the status quo regulation.

Pollock is currently the largest groundfish fishery in the world by volume harvested, with stocks concentrated in the North Pacific Ocean. Pollock are commercially harvested by several countries, but U.S. (Alaska) and Russia are the largest producers by a wide margin. In 2020, Alaskan pollock has accounted for approximately 42% of the global pollock supply, a proportion that has remained stable since 2014 (Abelman et al., 2024). The Alaskan pollock fishery plays an important role in local, regional, state, and national economies alike, and pollock is a valuable product in many global markets.

As highlighted in Table 4-6, in 2023, Alaska pollock harvests yielded approximately 480,860 metric tons of processed product, with a first wholesale value of \$1.6 billion. Alaskan pollock is primarily processed into five product types: surimi, fillets, fishmeal, headed & gutted fish, and roe. In 2023, the top products by volume were surimi (39%) and fillets (30%). However, fillets typically provide the most revenue annually of any product type, with surimi as a close second. In 2023, fillets were worth \$645 million in gross value, and surimi was worth \$577 million. Together, fillets and surimi accounted for 69% of Alaska pollock's production volume and 76% of Alaska pollock's first wholesale value in 2023.

Table 4-6 Summary profile of Alaska pollock wholesale production and markets, 2023

Product Type	Volume		Value	
	Product Volume (1,000 metric tons)	% of Total Pollock Product Volume	Gross Value (\$ millions)	% of Total Pollock Product Gross Value
Surimi	185.52	39%	\$577	36%
Fillets	142.92	30%	\$645	40%
Fishmeal	61.66	13%	\$118	7%
Head & Gut	15.78	3%	\$19	1%
Roe	14.66	3%	\$96	6%
Other	60.32	13%	\$149	9%
Total, All Products	480.86	100%	\$1,604	100%

Source: 2023 BSAI Groundfish Economic SAFE (Abelman et al., 2024), Table 4.16 and Table 4.17.

Pollock products occupy many global markets and cumulative factors may contribute to distribution of products in the future (as discussed more in Section 4.2.1.3 below). Currently processed products are typically delivered to Dutch Harbor, then shipped via cargo vessel to Asia, Europe, and North America for secondary processing or distribution. Europe, Japan, and the U.S. are the primary consumer markets

for Alaska pollock. Alaska pollock was among the top five seafoods consumed in the U.S. in 2020. Approximately 21% of Alaska pollock supply goes directly to the domestic market, with the remaining 79% exported for reprocessing or final consumption in other countries (McKinley Research Group, 2023). Almost 90% of Alaska pollock surimi is sold to export markets. In 2020, Japan and South Korea imported just under 70% of all Alaska pollock surimi production. The remaining markets for surimi included Europe, U.S., Thailand, and China. For Alaska pollock fillets, more than half of production have recently (2016-2020) been sold directly to European markets and about 28% have been sold into domestic markets in that timeframe (Abelman et al., 2024).

Competing supply also exists from other whitefish. Whitefish generally refers to non-oily species, such as cod, pollock, haddock, hake, whiting, and benthic flatfish, such as sole, plaice, flounder, and halibut. Though all whitefish may compete with pollock, farmed whitefish, such as tilapia and pangloss, are perhaps the most direct competitors to pollock since aquaculture production can be scaled to meet the needs of consumers in a way that wild caught harvests cannot. Though different perceptions of quality and price premiums exist for this range of species, all whitefish are competitors and may be substituted for each other based on price, preference, and availability. For example, Atlantic cod is reported as the preferred whitefish in Europe, likely due to traditional consumption of cod harvests in the North Sea. However, with ecosystem change and overfishing pressure on Atlantic cod, alternative sources of whitefish may be increasingly necessary as substitutions.

4.2.1.3 Alaska Seafood Market Challenges

The Alaska seafood market has been facing exceptional challenges on the local, national, and global scale. These challenges have contributed to “an economic squeeze not seen for decades or longer,” according to the Alaskan Seafood Marketing Institute (ASMI, 2023). Some of the challenges facing the Alaska seafood market include:

Cost Increases

- **Inflationary Pressures:** Inflationary pressures on fuel, equipment, labor, shipping costs, and cold storage costs, among others, have created significant cost increases for harvesters, processors, and distributors alike. Many global competitors do not face the same cost limits, such as those incurred for product testing, environmentally sound processing, and labor standards (Townsend, 2024).
- **Interest Rate Increases:** Higher interest rates have increased costs for both harvesters and processors and have disincentivized additional investment in the industry (Townsend, 2024).

Supply/Demand Imbalances

- **Holdover Inventories:** The COVID-19 pandemic generated a shift in consumer demand for seafood and contributed to volatility in prices. Increased supermarket demand for some Alaska species like pollock and crab increased as consumers were preparing more meals at home. In response, supermarkets and seafood suppliers purchased large amounts of frozen seafood and put it in cold storage. With increased inflation and higher consumer prices, supplier ended up with substantial remaining inventory. Historically, retailers would lower prices to clear inventory, but in 2022-2023 retailers transitioned to keeping their new purchases of wholesale supply lower and slowly moved high priced inventory out of cold storage (AFSC, 2024).
- **Increased Russian Harvests:** Harvests of pollock, sockeye salmon, and crab from Russia increased in recent years, creating excess supply. Inventories of these products have lingered, which disincentivizes retailers and wholesalers from purchasing additional products (McKinley Research Group, 2024).

- **Lower Consumer Demand:** Consumer demand for Alaskan seafood has decreased within the U.S. and globally. Nationally, inflationary pressures have contributed to demand decreases for all seafood products. Globally, Alaskan seafood competes with lower-cost products, making it a less attractive option for many consumers.
- **Lower Prices:** The factors affecting supply and demand have resulted in a substantial decline in first wholesale prices between 2022 and 2023 across all major species harvested in Alaska. A recent Alaska Fisheries Science Center economic snapshot report cited a 26% decline in wholesale revenue (\$1.2 billion) and a 32% decline in ex vessel revenue (\$617 million) between 2022 and 2023 (AFSC, 2024). This substantial change in value also contributed to loss of more than 38,000 fishing and non-fishing jobs in the US related to the Alaska seafood industry and a loss of \$4.3 billion in total U.S. output (the total dollar value of all goods and services produced) and a total decrease of \$269 million in state and local tax revenues (AFSC, 2024).

Global Market Conditions

- **Trade Conflicts:** Exports to China, traditionally a key market of Alaska seafood, have decreased substantially due to high tariffs.
- **Geopolitical Factors:** Russia has flooded the market with seafood at rock-bottom prices to fund the war in Ukraine. These products directly compete with Alaskan seafood. Additionally, in response to tariffs in the European Union, a primary market for pollock fillets, Russian seafood companies have shifted a new focus onto Asian surimi markets (Townsend, 2024).
- **Strong U.S. Dollar:** In 2023, the strength of the U.S. dollar made Alaskan seafood prices less competitive on a global scale (ASMI, 2023).

The culmination of these challenges has resulted in difficult economic conditions for Alaskan seafood markets and the processors, harvesters, and communities that participate in them. Over the last few years, delays in planned capital investments, closures of shoreside processing operations, companies listing assets for sale, and other impacts and changes in business relationships among entities with full or partial ownership in shoreside processors illustrate some of these implications (AFSC 2024). These headwinds leave the markets for many Alaskan seafood products more vulnerable to marginal changes in operational costs, product quality and value, and net revenues.

To address these market challenges, and help Alaska seafood market participants remain viable, the following policy changes have been proposed and/or enacted:

- **Loan Range Expansion:** Legislation to expand the financial support to fishing communities and businesses was introduced in both the House and Senate in 2023, titled the Fishing Industry Credit Enhancement Act. If passed, this legislation would expand the Farm Credit System to enable businesses that directly assist fishing operations to access a wider range of loans currently available to other agricultural service providers.¹⁰¹
- **USDA Commodity Procurement Program:** In 2024, the USDA purchased about 50 million pounds of Alaska seafood, including pink salmon, sockeye salmon, and pollock through the Department's Commodity Credit Corporation. The Commodity Credit Corporation purchases excess agricultural products to stabilize income and prices, which are then used in national food and nutrition assistance programs. An ASMI announcement highlighted the USDA's commitment to purchasing 15 million lbs. of Alaska pollock fish sticks for the National School Lunch Program in 2024, which is substantially larger than purchases in previous years (ASMI, 2024).
- **Ban on Russian Seafood Imports:** In 2022, the direct importation of Russian seafood products was banned via executive order. However, Russian seafood products that were reprocessed in

¹⁰¹ Congress.gov, S.1756 and H.R.4940, *Fishing Industry Credit Enhancement Act of 2023*.

third-party countries were still able to enter U.S. markets. A recent expansion on a U.S. ban of Russian seafood imports (EO 14114) took effect May 31, 2024 (Chase, 2024) intending to address this loophole. This EO may create more space in domestic markets for U.S. seafood, such as pollock.

Several new EOs have been enacted under the current administration. On January 31, 2025, the president signed E.O. 14192 Unleashing Prosperity Through Deregulation.¹⁰² To support the administration policy of reducing regulatory burden and private expenditures required to comply with Federal regulations, this E.O. requires agencies to track the incremental cost of new regulations and that the total incremental costs for all new regulations, including repealed regulations be significantly less than zero.

On April 17, 2025, the President signed E.O. 14276 Restoring American Seafood Competitiveness.¹⁰³ This E.O. articulated that it is the policy of the United States to promote the productive harvest of our seafood resources; unburden our commercial fishermen from costly and inefficient regulation; combat illegal, unreported, and unregulated fishing; and protect our seafood markets from the unfair trade practices of foreign nations. At this stage, it is unclear how these policies, combined with global factors, may change the landscape of opportunities and challenges for Alaska seafood.

4.2.1.4 Communities Engaged in or Dependent on the Pollock Fishery

This section provides information on community engagement and dependence on the B season pollock fishery (2011–2023), based on vessels' registered ownership address or community location of shore-based processing facilities. These communities are categorized in Figure 4-6 based on their type of engagement. Appendix 6 contains a series of tables with inter-annual data on community participation and dependence which are synthesized here.

¹⁰² E.O. 14192, 90 FR 9065 (2025). Available at <https://www.federalregister.gov/d/2025-02345>

¹⁰³ E.O. 142796, 90 FR 16993 (2025). Available at <https://www.federalregister.gov/d/2025-07062>

Community	CDQ group	Community size (number of persons)	Minority percentage population	Low-income percentage population	CP ownership	Mothership ownership	Inshore CV ownership	Mothership CV ownership	Shore-based processor location	CP product transfer location
Akutan	APICDA	1,589	90.8%	29.9%	NA	NA	NA	NA	1 facility (2011–2023)	NA
King Cove	NA	757	72.5%	16.4%	NA	NA	NA	NA	1 facility (2011–2023)	NA
Kodiak City	NA	5,581	67.8%	10.7%	NA	NA	4.2 CVs at 6.23% of total (2011–2023)	0.8 CVs at 5.92% of total (2011–2023)	NA	NA
Newport	NA	10,256	29.7%	20.4%	NA	NA	4.7 CVs at 7.04% of total (2011–2023)	NA	NA	NA
Seattle MSA	NA	4,018,762	41.2%	11.0%	12.7 vessels at 92.70% of all CPs (2011–2023)	1.6 motherships at 47.73% of total (2011–2023)	53.5 CVs at 80.16% of total (2011–2023)	12.0 CVs at 92.31% of total (2011–2023)	NA	NA
Unalaska	APICDA	4,254	68.8%	13.2%	NA	1.8 motherships at 52.27% of total (2011–2023)	NA	NA	3 facilities (2011–2016) 4 facilities (2017–2023)	Location of both CP and mothership product transfers

Figure 4-6 Engagement matrix for communities engaged in or dependent on B season pollock by vessel's registered ownership address, location of shore-based processing facility (2011–2023), CDQ group affiliation, and indicators for community size, minority percentage population, and low-income population

Notes: Community population (or size) data are based upon the 2020 U.S. Census. The minority percentage population and low-income percentage population are based upon the 2022 American Community Survey estimates. Color shading is provided for contrast. Blue denotes a CDQ community, purple denotes environmental justice indicators, and green denotes community participation in the pollock fishery through vessel ownership address or the location of a shore-based processor. Darker shading within a category indicates higher values.

Communities Affiliated with Catcher Processors

The CP sector receives 40% of the Bering Sea pollock directed fishing allowance. Regulations do not require CDQ groups to lease their pollock quota to AFA-eligible CPs, although it is common practice for them to do so.¹⁰⁴ From 2011–2023, 16 unique CPs participated in the B season fishery, but there has been a decline in participation over time from 15 CPs in 2015 to 11 in 2023. Of these vessels, 15 (92.70%) were registered to owners in Seattle City and one (7.30%) was registered to an owner in Anchorage.

Revenue data for CPs were grouped as “Seattle/Anchorage” for confidentiality. The gross first wholesale revenues CPs earned from AFA pollock harvested in the B season ranged from \$302.55 million (2022) to \$403.82 million (2011); the revenues earned from CDQ pollock harvested in the B season ranged from \$79.38 million (2020) to \$107.60 million (2019). CPs earned an average of \$450.05 million in gross wholesale revenue from B season pollock (CDQ and AFA harvests combined).

AFA CPs exhibit a high degree of dependence on the B season pollock fishery which accounted for an average of 55.37% of the total gross first wholesale revenues these vessels earned from all other fisheries (gear types and areas). It is more challenging to determine the degree of dependence the Seattle/Anchorage community group may have on B season pollock when viewed through the lens of CP participation because these are larger cities with more diversified economic bases. However, the first

¹⁰⁴ An exception to this harvesting and leasing pattern during the analyzed period occurred in the 2016 B season when one CV delivering to a mothership harvested CDQ pollock. As such, it is not anticipated that a different subset of communities would be identified, if vessels that harvested CDQ pollock were analyzed separately.

wholesale revenues CPs earned from B season pollock accounted for an average of 21.0% of the total revenue earned from the Seattle/Anchorage community fleet (2011–2023). The “community fleet” represents all commercial vessels with an ownership address in the same communities identified by CP ownership address.

Communities Affiliated with Motherships and Floating Processors

The mothership sector receives 10% of the Bering Sea pollock directed fishing allowance. While the sector is composed of both motherships and the CVs that deliver to them at sea, this section provides baseline information for motherships and floating processors.¹⁰⁵

Four unique floating processors/motherships operated during the B season with registered ownership addresses in Seattle MSA¹⁰⁶ or Dutch Harbor from 2011–2023. The gross wholesale revenue motherships have earned from B season pollock has decreased over time, ranging from \$140.71 million in 2011 to a low of \$72.85 million in 2020 with a slight increase in 2021 and 2022. On average from 2011–2023, motherships earned \$109.70 million in gross first wholesale revenues from B season pollock, which accounted for 58.19% of the total revenues earned by these entities. B season pollock accounted for 32.80% of the total gross first wholesale revenues by the Seattle MSA and Unalaska/Dutch Harbor community processing contingents.

Communities Affiliated with Catcher Vessels

The following section provides baseline participation and dependence information for inshore and mothership CVs. Data are presented together for these CV sectors to streamline information for the reader.

Inshore CVs were primarily registered to ownership addresses in Anchorage, Kodiak City, the Seattle MSA, and Newport. Other communities dispersed throughout Washington, Oregon, and California were also identified but represent a relatively small proportion of participants. The annual average level of participation was 74.4 vessels (2011–2023). The majority of ownership was concentrated in the Seattle MSA at 60.9 vessels (81.90% of all inshore CVs). Kodiak City is the Alaska community affiliated with the highest number of inshore CVs.

Mothership CVs had registered ownership addresses in Anchorage, Kodiak City, the Seattle MSA, and Neah Bay, WA. The annual level of participation by CVs ranged from 10 (2023) to 15 (2012 and 2015). Similar to the inshore sector, ownership was concentrated in Seattle MSA at 92.31% of all vessels that participated in this sector. Of all CVs, 8.07% have a registered ownership address in communities based in Oregon or California.

Figure 4-7 shows the number of CVs harvesting B season pollock by community of the vessel’s registered ownership address (2011–2023) to provide a sense of scale for the relative concentration of ownership in the Seattle MSA. This figure also shows a downward trend in participation over time, and a shift in CV participation towards Anchorage.

¹⁰⁵ The *Northern Victor* is a floating processor that operated outside of the Unalaska City limits from 2011–2017 and received B season deliveries from inshore CVs in its cooperative. In 2017, Icicle Seafoods moved the *Northern Victor* to Dutch Harbor (inside the Unalaska city limits) and converted it to a stationary processing facility by constructing a dock, permanently mooring the vessel by severing the connection between the engine and propeller and connecting the vessel to shoreside power. The *Northern Victor* is included in the mothership sector because the relationship between this entity and the community of Unalaska was different prior to 2017. The SSC recommended the analysts reconsider this choice and move the entity to the shore-based processing component of the analysis, but doing so would now pose confidentiality issues.

¹⁰⁶ The Seattle MSA is an urban conglomerate in Washington state that includes King, Snohomish, and Pierce counties.

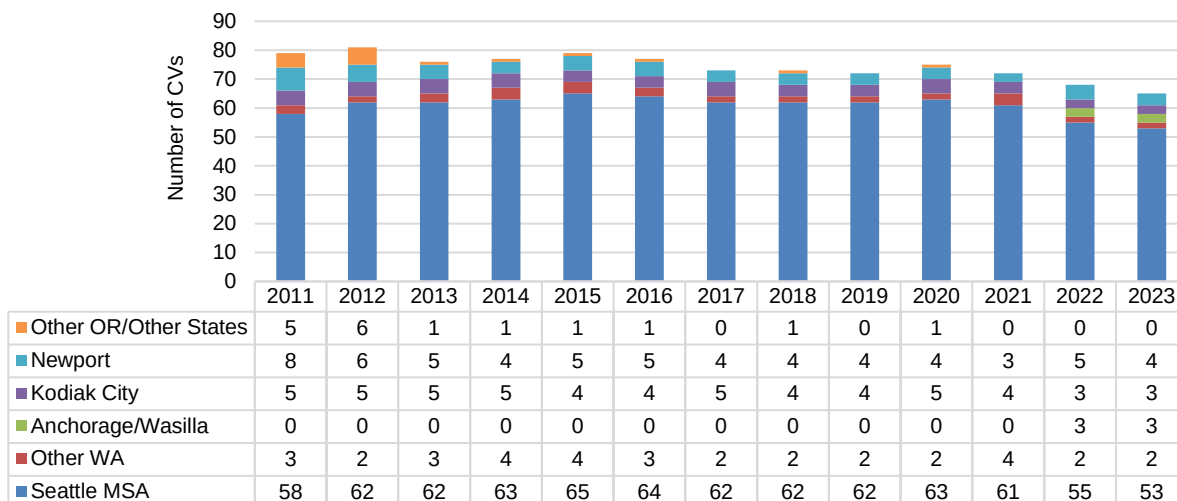


Figure 4-7 Number of CVs harvesting B season pollock by community of the vessel's registered ownership address, 2011–2023

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

The gross ex-vessel revenues that inshore and mothership CVs earned from B season pollock ranged from \$147.14 million (2020) to \$183.11 million (2012). Vessels registered in the Seattle MSA earned an average of \$141.40 million in gross ex-vessel revenue. This represented 68.08% of the total B season revenue earned by all CVs.

The majority of CVs participating in the inshore and mothership sectors during the B season pollock fishery have a historical ownership address in the Seattle MSA, followed by Newport and Kodiak. The Seattle MSA, Newport, and Kodiak “community fleets” are large and diverse. As such, the relative economic dependence of these communities on the B season pollock fishery varies. For example, the gross ex-vessel revenues earned from B season pollock accounted for approximately 2.81% of the total gross ex-vessel revenues earned from the Kodiak community fleet compared to approximately 20.13% and 20.81% of the Seattle MSA and Newport community fleets, respectively.

Communities Affiliated with Shore-based Processing Facilities

Three Alaska communities participated in the B season fishery as the location of a shore-based processor (2011–2023). Four shore-based processors operated in Unalaska/Dutch Harbor: UniSea Seafoods, Westward Seafoods, Alyeska Seafoods, and the *Northern Victor*¹⁰⁷; one shore-based processor operated in Akutan: Trident Seafoods in Akutan; and one shore-based processor in King Cove: Peter Pan Seafoods.

Revenue data for communities affiliated with a shore-based processor have been grouped as “Akutan/Dutch Harbor/King Cove” for confidentiality. The gross first wholesale revenues shore-based processors earned from B season pollock ranged from \$326.46 million (2017) to \$431.73 million (2012). These processors earned an average of \$374.21 million in gross wholesale revenue from the B season fishery.

All shore-based processors identified in this analysis are multi-species plants that participate in pollock, Pacific cod, crab, halibut, sablefish and other fisheries. On average from 2011–2023, B season pollock accounted for 43.82% of the gross revenue these processors earned from all fisheries processing activities. There have been shifts in these processors’ dependence on pollock in recent years. B season pollock accounted for 50%–60% of the total revenue that four shore-based processors earned from all processing activities in 2021. Prior to 2021, one or two shore-based processors relied on B season pollock for 50% or

¹⁰⁷ The *Northern Victor* was owned by Icicle Seafoods, but the processor was sold to Westward Seafoods in 2022.

more of their total revenue in a given year. The relative increase in dependence on the B season fishery in 2021 coincided with the recent Red King Crab and snow crab closures.

Table 4-7 provides additional information on the fisheries these processors participate in, the timing of when these fisheries occur, and an approximate level of employment during these periods.¹⁰⁸ In general, employment levels follow the ebb and flow of peak processing activities. For example, processing activities slow in these plants in mid-April when the Pacific cod fisheries slow and A season pollock is complete. As these processors transition to B-season pollock, employment levels pick up again. Some processors, like Trident's Akutan facility, take small deliveries of halibut and black cod fisheries during the lull between mid-April and early June.

These processing facilities have been designed to use economies of scale in production and move an optimal volume of fish through the processing plant at the most efficient, and cost-effective rate, given the capacity of the facility and expectations of catch and delivery rates from the pollock CV fleet. While cost data are not available for shore-based processors and would be considered confidential, the B season pollock fishery plays an important role in covering the fixed costs of these facilities.¹⁰⁹ Fixed costs for shore-based processing facilities on the Aleutian Peninsula typically include expenses related to infrastructure maintenance, utilities, property taxes, labor, insurance, and equipment depreciation. These costs can vary significantly based on the size and type of facility, location, and operational capacity, but they are generally anticipated to be substantial due to the remote setting and logistical challenges associated with the region.

¹⁰⁸ The SIA prepared for April 2024 contains a substantial amount of additional information on this topic, is incorporated by reference and summary here, and is available at the archived meeting agency for the April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

¹⁰⁹ Public comment, Pacific Seafoods Processing Association, April 2024.

Table 4-7 Summary of shore-based processors accepting B season pollock deliveries' participation in other fisheries, the timing of when these fisheries occur, and an approximate level of employment during these periods

Shore-based Processor	Community Location	Species, Timing, Employment			
Trident Seafoods	Akutan	A season pollock, cod, and opilio and bairdi crab	Halibut and black cod	B season pollock, cod, halibut, black cod and herring	Crab
		January to April	March to May	June to October	Mid-October to December
		1,000 to 1,300	200 to 300	800 and 1,200	200 to 250
Peter Pan Seafoods	King Cove	Pacific cod, crab, A season Western GOA and Bering Sea pollock	Salmon, B season pollock	Crab	
		January to mid-April	June to October	October to November	
		400	300	30	
Alyeska Seafoods	Unalaska	Pacific cod	A season pollock, opilio crab, trawl cod fisheries	B season pollock	Crab
		First two weeks of January	Mid-January to April	Late May to October	October to December
		160 to 180	400	220 to 230	75 to 150
UniSea Inc.	Unalaska	Pacific cod, A season pollock, other trawl and crab	Halibut and black cod	B season pollock and crab	Other intermittent deliveries
		January to April	May and June	June to October	October to December
		800	300 to 400	450	440
Westward Seafoods	Unalaska	Pacific cod, crab, pollock and trawl cod	Fixed gear cod, halibut and sablefish	B season pollock	Crab
		January to mid-April	Mid-April to June	June to mid-September	mid-September to mid-November
		530 to 640	190	370	110
Northern Victor	Unalaska	Cod, A season pollock	B season pollock		
		January to mid-April	mid-June to October		
		220	220		

Source: Akutan and Unalaska Community Profiles (Downs & Henry, 2023) as well as the Comprehensive Baseline Commercial Fishing Community Profile for King Cove (EDAW, 2005).

4.2.1.4.1 Community Context

This portion of the analysis provides additional information on the communities of Akutan, King Cove, Kodiak, Newport, Seattle MSA, and Unalaska. These communities were identified as being *substantially* engaged in or dependent on B season pollock based upon three screening criteria applied to fisheries-dependent data from 2011–2023: a shore-based processor was located in the community during the analyzed period, the community was a primary location of CP and mothership product offloads, and/or the community had a consistent level of participation in the fishery measured by an annual average of

more than one vessel with a local ownership address. This approach is consistent with the portion of the National Standard 8 guidelines that state, “to address the sustained participation of fishing communities that will be affected by management measures, the analysis should first identify affected fishing communities and then assess their differing levels of dependence on and engagement in the fishery being regulated (50 CFR 600.345).”

4.2.1.4.1.1 Alaska Communities

Table 4-8 provides indicators on the minority and low-income proportion of the population for Akutan, King Cove, Kodiak City, and Unalaska compared to the State of Alaska as a reference population. As shown, Kodiak City had the largest population at 5,581 persons and King Cove had the smallest population at 757 persons. The minority proportion population in these select Alaska communities is greater than that of Alaska’s general population, while only Akutan has a low-income population greater than Alaska’s general population.

Table 4-8 Select social and economic indicators for Alaska communities engaged in or dependent on B season pollock

Community	CDQ Group	2020 U.S. Census			2022 5-year ACS			
		Total Pop.	Alaska Native/American Indian Residents as Percentage of Total	Minority Residents as Percentage of Total	Per Capita Income	Number of Households*	Median Household Income	Low-Income Residents as Percentage of Total***
Akutan	APICDA	1,589	3.6%	90.8%	\$45,054	58	\$28,750	29.9%
King Cove	-	757	43.2%	72.5%	\$40,796	358	\$79,844	16.4%
Kodiak City	-	5,581	10.9%	67.8%	\$36,227	1,768	\$76,765	10.7%
Unalaska	APICDA	4,254	4.6%	68.8%	\$46,296	796	\$104,706	13.2%
Alaska	-	733,391	15.2%	42.5%	\$42,828	274,574	\$86,370	14.2%

Source: U.S. 2020 Census and 2022 ACS 5-year estimates.

* The U.S. Census Bureau defines a “minority” as anyone that self-identifies as not single-race white and not Hispanic. Information on race and ethnicity is sourced from the U.S. Census, Demographic and Housing Characteristics. The same definition and data source applies to all other minority population data reported in subsequent tables and is not repeated.

***Defined as the percentage of people in a particular geography/place whose income in the past 12 months is below the poverty level. The U.S. Census Bureau calculates several different poverty thresholds. As a point of reference, a family of four (two adults and two children) had a poverty threshold of \$29,678 in 2022).

Akutan, King Cove, and Unalaska are communities affiliated with the pollock fishery through shore-based processing, noting Unalaska has a wider reach of connections via other sectors. Table 4-9 provides a summary of population and demographic information by housing type (non-group quarters and group quarters) for these communities where B season pollock deliveries were made. The minority proportion population residing in group quarters is used as a proxy for the minority populations working at the shore-based processors in these communities. The minority proportion population residing in group quarters ranges from a low of 54.2% in King Cove to a high of 91.1% Akutan. A relatively small proportion of the population residing in group quarters identified as Alaska Native/American Indian compared to residents living in non-group quarters housing. In Akutan, the traditional village and Unanga population is highly concentrated in one area and generally insulated from commercial groundfish-related activity and its associated non-Native population. In Unalaska, a similar pattern is observed where year-round residents live in the village of Unalaska and seasonal employees live in group quarters servicing the seafood industry (Downs and Henry, 2023).

Table 4-9 Population housing type for communities where shoreside processing facilities accepting B season pollock deliveries are located

Community	Total Population	Population NOT Living in Group Quarters			Population Living in Group Quarters		
		Total Pop. Living Outside Group Quarters*	Alaska Native/American Indian Residents as Percentage of Total	Minority Residents as Percentage of Total	Total Pop. Living Outside Group Quarters	Alaska Native/American Indian Residents as Percentage of Total	Minority Residents as Percentage of Total
Akutan	1,589	113	43.4%	87.6%	1,476	0.5%	91.1%
King Cove	757	427	71.0%	86.7%	330	7.3%	54.2%
Unalaska	4,254	1,677	10.3%	65.2%	2,577	0.9%	71.2%

Source: 2020 U.S. Census.

*Defined as "other noninstitutional facilities," which excludes institutionalized populations, college/university student housing, and military quarters.

Local Economy and Links to Commercial and Subsistence Fisheries

All Alaska communities substantially engaged in or dependent on B season pollock are home to Federally-recognized tribal governments and many year-round residents engage in subsistence activities. Subsistence uses are customary and traditional uses of wild resources for food, clothing, fuel, transportation, construction, art, sharing and customary trade (AS 16.05.258(c)). However, "subsistence" holds many dimensions and is vital to the local economies and cultural practices of many rural and Alaska Native communities (Kawagley, 2006). This section highlights the fundamental importance of subsistence and the key role of sustained participation in Federal fisheries for community wellbeing in these select Alaska communities.

Akutan

Akutan is the traditional site of an Unanga² village that has been continually inhabited by the Unanga² for at least 8,000 years (Downs & Henry, 2023). Unanga² residents have historically, and continue to, harvest salmon, Pacific cod, herring, seal, wild cattle, and game birds for subsistence. A 2018 study documented the per-capita harvest by year-round residents in Akutan as 439 pounds, 76% of which was fish (Schmidt & Berman, 2018). Salmon harvests contributed to the majority of subsistence harvests of fish, but harvest levels fluctuate year-to-year depending on availability.

In terms of commercial fisheries engagement, Akutan is home to a single shore-based processing entity that is the largest seafood production facility in North America and a direct link between Akutan and the pollock fishery. From 2000–2020, the number of active vessels affiliated with Akutan by either ownership or homeport address has ranged between one and six vessels. Fixed gear groundfish and halibut IFQ have accounted for most of the landings from these vessels (Downs & Henry, 2023, 18). Pelkey's Dive Service is the only direct fishery support business active in Akutan in recent years. This operation caters to fishing vessels by changing zincs, clearing fouled propellers, among other services (Downs & Henry, 2023). Other Akutan businesses derive benefits from commercial fisheries in less direct ways. For instance, the Akutan Corporation benefits from local processing activities through sales of goods and services to plant employees at the McGlashan Store, the community general store owned by the corporation. Akutan Bay has also been the site of product transfers from at-sea processors to cargo vessels and has resulted in shared state FRLT revenues accruing to the City of Akutan (Downs & Henry, 2023).

King Cove

King Cove is an Unanga² community that has long been engaged in commercial salmon and groundfish fisheries, and there is a strong relationship between commercial fishing access and subsistence in King Cove. Salmon used for subsistence are sometimes removed from commercial catches while other species are also harvested within the context of commercial fishing. Commercial fishermen have reported

harvesting pink and chum salmon and drying them on their boat to bring back home to eat. Salmon strips are valuable gifts, and jarred salmon are used as a high value barter item (Reedy, 2019).

Vessels affiliated with King Cove participate in a commercial salmon (drift, driftnet, setnet, and Seine), halibut, cod, among others. Residents have typically delivered catches to the Peter Pan Seafoods plant in the community. The plant is set up to serve smaller vessels but takes deliveries from larger vessels like those participating in the AFA pollock fishery as well (Reedy, 2016). However, in January 2024, [Peter Pan Seafoods announced](#) the closure of the King Cove facility for the 2024 A pollock season, citing tumultuous markets, high interest rates, and financing challenges combined with the high cost of fuel. More broadly, King Cove has several marine support businesses in pot hauling, pot storage, moorage, boat watchers, and diving/welding.

Kodiak City

Kodiak City is located on Kodiak Island, which has been inhabited for the past 8,000 years by the Alutiiq, or Sugpiaq, peoples. The Alutiiq language is one of the “Esk-Aleut” languages and is closely related to Central Yup’ik.¹¹⁰ Salmon play a critical role in the subsistence economy for Kodiak Island residents. In Kodiak, as with King Cove, commercial fishing plays an important role in supporting mixed subsistence economies where residents who fish commercially often retain salmon, crab, herring, and other resources for subsistence or personal uses (Brown et al., 2023).¹¹¹

Kodiak City has been involved in large-scale commercial fisheries for over a century. Kodiak residents have been engaged in the groundfish, crab, halibut, black cod, and salmon fisheries. The majority of vessel ownership and processor location is concentrated in Kodiak City, compared to other communities across the Borough. While Kodiak City is the largest commercial fishing port in terms of the volume of seafood landed, the community has long seen fluctuations in the harvest volumes and values for the region’s commercial fisheries. Total volumes landed in the community have been subject to resource shocks in the last five years, including the precipitous drop in Pacific cod abundance since 2015, very low pink salmon returns in 2016 and 2018, and challenging dynamics in the pollock market (McDowell, 2021).

Unalaska

Unanga families in Unalaska have historically relied on marine mammals for subsistence, especially Stellar sea lion and seals; salmon have also played an important role in the subsistence economy in this community for thousands of years; the primary salmon species used locally for subsistence is sockeye salmon (Keating et al., 2022). Pacific halibut and cod are the primary nonsalmon fish harvested for subsistence uses among households in the community (Reedy & Maschner, 2014). In the past it was common for some households to obtain significant amounts of crab for household use through home pack, “cementing crab as a critical subsistence resource and part of the social economy [and] also the status and social capital of the providers” (Reedy & Maschner, 2014, 375). While residents continue to harvest crab under subsistence regulations, recent closures have reduced opportunities for locals to participate in the industry as crew and reduced home pack crab resources (Keating et al., 2022).

The residential fleet is comparatively smaller than the local fleets in other fishing communities, but residents are engaged to varying degrees in the fixed gear groundfish, IFQ halibut, IFQ sablefish, salmon, and local crab fisheries. Pacific cod has been a primary groundfish fishery for local Unalaska vessels. A frequently noted problem in developing markets and long-term relationships with the larger processing entities in the community, however, is that the locally based fleet consists of vessels that are small by Bering Sea standards (typically 18–68’ in length). These vessels are more weather dependent compared to larger vessels and have a smaller delivery capacity per trip. These factors make it more challenging for

¹¹⁰ More information is available at the [Alutiiq Museum's Archeological Repository](https://alutiigmuseum.org/) - <https://alutiigmuseum.org/>.

¹¹¹ Personal use fishing is similar to subsistence fishing, except that it is fishing with efficient gear for food in nonsubsistence areas, particularly by residents of urbanized areas, or fishing for stocks without customary and traditional uses (Fall, 2018).

larger plants to accommodate what are, by necessity, relatively small and (in most cases) sporadic deliveries (Downs & Henry, 2023).

More broadly, Unalaska's primary commercial economy is based on fishing, seafood processing, and fleet services. This community is home to a wide range of support services including accounting and bookkeeping, banking, cold storage, construction and engineering, diesel sales and service, electrical service and marine electronics, equipment and gear, hydraulic services, logistical support, marine pilots and tugs, trucking, vehicle rental, vessel repair, warehousing, among others. The community is also home to the westernmost container terminal in the United States, acting as an international hub for cargo transshipment. Two rail cranes are located in Unalaska, one at the marine center and one at a privately owned commercial dock (Downs & Henry, 2023).

School Enrollment

Appendix 6 provides supplemental figures on K-12 school enrollment trends for Akutan, King Cove, Kodiak City and Kodiak Island Borough schools, and Unalaska. These communities are home to small, geographically isolated populations where commercial fishing plays a meaningful role in the local economy, community wellbeing, and sustainability. Shrinking school enrollments may suggest a population undergoing transition. Alaska requires a minimum of 10 students to be enrolled to qualify for state funding, which helps to ensure the school can stay open, and that children in these communities have access to education close to home. Schools serve as central institutions, providing a hub for social activities, events, and community gatherings, all of which help to create a sense of identity and place.

Akutan school enrollment tends to fluctuate with fisheries sector employment. In recent years, total enrollment has been steady at 20 students, but continued state funding is an area of concern for residents. King Cove's enrollment has remained somewhat steady, due in part to dwindling populations and school closures in nearby communities (Reedy, 2019). Stable school enrollment is a concern for Kodiak Island Borough communities, which have struggled to keep schools open with declining enrollment in recent years. Larsen Bay School closed in 2018, and Karluk school closed in 2019 due to low enrollment. There is one elementary school and one high school in Unalaska with a total enrollment of 354 students in 2023, up from 342 in 2022. However, the 2023 enrollment is 7% less than the previous 5-year average which includes those years most affected by the COVID-19 pandemic.

Recent Cross-Cutting Challenges Facing Communities

As discussed in Section 4.2.1.3, the Alaska seafood industry is facing widespread challenges that affect fishery participants and communities. More broadly, communities are experiencing adverse socioeconomic impacts due to declines in fishery participation (*e.g.*, Pacific cod, crab, among others) and processing plant closures, in addition to geopolitical tensions that have impacted seafood prices. All of these factors have been compounded to a degree by the residual impacts of the COVID-19 pandemic, which include inflationary pressures, reductions in fishery participation, increased interest rates, and changes in consumer demand.

Three major seafood processing companies –Trident, Peter Pan Seafoods, and OBI – announced seasonal or permanent plant closures in response to some of the cross-cutting challenges facing the seafood industry. Processors play a central role in Alaska's coastal economy as they provide jobs for residents and non-residents that support the livelihoods of local community, contribute to the local economy through wages, taxes, and the purchase of goods, and provide stability through support of other industries like cold storage and equipment maintenance. All major seafood processors that have announced plant sales or closures operate in pollock-dependent communities, and one processor (Peter Pan Seafoods in King Cove) has been an active participant in the B season fishery until the 2024 season.

4.2.1.4.1.2 Pacific Northwest Communities

Table 4-10 provides select social and economic indicators for Newport and the Seattle MSA compared to Oregon and Washington as reference populations. The 2020 U.S. Census recorded the total population of

Newport at 10,256 persons and the total population of the Seattle MSA as over 4,000,000 persons. Newport and the Seattle MSA have a proportion of minority residents that mirrors the minority population of the states they are situated in at 29.7% and 42.1%, respectively.

Table 4-10 Select social and economic indicators for Newport and Seattle MSA compared to Oregon and Washington

Community	2020 U.S. Census			2022 5-year ACS Estimates			
	Total Pop.	Alaska Native/American Indian Residents as Percentage of Total	Minority Residents as Percentage of Total	Number of Households	Median Household Income	Per Capita Income	Low-Income Residents as Percentage of Total
Newport	10,256	2.6%	29.7%	4,551	\$57,511	\$33,541	20.4%
Oregon	4,237,256	1.5%	28.3%	1,726,340	\$75,657	\$41,805	15.8%
Seattle MSA	4,018,762	1.1%	42.1%	537,193	\$103,736	\$40,911	11.0%
Washington	7,705,281	1.6%	36.2%	3,079,953	\$57,511	\$33,541	20.4%

Source: U.S. 2020 Census and 2022 ACS 5-year estimates.

Local Economy and Links to Fisheries

Newport

Newport is located in Lincoln County, Oregon on the north and south sides of Yaquina Bay. For over 3,000 years, the Yaqo'n people inhabited the coastal area, relying on marine and freshwater resources and developing complex social networks across the land and waterways. Members of the Siletz Tribe may engage in cultural fishing in Euchre Creek Falls, Dewey Creek Falls, and at a site in Rock Creek (Norman et al., 2007).

Commercial fishing is central to the identity of Newport (Package & Conway, 2010). Newport is home to a large commercial fleet that participates in a range of local and “distant waters” commercial fisheries in Alaska including salmon, halibut, crab, tuna, shrimp, Dungeness crab, flounder, sole, rockfish, lingcod, and pollock. Vessels that participated in the B season pollock fishery and registered in Newport are a source of local employment. It is common practice for pollock vessels based out of Newport to hire crew from the community, most of which stay with the same boat year-after-year.¹¹²

More broadly, Newport’s fishing economy has long been centered on seafood processing. However, there are residual effects from the Covid-19 pandemic which drove multiple plant closures. In 2000, Newport had four processing plants that employed at least 217 people (Norman et al., 2007), but in 2022, only two seafood processors remained in the community. Employment data are limited due to confidentiality concerns. The community is also a regional hub for the fishing industry with many support sector businesses including repair, provisioning, gear manufacturing, financial services, supply services, and new boat building (the Research Group, LLC, 2021). In fact, many fishermen make this community their destination because of the support services offered (Package & Conway, 2010).

Seattle MSA

Seattle MSA area encompasses the traditional territories of the Suquamish, Duwamish, Muckleshoot, Tuulalip, Puyallup, and Snoqualmie Tribes. The area has been continuously inhabited for thousands of years with expansive trade networks. Tribal and nontribal community members may be engaged in subsistence fishing in the Seattle area, however little information is available. The Muckleshoot Tribe,

¹¹² Personal communication, H. Mann.

located southeast of Seattle, in partnership with the Washington Department of Fish and Wildlife is involved with a sockeye salmon counting program on Lake Washington (Norman et al., 2007).

Seattle MSA has long played an integral role in Alaska's commercial fisheries. The Seattle MSA fishing fleet is large and diverse with participants in Alaska groundfish, Pacific Northwest groundfish, crab, and other fisheries (Wise et al., 2022). Seattle is the home port to 300 vessels, of which 226 or 75% participate in Alaska's groundfish, crab, and salmon fisheries (Port of Seattle, 2019). In 2017, Seattle MSA's commercial fishing industry supplied 7,200 jobs. Of that, 5,100 individuals worked on fishing vessels and 4,900 of those fished in Alaskan waters. This activity supported over \$313 million in labor (\$150 million in fishing employment and \$163 million in onshore labor).

4.2.1.5 Harvesting and Processing Crew Employment

This section provides information on the number of crew persons working onboard AFA vessels prosecuting the Bering Sea pollock fishery and estimates of employees at inshore processing facilities partnered with an AFA inshore cooperative.

Inshore processing plants report their number of employees by month on a quarterly basis to the Alaska Department of Labor and Workforce Development (ADOLWD). ADOLWD compiled the data for this analysis by filtering employment statistics for fish processing facilities in partnership with inshore cooperatives under the AFA. It is important to note that all AFA inshore processing facilities often process multiple species simultaneously, and it is not possible to precisely estimate the proportion of employees engaged in the processing of Bering Sea pollock compared to all other species.

Figure 4-8 summarizes the estimates of total onboard positions on AFA vessels in all sectors by year, as well as the annual average level of employment at AFA inshore processing facilities from 2014–2023. Estimate of total crew positions onboard AFA vessels have remained relatively stable during the analyzed period, although there was a slight decrease from 2014 to 2015. Likewise, estimates of workers at inshore processing facilities have remained relatively stable except for 2020 which coincides with the global COVID-19 pandemic. In 2020, employment levels were lowest in July, August, and September (Quarter 3) at 1,200 persons and October, November, and December (Quarter 4) at 1,045 persons.

Figure 4-9 provides a breakdown of the onboard positions for CPs, motherships, and CVs (inshore and mothership sectors combined) from 2011 to 2023. Across all sectors, the estimated number of positions as remained relatively stable across the analyzed period.

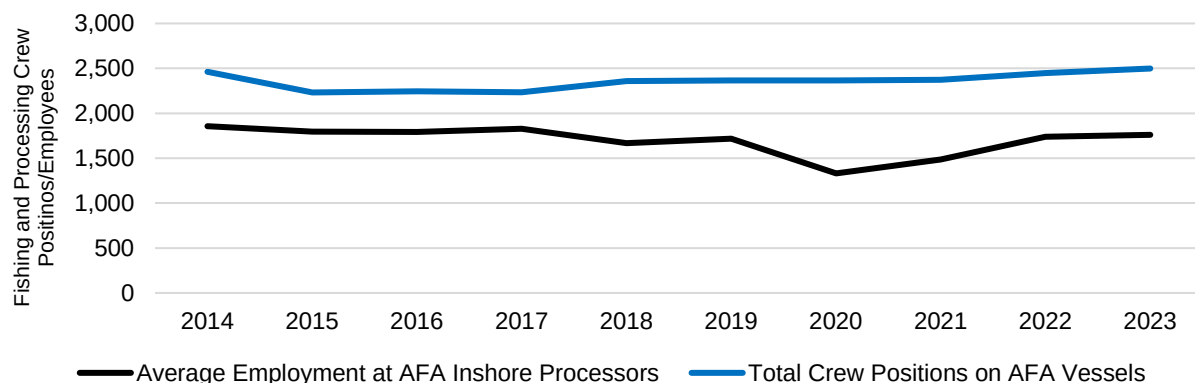


Figure 4-8 Employment on AFA vessels and at AFA inshore processing facilities, 2014–2023

Source: AKFIN and ADOLWD.

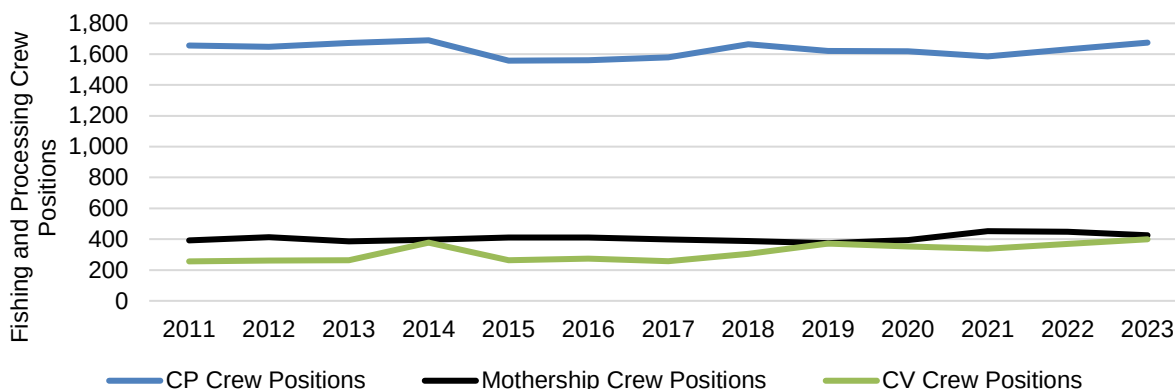


Figure 4-9 Employment on AFA CPs, motherships and CVs, 2011–2023

Source: Alaska Fisheries Information Network.

4.2.1.6 Effects of Human Actions on the Pollock Fishery

Human actions, including the authorization and prosecution of the Bering Sea pollock fishery, have had and continue to have wide-ranging effects on the health, cultural, economics and well-being of individuals and communities that are engaged in or dependent on the pollock fishery, many of which are described at length in documents incorporated by reference (see Kasperski, 2024; NMFS, 2016; NPFMC, 2009; NPFMC, 2025) in addition to the information and impact analysis provided in the preceding sections. The authorization and prosecution of the Bering Sea pollock fishery described at the beginning of Chapter 3 is also relevant. The impact analysis throughout this RIR inherently considers these impacts, and that economic and market conditions, including challenges that have been experienced in recent years, would continue.

4.2.2 The Community Development Quota Program

The CDQ program was implemented in 1992 to provide coastal Western Alaska communities an opportunity to participate and invest in Federally managed BSAI fisheries. In doing so, the program was intended to promote economic development in eligible communities, alleviate poverty, and provide other social benefits. The CDQ program allocates a portion of the quota for Federally managed fisheries in the BSAI region to six entities known as CDQ groups. The six CDQ groups represent 65 communities, and the groups earn revenue from their allocations. These revenues are then used to make other investments or provide community-related benefits.

4.2.2.1 Revenue from Direct CDQ Pollock Allocations

The CDQ Program receives 10% of the Bering Sea pollock TAC which is sub-allocated among the CDQ groups. Bering Sea pollock is a high volume and high value fishery, and the revenue earned from this allocation has been a large source of each group's revenue.

Figure 4-10 shows the gross first wholesale revenue associated with CDQ allocations of BS pollock compared with CDQ allocations of BSAI crab, halibut, Pacific cod, and other groundfish. Due to confidentiality restrictions, quantitative information for individual CDQ groups cannot be provided thus these figures are aggregated across all groups. The left-hand figure demonstrates the proportions of gross first wholesale revenue averaged across 2011–2023, whereas the right-hand figure demonstrates the proportions of gross first wholesale revenue for 2023 only. From 2011–2023, CDQ pollock generated an average of \$149 million in gross first wholesale revenues annually, across all CDQ groups. As shown in Figure 4-10, this represented 60% of the total gross first wholesale revenues derived from CDQ allocations of species in the BSAI.

The revenues earned from the pollock fishery have played an increasingly important role in recent years as other species, such as snow crab and red king crab have declined. This trend can be observed in the revenue data from 2023 which included crab fishery closures and low crab TACs. In 2023, the relative proportion of first wholesale revenues derived from Bering Sea pollock increased with the decrease in crab revenues, as well as revenues from halibut and Pacific cod. In this year, pollock CDQ accounted for over \$162 million and represented 70% of the total revenues from BSAI allocations. Crab CDQ revenues represented 5% of the total gross first wholesale revenues in that year.

One caveat to Figure 4-10 is that the first wholesale values used do not account for the proportion of the wholesale value that may be realized by the groups based on the way in which the CDQ species were harvested. The CDQ groups use different approaches to harvesting their CDQ pollock allocations. One group (*i.e.*, CVRF), has recently harvested the majority of its pollock CDQ on a vessel it fully owns.¹¹³ However, most pollock CDQ is leased to independent or partner companies to be harvested and processed on CPs. In these instances, multi-year contracts are often agreed to in which CP companies will pay a lease fee for the additional pounds of pollock to harvest, process, and market.¹¹⁴ Compared to the types of direct investments described below, revenue from the leased CDQ allocations are relatively stable and predictable sources of revenue.¹¹⁵ The CDQ group may be more disconnected from the fluctuations in direct operational costs and market dynamics through leasing arrangements. However, in leasing the quota the group may receive a fraction of the royalties, not the full value of the harvested species. Note that many other species' CDQ represented in Figure 4-10 is also leased, therefore the groups would also only receive a fraction of the gross wholesale values from these species as well.

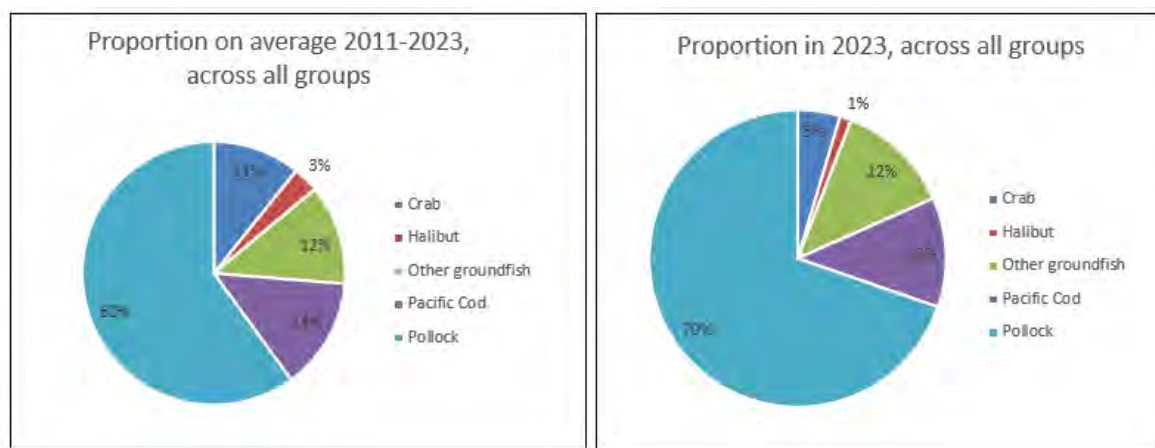


Figure 4-10 Annual average gross first wholesale revenues (millions of \$) associated with CDQ allocations by species, 2011–2022

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

4.2.2.2 Investments into AFA Sectors

All CDQ groups are engaged in the BS pollock fishery through their direct allocation; however, most of the groups are also engaged through other investments into the BS pollock fishery. This context is useful in understanding the depth and scope in economic impacts that may be incurred from the proposed alternatives should they result in forgone net revenue from reduced pollock harvest or increased costs associated with harvesting.

The AFA requirement that vessel-owning entities be at least 75 percent owned and controlled by U.S. citizens resulted in foreign-owned companies divesting majority ownership interests in vessels engaged in BSAI fisheries, which, in turn, provided CDQ groups greater opportunities to acquire equity interests in

¹¹³ Personal communication, P. Wilkins.

¹¹⁴ Personal communication, L. Fanning.

¹¹⁵ Personal communication, W. Jones.

those entities than would have otherwise been the case. CDQ groups became sought-after business partners for their political capital as well as their CDQ quota, resulting in financing arrangements being extended to CDQ groups that were not previously available to them.

Expanding ownership interests in AFA vessels is one-way CDQ groups have worked to meet the economic and social goals of the CDQ Program.¹¹⁶ Investments in subsidiaries, such as limited liability corporations (LLCs), allow CDQ groups to wholly or partially own vessels directly related to fisheries. Ownership of AFA vessels increase the CDQ group/ subsidiary's holdings of quota in the AFA fishery by providing revenue through the direct catch and sale of pollock.

As of July 2024, 5 of the 6 CDQ groups had ownership interests in AFA vessels (Table 4-11). These ownership interests are often highlighted in CDQ groups' Annual Reports but are not systematically updated in aggregate through a data source accessible to analysts. These ownership interests were updated with direct input from CDQ representatives and vary considerably from ownership reported in NMFS CDQ report in 2018. The table demonstrates that 3 CDQ groups (BBEDC, CVRF, and NSEDC) currently have full or part ownership in 3 CPs, 5 CDQ groups (BBEDC, CBSFA, CVRF, NSEDC, and YDFDA) have full or part ownership in 30 of the AFA CVs that actively fish pollock. Two CDQ groups (CVRF and YDFDA) also have an ownership interest in motherships that can process AFA pollock.

Using the ownership percentages from this table and applying it to the pollock allocations associated with each entity, analysts estimated that **28.7% of the total Directed Pollock Fishery (i.e., CDQ + additional AFA pollock quota) is associated with CDQ groups**. There are several important caveats to this calculation. These ownership relationships are more nuanced than conveyed in Table 4-11. In some cases, the CDQ ownership connection is more direct, which can also mean more direct connections to the gross revenue produced by the vessel as well as the fixed and variable costs of pollock fish and chum salmon avoidance. Conversely, some investments are more indirect, in which case royalties and operational decisions may not be as direct. In addition, as described above, CDQ pollock as well as some AFA pollock is typically leased. Therefore, it may not be the case that the CDQ groups receive 28.7% of the total net revenues from the pollock fishery due to these additional factors. However, this estimate demonstrates the additional CDQ groups' investments into and reliance on the AFA fishery above the CDQ allocations.

¹¹⁶ This type of CDQ group ownership investment growth is not unique to the BS pollock fishery managed under the AFA program. For example, it has also been seen in the context of the BSAI crab rationalization program, where CDQ groups have come to have substantial ownership interest in the non-CDQ portion of the fishery, both in terms of crab vessels and crab quota shares, including processor quota shares, with those types of ownership interests increasing over the course of that program. In addition, investments in harvesting and processing capacity provide revenue stream through contractual agreements to harvest other CDQ group's quota, profit sharing, and chartering commercial fishing vessels to government agencies conducting stock assessment surveys.

Table 4-11 CDQ investments in fishery companies and AFA vessels as of July 2024

CDQ Group	Name of Company	CDQ Ownership	Vessel Name	Vessel Type	Recent Coop
BBEDC	Dona Martita	50.0%	Defender (new vessel)	CV	Westward
			Defender (old vessel)	CV	Unisea
			Alaskan Defender	CV	Westward
			Bering Defender	CV	Westward
			Northern Defender	CV	Unalaska
	Arctic Storm Holding Company	18.3%	Arctic Fjord	CP	PCC
			Neahkahnie	CV	HSCC
			Arctic Storm	CP	PCC
CBSFA	St. Paul Fishing Company	75.0%	Sea Storm	CV	HSCC
			Starlite	CV	Unisea
		30.0%	Starward	CV	Unisea
			Fierce Allegiance	CV	Unisea
CVRF	Coastal Alaska Premier Seafoods	100.0%	Northern Hawk	CP	PCC
	Excellence Seafood LLC	100.0%	California Horizon	CV	Mothership CVs
			Misty Dawn	CV	Mothership CVs
			Morning Star	CV	Mothership CVs
			Papado II	CV	Mothership CVs
	Phoenix Processor LP	7.6%	Excellence	MS	Mothership
			Tenacious	MS	Mothership permit
CVRF (50%) / NSEDC (50%)	BSAI Partners	75.0%	Alaska Rose	CV	Unalaska
		75.0%	Bering Rose	CV	Unalaska
		78.9%	Destination	CV	Unalaska
		51.0%	Great Pacific	CV	Unalaska
		75.0%	Sea Wolf	CV	Unalaska
		75.0%	Ms. Amy & Messiah	CV	Unalaska
	Bering North	75.0%	Progress	CV	Northern Victor
			Sunset Bay	CV	Northern Victor
			Half Moon Bay	CV	Northern Victor
			American Eagle	CV	Northern Victor
			Commodore	CV	Northern Victor
			Hickory Wind	CV	Northern Victor
			Patricia Lee	CV	Northern Victor
			Storm Petrel	CV	Northern Victor
			Ocean Hope 3	CV	CV permit
NSEDC	Glacier Fish Company	71.9%	Alaska Ocean	CP	PCC
YDFDA	Nunam Iqua Harvester	100.0%	Aleutian Challenger	CV	Mothership CVs
	Kotlik Challenger	100.0%	Pacific Challenger	CV	Mothership CVs
	Alakanuk Beauty	75.0%	American Beauty	CV	Mothership CVs
	Emmonak Leader	76.8%	Ocean Leader	CV	Mothership CVs
	Golden Alaska	58.3%	Golden Alaska	MS	Mothership

Source: Personal communication L. Price; J. Kauffman; P. Peyton; A. Drobnica; P. Wilkins; S. Kinneen

Note there are some AFA vessels with CDQ ownership that do not actively fish, but the AFA permits are retained and fished on other vessels. This is the case for the Ocean Hope 3 (Bering North; CVRF/NSEDC) as well as Ms. Amy & Messiah and the Destination (BSAI Partners; CVRF/NSEDC ownership in the associated AFA permits). This is also the case for the mothership permit assigned to Tenacious. Ownership of these AFA permits and access to their associated pollock continues to provide benefits to these CDQ groups. Additionally, CBSFA has indirect interest in American Seafoods, which owns several CPs. Given the indirect nature of this ownership structure, it was not included in this table.

4.2.2.3 CDQ Communities and Regional Economies

The information provided directly above highlights the different ways that CDQ groups and the communities they represent are engaged in or dependent on the Bering Sea pollock fishery, while noting the magnitude of participation and dependence varies. This portion of the analysis provides information on CDQ regional economies, communities, and programmatic benefits.

The CDQ groups and their communities are diverse, spanning the entire length of the Bering Sea coast. CBSFA represents one Unanga community with a total population of 413 persons whereas CVRF represents 20 Yup'ik communities with a total population of 9,691 persons (Table 4-12). The proportion of Alaska Native/American Indian residents is greater than Alaska in most CDQ regions, which encompass the ancestral lands of the Unanga, Sugpiaq, Central Yup'ik, the St. Lawrence Island Yup'ik, and Inupiaq peoples. The APICDA region is an exception to trend, but Akutan, Unalaska, and False Pass are home to shore-based processing facilities with a high number of minority workers captured by the U.S. Census at their "usual place of residence." The demographics of the processing workforce can overshadow the small, predominately Alaska Native populations residing within the traditional community footprints. Year-round residents make up a smaller portion of the overall population and many residents are Alaska Native (Downs & Henry, 2023).

All CDQ regions have a high proportion of minority and low-income residents. The cost of living in these communities is high because goods have to be transported long distances, usually by air or seasonally by barge, to areas with limited transportation and distribution infrastructures. Among communities on the Aleutian Peninsula, aside from housing, groceries are the largest household expenditure (Reedy, 2016). Permanent wage employment in smaller villages is typically scarce and often limited to jobs within local school districts or various tribal-related entities including tribal councils, non-profits, and ANCSA chartered village corporations.

Table 4-12 Select social and economic indicators for CDQ groups and communities compared to the State of Alaska

CDQ Group	Communities	Total Pop.	Alaska Native/American Indian Residents as Percentage of Total	Minority Residents as Percentage of Total	Number of Households	Median Household Income	Per Capita Income	Low-Income Residents as Percentage of Total
APICDA	6	2,186	11.8%	92.8%	143	\$53,740	\$25,996	39.7%
BBEDC	17	5,178	63.4%	70.7%	1,545	\$51,717	\$32,688	35.6%
CBSFA	1	413	86.7%	88.9%	78	\$60,000	\$31,903	45.0%
CVRF	20	9,691	95.0%	97.2%	2,044	\$40,867	\$18,000	35.4%
NSDC	15	9,207	74.5%	92.1%	2,553	\$49,671	\$19,695	38.6%
YDFDA	6	3,284	94.5%	97.8%	1,118	\$37,901	\$13,103	37.9%
All CDQ	65	29,959	76.9%	90.6%	7,481	\$52,506	\$22,250	37.0%
Alaska	-	733,391	15.2%	42.5%	274,574	\$86,370	\$42,828	14.2%

Source: 2020 U.S. Census and 2022 5-year ACS estimates.

Historically important subsistence resources vary by region and community, depending on their seasonal availability. For example, Unanga communities across the APICDA region have relied on salmon, cod, herring, rockfish, crab, among others. Traditionally used species for St. Paul (CBSFA) residents include seals, halibut, crab, and some groundfish. It is fairly common practice for St. Paul residents harvesting seal and halibut to exchange those resources for salmon with other communities (Wise et al., 2022).

Sugpiaq and Yup'ik communities across BBEDC, CVRF, and YDFDA communities rely on all five species of Pacific salmon found in Alaska. While salmon may be eaten fresh, they are also preserved using traditional methods like drying, smoking, freezing, canning, salting, pickling or fermenting (Brown et al., 2023). Nonsalmon species are also important components of subsistence harvest, especially various species of whitefish (*e.g.*, sheefish, broad whitefish, humpback whitefish, Bering cisco, and least cisco); other important nonsalmon fishes to the region's communities include herring burbot, Northern pike, and Arctic grayling (Brown et al., 2015). In the Norton Sound region, traditionally used subsistence species

include seals, walrus, and beluga whales for communities in the north and fish to the south including chum salmon (Tremayne et al., 2018).

Many communities are characterized by mixed economies that include both a commercial and subsistence component. In a mixed economy, cash income earned from commercial fishing or other wage employment is used to purchase goods like fuel oil, electricity, clothing, as well as other goods necessary for subsistence activities like firearms, ammunition, nets, boats, or snowmachines (Wolfe, 2004). Subsistence food production is directed toward meeting the needs of families and communities, not market sale as in commercial production. It is this combination of money from paid employment and subsistence food production that characterizes the mixed, subsistence economies in many areas (Fall 2018).

Commercial fishing and processing are economic mainstays across the CDQ regions. For example, a number of St. Paul residents are involved in commercial fishing as vessel owners, IFQ holders, and/or crew license holders (Himes-Cornell et al., 2013). The local fleet operating out of St. Paul focuses almost exclusively on BSAI halibut fisheries which is a major source of employment, income, and subsistence for the community. Compared to CBSFA's other CDQ groundfish allocations, halibut can be harvested with small boats and provides an opportunity for income to be earned directly by CBSFA members. St. Paul is also a commercial fishing hub that provides support services to a variety of vessels and operation types, and the community is home to one large shore-based processing facility owned by Trident Seafoods. This facility was a major crab processing plant prior to rationalization and has remained so post rationalization.

Kwik'pak Fisheries is a subsidiary of YDFDA and was formed in 2002 to provide economic security to villages on the Yukon River Delta. It has historically processed and exported salmon from Emmonak. Commercial salmon fisheries have not been open in recent years due to Chinook salmon and chum declines, and Kwik'pak Fisheries has not operated as a fish processor since 2020. Prior to recent years, Kwik'pak Fisheries was a top employer for some YDFDA communities including Emmonak and Alakanuk (located eight miles apart from each other). During the plant's peak season, which included salmon and freshwater whitefish, the plant employed a maximum of 185 people (Himes-Cornell et al., 2013).

In the Norton Sound region, shoreside processing has historically taken place in Nome, Saint Michael, Savoonga, and Unalakleet. Norton Sound Seafood Products is a subsidiary of NSEDC with shore-based plants located in Savoonga, Unalakleet, and Nome.¹¹⁷ Norton Sound has the northernmost fisheries for both Pacific herring and red king crab. Residents across the region hold commercial fishing permits (e.g., salmon and herring) issued by the Commercial Fisheries Entry Commission (Himes-Cornell et al., 2013).¹¹⁸

4.2.2.4 Social and Economic Benefit Programs

The information provided directly above is important context for understanding the types of social and economic benefits the various groups have worked to provide to their regions and communities. This is an important point, in that the benefits provided by CDQ groups extend beyond their constituent communities. As an example, APICDA's Haginaa Kidul (*Helping to Grow*) Vocational Scholarship is available to residents from the APICDA Communities of Akutan, Atka, False Pass, Nelson Lagoon, Nikolski, St. George and the Aleutian region communities of Adak, Cold Bay, King Cove, Sand Point, and Unalaska. This portion of the analysis relies on recently available information in CDQ group annual reports (2018–2023), but the groups and the broader social and economic contexts they operate in are

¹¹⁷ 2022 Arctic-Yukon-Kuskokwim Region Shore-based Processors by Port.

(https://www.adfg.alaska.gov/static/fishing/pdfs/commercial/maps/ayk_shorebased_processors.pdf, accessed November 26, 2023).

¹¹⁸ Mining is another economic driver in the region, with some tin and polymetallic resources found in the area and several small gold mines in operation around Nome. Some tourism occurs in conjunction with the Iditarod, the last third of which runs from Unalakleet to Nome within the NSEDC region.

dynamic. It is expected that some of this information may be outdated, and the full scope of programs and benefits cannot be adequately captured here.

One of the most tangible benefits the CDQ groups have been able to support are employment opportunities for residents. In 2023, APICDA employed 183 individuals that earned more than \$1.6 million in compensation (APICDA, 2023); CVRF employed 783 individuals including Board members, youth to work, and intern employees that earned \$4.8 million in wages (CVRF, 2023); and YDFDA and its subsidiaries employed 396 in-region residents who earned \$4.5 million in wages (YDFDA, 2022).

BBEDC runs a Seasonal Employment Opportunities Program that provides short-term employment opportunities ranging from 4–16 weeks. In the 2022 seasonal employment cycle, BBEDC employed 26 people earning \$189,158 in compensation (BBEDC, 2022). Employment opportunities are available with BBEDC partners on pollock boats, longliners, crab boats, multi-species bottom fish boats, floating processors, and at shore-based processing facilities. More broadly, BBEDC assists residents interested in working with fishing companies operating in the Bering Sea. These efforts include help with submitting applications to specific companies, pre-employment screenings, traveling to a job site, and obtaining gear and supplies that are necessary for new hires.

Many CDQ groups provide jobs associated with shore-based fisheries development in their regions. For instance, NSEDC's Norton Sound Seafood Products has operated processing plants and purchasing stations throughout the region that provide commercial fishing and employment opportunities to residents. Norton Sound Seafood Products supported local fishermen through the purchase of four species of salmon, halibut, cod, and red king crab. Operating processing plants in Nome, Unalakleet, and Savoonga; buying stations in Shaktoolik, Golovin, Moses Point (Elim), and Koyuk, and a fleet of tender vessels in 2022. NSEDC's 2023 Annual Report notes 109 seasonal employees processed nearly 1.2 million pounds of fish product in Norton Sound Seafood Product processing plants in Unalakleet, Nome, and Savoonga earning \$721,052 in wages; 17 residents from NSEDC member communities were employed at buying stations earning \$222,749 in wages.

YDFDA's Kwik'pak Fisheries has provided funding for the Emmonak Tribal Council's fish processing plant. Capital investments in processing equipment have allowed plants to produce processed seafood products for sale in global seafood markets. Kwik'Pak Fisheries did not have commercial operations in 2021 and 2022 as a result of the poor projected salmon run sizes on the Yukon River. However, Kwik'pak workers have transitioned to assisting with the development and expansion of the Youth Agricultural project by developing site upgrades, helping to construct additional greenhouses, among other tasks. In 2022, Kwik'pak Fisheries employed 33 people earning \$643,342 in wages (YDFDA, 2022).

Alongside employment opportunities in commercial fishing and processing, many CDQ groups employ residents for fisheries research, environmental stewardship, and advocacy efforts. Through partnerships with ADF&G and NOAA, YDFDA provides funding for local technicians to participate in regional fisheries research projects such as salmon and Lamprey test fisheries as well as juvenile salmon outmigration. In 2022, YDFDA employed 39 people across these various research projects who earned a total of \$562,076 in wages (YDFDA, 2022). NSEDC supports sustainable fisheries management by providing data to partners, ADF&G and NOAA, through projects with the Norton Sound Fisheries Research and Development (NSFR&D) Department. In 2023, NSFR&D projects ranged from salmon sustainability and enumeration, salmon lake fertilization, salmon acoustic tagging, waterways cleanup, salmon restoration and incubation, and halibut tagging. In total, NSFR&D employed 53 people earning wages totaling \$494,438 (NSEDC, 2023).

BBEDC's Vocational/Technical Training Program aims to help those who are unemployed or under employed gain required certifications or attend trainings to increase employability. The program also works with residents that need training to maintain current certifications or that are mandated by their employer. In 2022, 43 applications were approved giving BBEDC CDQ residents training funding at a total expense of \$158,381 (BBEDC, 2022). CVRF's Youth to Work Maritime Program has offered local

Alaska Native youth opportunities for training and experience in commercial fishing fulfilling requirements for a certificate in nautical skills from the Alaska Vocational Technical Center in Seward; in 2023, 36 students received basic skills training and maritime education (e.g., knots, different roles and stations on ships, and more) (CVRF, 2023).

Many CDQ groups have provided financial support for local participation in small boat fisheries.

CBSFA has provided the local fleet in St. Paul harvesting opportunities by leasing its CDQ halibut to the fleet. The group also provides support services for these fishermen through its Local Fleet Support program and worked closely with Trident Seafoods to provide halibut processing services. In a typical year, CBSFA purchases the halibut from the local fleet and partners with Trident Seafoods to process and market the fish. Any halibut CDQ not able to be caught by the local fleet is leased to the *F/V Saint Paul* and *F/V Saint Peter*, vessels wholly owned by CBSFA, if the vessels are available at the end of the season (CBSFA, 2021).

APICDA has supported the Nelson Lagoon Coho Fishery, a cooperative project between APICDA and Peter Pan Seafoods designed to extend the fall coho fishing season and market access for resident fishermen in Nelson Lagoon. In 2022, this program extended fishing opportunities for five days which allowed fishermen to earn additional income before the end of the season (APICDA, 2022).

CDQ groups also provide emergency assistance through access to capital and other resources for fishermen when things go awry during the season. BBEDC has an in-season emergency provision, helping fishers who experience engine or drive train failures during the season to get back on the water. In 2022, BBEDC spent \$70,000 helping two resident fishermen replace their engines (BBEDC, 2022).

CDQ groups provide benefits to their regions and communities by supporting community development and infrastructure. APICDA awarded member communities a total of \$1.8 million in funding, \$300,000 per member community, through its Community Development Grant Program in 2023 to support projects. These projects are identified through an inclusive community-wide strategic planning process undertaken annually by leadership from the local tribal government, Alaska Native Corporation, and municipal government with additional engagement from APICDA employees. Some examples of community-specific projects funded by this grant program include job creation and infrastructure development in Atka, Harbor house construction in False Pass, marine debris beach cleanup in Nelson Lagoon (APICDA, 2023).

BBEDC operates the Community Block Grant Program which provides BBEDC communities with the opportunity to fund projects that promote sustainable community and regional economic development. With over \$116 million in community grants since 2002, the Board of Directors allocated \$500,000 per BBEDC community in 2022. Examples of community-specific investments include the purchase of heavy equipment (a loader) for Aleknagik, Ekwok, and Port Heiden, Tribal facilities or buildings in Dillingham and Levelock, library construction in Egegik, home heating fuel/electric assistance in most BBEDC communities, among others (BBEDC, 2022).

CBSFA has supported the Elders Residential Assistance Program which provides annual payments of \$4,000 per household to energy suppliers or housing entities on behalf of community elders. Additionally, the Community Internet Service Contribution is a joint venture between Tanadgusix Corporation and CBSFA to increase the local internet speed in Saint Paul (CBSFA, 2021).

All CDQ groups have provided post-secondary educational scholarship opportunities to residents.

While the CDQ Program is intended to support economic and social development activities in eligible communities, many non-CDQ communities also benefit from an educated and well-trained workforce that is able to work in local, fisheries-based positions. Fishermen and community members from non-CDQ villages utilize the infrastructure, including maintenance and repair facilities, and training available as a result of CDQ revenues. In addition, non-member fishermen contribute catch to CDQ processing plants and residents of non-member communities gain employment in CDQ-related projects.

Several CDQ groups also support salmon assessment and enhancement projects intended to benefit salmon runs throughout western Alaska. For example, NSEDC supports the Norton Sound Fisheries Research and Development program to increase regional knowledge and understanding of fishery resources through salmon enumeration projects, salmon enhancement projects (incubation and salmon lake fertilization), research projects involving salmon, halibut, and cod tagging, among others.

CVRF's People Propel provides financial subsidies for adult resident's purchase of ATVs, outboards, snow machines, and skiffs which offsets the expense of equipment frequently used for work, life, and subsistence. In 2023, CVRF invested \$1 million into equipment purchases through its People Propel program benefitting 258 residents (CVRF, 2023). Additionally, in a partnership with Honda Motor Company, CVRF has developed Mechanic/Welding Shops in 18 of their communities to service equipment vital to subsistence (*e.g.*, ATVs, snowmachines, boats, etc.) as well as other mechanical household needs. CVRF has hired certified mechanical technicians for these shops and residents can pay for labor and parts or they can rent the space to do their own maintenance (Hughes, 2023). In 2023, CVRF announced its acquisition of the All Seasons Honda and Peninsula Ski-Doo dealership in Homer, which will provide the region with technical training, better access to parts, and in-region Honda warranty repair work, meaningfully lengthening the service lives of Honda equipment for residents (CVRF, 2023).

4.3 Effects of Alternatives on the Pollock Industry and Communities

This section examines the potential economic and social impacts of the proposed alternatives on participants in the Bering Sea pollock fishery, CDQ groups, and associated communities, relative to no action (Alternative 1). This section primarily focuses on the potential cost categories from displaced fishing effort with possible decreases in efficiency, as well as the possibility of reduced gross revenue from a B season closure of a fishery, closure of a fishing area, or reduced product quality. Other impacts that are qualitatively addressed include avoidance costs, potentially adverse effects on crew and processing workers' employment, as well as social and cultural effects within and across communities.

An evaluation of potential costs is designed to meet the requirements of EO 12866, which requires an evaluation of the costs and benefits of the alternatives, to include both quantifiable and qualitative considerations. An appropriate scope for a BCA on the marginal impacts of the proposed alternatives compared to the conditions observed under status quo includes the expected impact on net revenue (*i.e.*, profits). This type of analysis requires access to empirical data on cost categories, gross revenue data, and a way to predict the behavioral changes that may influence these variables. Without accurate verifiable cost data and operational information for the pollock trawl fleets operating in the BSAI, gross revenue estimates constitute the "best" empirical economic information available, although changes in first wholesale (or ex-vessel, as appropriate) gross revenues cannot be regarded as indicative of net results. That said, these estimates represent the current limit of the analysts' ability to empirically characterize the expected outcome for each sector in the pollock fishery, from the changes in chum salmon PSC management under consideration. Thus, the primarily qualitative approach employed in this section is the result of limited available empirical data on cost categories, in addition to the uncertainty of fishing behavior changes in response to the alternatives considered. This analysis includes primarily qualitative descriptions of avoidance costs and the expected effect of the proposed alternatives on the direction of those costs.

While the analysts acknowledge the limitations of this approach in providing quantitative information on the magnitude of these marginal changes, which also inhibits the ability to calculate expected net benefits, this method was chosen for a number of reasons. The deficiency in operational cost data as well as uncertainty around the specific ways fishing behavior would change means that qualitatively contextualizing the retrospective harvest patterns and associated gross revenues are the best available proxy for impacts on net revenue. Additionally, the qualitative discussion can provide context to the types of impacts that may be expected and the directionality of impacts.

4.3.1 Alternative 1

Under Alternative 1, the current chum salmon bycatch regulations would remain in place (see Section 2.2). These regulations primarily include those that are specified for the salmon bycatch IPAs at 50 CFR 679.21(f)(12)(iii)(E). A primary management tool for chum salmon avoidance is the RHS program that operates during the B season and provides incentives for pollock operators to avoid areas on the fishing grounds with high chum salmon bycatch rates. It is expected that the RHS program would continue to exist as is under Alternative 1 (No Action), as would vessel behavior and any associated costs.

The RHS program closes discrete areas on the pollock fishing grounds to some vessels when chum salmon bycatch rates are unacceptably high, and it creates incentives for pollock operators to keep their vessel bycatch rates low to not risk losing access to good fishing areas in a given week. To the extent that the RHS program, or any other provisions within the IPAs, require an operator to alter their fishing pattern, whether in time or space, is likely to impose additional costs on that operator. Thus, even under existing regulations, chum salmon bycatch avoidance measures likely result in “avoidance costs” such as increased fuel costs, reductions in harvesting efficiency or product quality as well as the potential for costs associated with longer seasons that may result from more inefficient fishing.

Despite the common occurrence of these types of costs and influence other Council action have likely had on these types of costs (*e.g.*, as predicted in amendment 91, amendment 110, and commonly referenced in the amendment 91 Vessel Masters Survey), systematically teasing out precise costs associated with bycatch avoidance relative to other operational costs remains inherently difficult, even under the status quo. Many of these costs are embedded in the way the fleet operates (for example, in reliance on communication and use of the RHS program data to choose the next fishing location) which makes it difficult to quantify these baseline conditions.

These baseline conditions included changes that were taken 2022 and beyond in response to Council and public requests for increased chum salmon avoidance. Since this time, each sector’s IPA has been amended and fleet behavior has likely changed in response. These changes may have vessel-level avoidance costs, such as increased movement and fishing in sub-optimal pollock locations.

In this analysis, any avoidance costs associated with this behavioral change are attributed to status quo regulations, because operational changes associated with these changes have occurred prior to current proposed regulatory changes. However, as described in Section 4.3.3.1 below, the adoption of Alternative 4 would essentially codify many of the actions that have been specified by amended IPAs, which means additional fleet movement and any associated avoidance costs may persist under Alternative 4.

Section 4.2.1.4 and the relevant subsections provide information on Alaska and Pacific Northwest communities’ engagement and participation in the B season pollock fishery under the status quo (2011–2023). Sections 4.2.2.3 and 4.2.2.4 provide information on the regional economies and socioeconomic benefit programs provided by CDQ groups. To streamline information for the reader, that information is not repeated here. Continued chum salmon PSC management under the existing regulations would be expected to result in the social and economic conditions at the local, regional, and state level to continue along current trends described above.

Industry may bear other indirect costs, although not required by regulation that support their implementation of regulatory requirements associated with salmon bycatch reduction. One example are the live feed camera systems that are used by all CPs and six CVs. These camera systems were originally used during the development of salmon excluders to ensure the device was taking its proper shape. They provide a front facing view of the composition of the catch entering the codend. The camera system itself is not a tool that improves bycatch avoidance (compared to an excluder device for example), but it can inform a skipper’s decision to stop a tow and haul the net back early because the composition of pollock and salmon in the net is perceived to be too high (2023 CP IPA). These camera systems are cost prohibitive for many vessels at approximately \$500,000. However, vessels equipped with live feed

systems may communicate what the skipper is seeing in terms of catch composition on the camera with cooperative managers and vessels fishing nearby.¹¹⁹

4.3.2 Alternative 2 or 3

Alternative 2 or 3 include an overall chum salmon PSC limit that would be apportioned between the sectors. The economic impacts of Alternatives 2 and 3 on the pollock fishery are analyzed primarily together in this section due to the similarities between the alternatives but they are mutually exclusive. The subsequent discussion applies to both proposed alternatives unless otherwise noted. Section 4.3.3 describes some of the more specific impacts and nuances of Alternative 3 which would allow the possibility for a PSC limit to be in effect following a year when returns fail to meet index thresholds. The analysis of economic impacts throughout the remainder of this section is primarily focused on the AFA and CDQ sector-level impacts because there are intrinsic characteristics and practical constraints shared among vessels within a sector.

4.3.2.1 Vessel-Level Impacts

An overall chum PSC limit would be apportioned by NMFS to the cooperative or CDQ group level so some impacts may be shared within these entities. However, *vessel-level* impacts are discussed first because within a sector or cooperative, impacts from the proposed actions could also be experienced differently by participating entities. This may particularly be the case if the IPAs or cooperatives choose to internally sub-apportion a chum salmon PSC limit down to the vessel-level, as described in Section 3.3.4.4.3. This could have the advantage of insulating members of the cooperative or group from the performance of other vessels and preventing a ‘race for PSC’. However, the more pulse-like nature of chum salmon encounters may create a higher risk for vessels, depending on the overall chum salmon PSC limit.

Appendix 6 provides additional information on the possible vessel-level impacts of the chum salmon PSC limit by using the inshore sector’s apportionment of Chinook salmon PSC under the Inshore SSIP to show how chum PSC apportioned at the CV level could have distributional impacts among participants from 2021–2023. If chum salmon PSC was apportioned similar to Chinook salmon PSC across vessels active in 2023, then at the lowest cap level (100,000 chum salmon) and most adverse apportionment for the inshore sector (AFA apportionment) active inshore vessels may be apportioned a vessel-level limit of 15 to 2,285 chum salmon PSC to remain under. Using these hypothetical sub-apportionments across active vessels in 2023, this could have resulted in an average of 648 chum salmon apportioned per CV.¹²⁰

Based on the most restrictive cap and apportionment for the inshore sector (100,000 chum salmon PSC limit with an AFA apportionment) and the methods described in Appendix 6:

- 4 vessels would have been hypothetically apportioned between 1,500 and 2,285 chum salmon. In comparison, across the most recent five-year period (2018 –2023), these vessels caught between 0 and ~8,000 chum salmon per trip.
- 7 vessels would have been hypothetically apportioned less than 100 chum salmon. In comparison, across the most recent five-year period (2018 –2023), these vessels caught between 0 and ~2,300 chum salmon per trip.
- Due to the 3- to 4-day lag in data for the inshore sector, a PSC spike could occur for the inshore sector and vessels may not be able to respond in time prevent a closure. For example, in four days (July 27–July 30, 2021) greater than 60,000 chum salmon were caught on 15 CVs in one stat area (675500). An inshore apportionment of 45,000–62,900 chum salmon under a 100,000-chum

¹¹⁹ Personal communication, S. Zagorski and H. Berns.

¹²⁰ As described in Appendix 6, these hypothetical vessel-level sub-apportionments included Chinook PSC and pollock transfers but excludes Amendment 69 fishing.

salmon PSC limit means this event would have closed whole inshore sector at this point in the season.

These examples, along with Appendix 6, illustrate the variability in chum salmon PSC per trip and the inherent risk for all capacities of vessels under a lower chum salmon PSC limit based on recent years' chum PSC. This risk may be present even before the B season begins, as decisions of whether and how to operate in the B season with chum salmon PSC limit would be made by an AFA company and within the cooperatives. This assessment would be made with imperfect information on catch rates and chum PSC encounters for the upcoming season. Although additional seasons operating under a chum salmon PSC limit may provide more insight to the degree of constraint, annual factors (*e.g.*, pollock aggregation, encounters with other PSC species, ocean and weather, etc.) would continue to add uncertainty. If a company perceives the risk of operation to be too great, they may choose to operate differently even prior to incurring any avoidance costs or before a closure results in forgone revenue. This could include consolidation of pollock quota onto other vessels owned by the same company or leased to an unaffiliated vessel within their cooperative. Therefore, pollock could be fully harvested at the sector or cooperative level; while adverse impacts are still experienced for the vessel owner and crew of the vessel that exceeded its vessel-level apportionment.

4.3.2.2 Offshore Sectors Impacts

This section evaluates the potential economic impacts of a chum salmon PSC limit for the offshore sectors, although many of the discussed impacts would also apply to the inshore sector.¹²¹ The offshore sectors include the motherships and the CVs that deliver to them, as well as the CPs. The CDQ sector is also considered here as all CDQ pollock has recently been fished on offshore vessels. However, additional considerations for the CDQ sector are included under Section 4.3.2.3.2.5 as some CDQ groups have additional investments in inshore CVs.

The CP sector has recently (since 2019) consisted of 13 active vessels and most of the CDQ pollock is typically harvested on 11–13 of these vessels (Table 4-1). These vessels range from 199 ft LOA to 376 ft LOA and 2,750 hp to 9,300 hp. Between 2011–2022, for the A and B season, they collectively harvested an average of 461,410 mt of pollock each year under the CP allocation and 131,090 mt for the CDQ allocation. Most CPs rely on pollock B season gross revenue for 30%–50% of their total fisheries revenue (Table 4-5). Some of the CDQ pollock allocations are leased and harvested on vessels unaffiliated with CDQ groups, and some CDQ is harvested on CPs that are wholly or partially owned by CDQ groups (as described further in this section). In the B season, the pollock tends to be less aggregated and the CP sector typically covers a wide broad area along the continental shelf break. In particular, the CP (and CDQ) sectors have had greater reliance on Cluster 2 and east and northeast of Zhemchug Canyon.

Between 13 and 15 CVs delivered pollock to three motherships throughout the analyzed time series but only two motherships operated in 2024. Mothership CVs fish closely together near the mothership, typically delivering one tow at a time. A trip for the mothership fleets typically last between 7 to 12 days before the mothership must return to port to offload. The dual-qualified CVs do not collectively follow a specific pattern to when they deliver inshore versus to the mothership but coordinate their participation with associated processors.¹²² Similar to CPs, these vessels can travel further northwest in the Bering Sea. However, as they are not self-contained and movement requires a more coordinated effort. While B season harvest from the mothership sector can extend northeast of Zhemchug Canyon, and dependency on certain areas can be highly variable, these CVs often harvested a substantial portion of their B season pollock in the Unimak area.

¹²¹ The inshore sector has a number of different operational constraints given the limited distance from shore these vessels can travel, and additional impacts result for shoreside processors and communities. Therefore, additional effects for this sector are highlighted in a separate section of the analysis.

¹²² Personal communication, J. Henderschedt.

4.3.2.2.1 Avoidance Costs

As referenced under Alternative 1, if a vessel operator changes their fishing behavior to avoid chum salmon, there may be additional costs. There is an incentive for operators to take on potentially more costly fishing to avoid the consequence of an early B season closure. Table 4-13 below provides a summary of how these types of costs could manifest under an overall chum salmon PSC limit and any known nuances that could influence the level of impact.¹²³

Avoidance costs vary substantially each year even under status quo and the marginal effect of a chum salmon PSC limit to the types of avoidance costs addressed below are expected to be highly influenced by other factors that are also difficult to predict. Some of these factors include high pollock CPUE, less overlap in the distributions of chum salmon and pollock, lower encounters of other constraining species on the fishing grounds, and/or favorable environmental conditions may lead to productive pollock fishing in which caps may not result in any marginal impact on avoidance relative to status quo. However, the inverse could also be true (*i.e.*, more potential for adverse impacts) in the presence of unfavorable conditions. The large number of factors at play results in uncertainty in the magnitude of impacts on operational efficiency; however, the direction of impacts is more certain. It is likely that a chum salmon PSC limit will have adverse impacts on operational costs and efficiency if a medium or high degree of risk is perceived.

¹²³ Section 6.2.5.2 of the April 2024 Initial Review Analysis provides a more in-depth description of these types of costs, available at archived meeting agenda of April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

Table 4-13 Potential avoidance costs that may be incurred under a chum salmon PSC limit

Type of Avoidance Cost	Description of Potential Impact
Decreased operational efficiency	Moving vessels out of areas with known chum encounters would mean additional travel time in which they may not be fishing (and associated opportunity cost of that time). It could also mean vessels could have to move to areas with lower pollock catch per unit effort and poorer pollock flesh quality (which can affect products and value). Cost per unit of catch could increase, which would carry different implications for economic viability and sustained participation for smaller and less efficient vessels. Larger vessels, built for higher throughput may also struggle if moved to areas with low catch rates.
Increased travel costs	Fuel ranks as one of the top operating expenses for the fleet. Since the primary chum avoidance technique is moving vessels out of areas with known chum encounters this could increase fuel expenditures.
Extended seasons	Decreased efficiency due to the factors described above, means that the season could be extended relative to when the TAC may have been caught without a chum salmon PSC limit. A longer fishing season increases all the variable costs of operation (<i>e.g.</i>, fuel, costs of crew provisions and other labor expenses, observer costs for offshore vessels, lease fees for vessels and equipment, etc.) in addition to a greater risk of Chinook encounters later in the fall.
Increased risks and costs of unknown fishing areas	Moving a vessel from an area of high chum encounters does not guarantee that the area it moves to will have a low chum (or Chinook) encounter rate, particularly if other vessels have not been fishing in this new area. There is also a risk of decreased pollock catch per unit effort when effort is moved which can decrease operational efficiency and potentially require fishing later in the season. Fishing new areas may require increased test tows which can result in slower fishing and potentially greater costs associated with gear damage. Chum salmon PSC limits would be additive to a portfolio of other PSC limits (<i>i.e.</i>, Chinook, herring, crab), existing area closures, and potentially constraining species (<i>e.g.</i>, sablefish and sometimes Pacific Ocean Perch) and the cumulative suite of PSC limits and spatial closures may exacerbate the risk of reaching a PSC limit.
Crew impacts	AFA fishing and processing crew are often paid based on shares of an operation's net (or modified gross) revenues. Therefore, increased chum avoidance could adversely affect crew compensation in three ways: 1) additional fuel costs may reduce net revenues unless the company specifically insulates crew from this expense, 2) if a vessel produces lower valued products this will reduce total revenue, and 3) a longer B season can mean a lower pay per day for crew members. If crew compensation is affected in a way that affects employee retention it may impact the level of onboard experience that contributes to safety and productivity. While data are not available to connect crew to communities, reduction in crew compensation can also indirectly impact the communities associated with crew through induced expenditures in communities where these crew are located. If fishing trips are extended and crew members spend more time at sea, this may have a negative effect on crew morale and willingness to maintain employment. Related, there may be increased challenges with recruiting crew and processing workers.
Social and community impacts	Working to avoid reaching the hard cap may increase stress and uncertainty among captains and crew regarding work, catches, and regulatory compliance. As a cap is perceived to be more constraining, or a vessel experiences closures, there may be less social cohesion among crew and/or processing workers. Either of the above impacts resulting from avoidance costs could lead to an attrition of crew, processing workers, among others in the pollock industry as they pursue alternative livelihoods. If vessels fish areas with lower bycatch rates, pollock may be of lower quality such that FRLT revenues would be lower in the City of Unalaska.

4.3.2.2.2 Broader Implications of a B Season Closure for the Offshore Sectors

Avoidance techniques may delay or prevent a closure resulting from a chum salmon PSC limit; however, if the sector is unsuccessful and they are closed early there may be forgone revenue associated with that unharvested pollock. In addition to the direct impacts of a B season closure on possible forgone revenue for offshore sector participants, a B season closure could have a much wider distribution of impacts. Specifically, the adverse effects would extend to pollock communities, the CDQ groups and associated communities, other fisheries, as well as pollock markets. The type of impacts, as well as the potential magnitude of these are described below.

4.3.2.2.2.1 Potentially Forgone Revenue

This analysis of potentially forgone gross revenue begins with a retrospective examination of when each pollock sector hypothetically would have hit the various chum salmon PSC limits had the limits been in place in each of the years 2011–2023. These tables and figures are intended to provide a frame of reference for impacts related to the chum salmon PSC limits and sector apportionments considered under Alternative 2 and 3. However, as previously stated, these values may be considered an upper bound given the expectation that should a PSC limit be adopted, fishing operations will likely respond to prevent a B season closure.

The approach for forgone gross revenue tables and figures matches the methodology used in the Initial Review Draft Analysis, by using the week-end date in which the sectors' limit would have been met and considers all pollock and resulting revenue after that point in the B season forgone. These tables demonstrate the estimated gross forgone ex-vessel and first wholesale values associated with this closure,¹²⁴ under different PSC limits and apportionment scenarios.

For the **CDQ sector**, Table 4-14 demonstrates that a PSC limit of 100,000 may have resulted in B season closures in 5 or 6 of the 13 years, depending on the apportionment selected. Thus, in some years there may have been no forgone revenue, but in the most impacted year they could have had to forgo \$77.2 million in gross first wholesale revenue, representing 83% of the CDQ groups' B season gross revenue. Alternatively, a PSC limit of 550,000 may have resulted in B season closures in 2 of the 13 years. This could have resulted in more years in which there was no forgone revenue, with the median value of \$0 forgone. However, the maximum that may have been forgone in one year was \$36.6–\$57.5 million, depending on the apportionment selected. This would have represented 38%–55% of the CDQ groups' B season gross revenue. Because the CDQ groups have recently had relatively lower chum salmon PSC rates relative to their apportionment of pollock, the retrospective analysis shows that using the 3-year average apportionment generates the greatest potential for adverse impacts to the CDQ sector and the AFA apportionment has the least potential for adverse impacts to the CDQ sector.

For the **CP sector**, Table 4-15 demonstrates that a PSC limit of 100,000 chum salmon may have resulted in B season closures in 10 of the 13 years. Thus, in some years there may have been no forgone revenue, but in the most impacted year they could have had to forgo \$266.9–288.6 million in gross first wholesale revenue, depending on the apportionment selected. This would have represented 83–90% of the CP sector's B season gross revenue. Alternatively, a PSC limit of 550,000 chum salmon may have resulted in B season closures in 1–2 of the 13 years. This implies that the sector would not have reached the PSC limit in most of the years, with the median value of \$0. However, the maximum that may have been forgone in one year was \$2.9–\$174.1 million, depending on the apportionment chosen. This would have represented 0.8%–50% of the CP sector's B season gross revenue, depending on the apportionment

¹²⁴ This section the analysis refers to ex-vessel terms for the CVs and wholesale values for the CPs. Ex-vessel prices are the price received by the CVs from delivery of pollock to a shoreside plant or mothership, thus they are the relevant prices in considering the impacts to the CV fleets. First wholesale prices are the prices received by the first level of inshore processors, or by catcher-processors and motherships. They reflect the value added by the initial processor of the raw catch. They are not, therefore, equivalent to ex-vessel prices. They are the relevant value for CPs as there is no ex-vessel value exchanged in these operations. However, both types of values are included so the reader may compare across sectors in order to understand relative impacts under different PSC apportionments.

selected. This demonstrates that there is a relatively high marginal difference in impacts for the CP sector depending on apportionment chosen. As with the CDQ sector, using the 3-year average apportionment generates the greatest potential adverse impact for the CP sector and the AFA apportionment has the least potential for adverse impacts to the CP sector.

For the **mothership sector**, Table 4-16 demonstrates that a PSC limit of 100,000 may have resulted in B season closures in 9 of the 13 years, depending on the apportionment selected. Thus, in some years there may have been no forgone revenue, but in the most impacted year the sector could have had to forgo \$63.3 million in gross first wholesale revenue, representing 78% of the mothership sector's B season revenue in that year. Alternatively, a PSC limit of 550,000 may have resulted in B season closures in 0 or 1 of the 13 years. This implies that the sector would not have reached the PSC limit in most if not all of the years. The maximum amount may have been forgone in one year was \$12.9–27.2 million, depending on the apportionment chosen. This would have represented between 16%–33% of the mothership sector's B season gross revenue, depending on the apportionment selected. The incremental difference between the potential impact of the apportionment options is less pronounced for the mothership sector than it is for the inshore or CP sector. Using the AFA apportionment has the greatest potential for adverse impacts to the mothership sector and the 5-year average apportionment has the least potential for adverse impacts.

As highlighted previously, an evaluation of *gross* revenue does not account for the multitude of costs of production and, thus, does not quantify the potential net effects of the proposed action. This is expected to be a meaningful distinction, as some of the AFA fleet's primary strategies under a chum salmon PSC cap may increase costs associated with avoidance, such as traveling further, using test tows and movement out of areas with higher bycatch rates which may contribute to higher fuel costs and lower operational efficiency.

As the SSC emphasized in the April 2024 minutes, there are years in which the proposed chum salmon PSC limit would not have been met at the sector-level even with no behavioral changes (*e.g.*, 2012). Moreover, the Council is considering chum salmon PSC limits that include full transferability between cooperatives and sectors. For the reasons described in Section 3.3.4.4.3, the analysts do not expect that this would occur in an efficient way. However, the ability to transfer chum salmon PSC, may increase the level of pollock TAC able to be harvested under more constraining limits

Finally, future variation in ocean conditions and the distribution of pollock/chum/Chinook/other constraining species might render recent history a less representative picture. These conditions could be more or less favorable to pollock fishing and the resulting bycatch. It is important to emphasize the level of uncertainty that exists for future conditions and thus the expectations for marginal impact on forgone revenue and avoidance costs.

Overall, there is uncertainty in the success of chum avoidance as a result of implementation of a chum salmon PSC limit and a sectors' ability to prevent a B season closure. If the offshore sectors are successful at avoiding chum salmon under a prescribed PSC limit, they could still harvest their full pollock allocation and there may be no potential impact to forgone revenue at the sector-level. If a PSC limit results in an early B season closure, this is expected to have potential adverse economic impacts on the CP and mothership sectors as well as the CDQ groups that rely on the CP vessels to harvest and process their allocation. This means it could have direct adverse economic effects on the companies that own and maintain the vessels, those that lease their pollock allocation to be harvested on these vessels, and the skippers, fishing and processing crew employed on these vessels.

Table 4-14 Summary of pollock potentially left unharvested and associated forgone gross revenue for the CDQ sector as an upper bound if chum salmon PSC limits had been in place, 2011–2023

CDQ Sector			Pollock forgone (mt)				Ex-vessel rev forgone (millions 2022\$)				First wholesale rev forgone (millions 2022\$)			
PSC limit	Apportionment	Number of years closed (13 total)	Min	Median	Avg	Max	Min	Median	Avg	Max	Min	Median	Avg	Max
100,000	3-yr average	6	0	0	17,351	63,534	\$0.0	\$0.0	\$6.5	\$24.8	\$0.0	\$0.0	\$21.6	\$77.2
	5-yr average	6	0	0	17,083	63,534	\$0.0	\$0.0	\$6.4	\$24.8	\$0.0	\$0.0	\$21.3	\$77.2
	Pro rata	6	0	0	17,083	63,534	\$0.0	\$0.0	\$6.4	\$24.8	\$0.0	\$0.0	\$21.3	\$77.2
	AFA	5	0	0	14,755	63,534	\$0.0	\$0.0	\$5.5	\$24.8	\$0.0	\$0.0	\$18.3	\$77.2
325,000	3-yr average	3	0	0	11,365	57,635	\$0.0	\$0.0	\$4.2	\$22.5	\$0.0	\$0.0	\$13.9	\$70.0
	5-yr average	3	0	0	11,018	53,133	\$0.0	\$0.0	\$4.1	\$20.7	\$0.0	\$0.0	\$13.5	\$64.6
	Pro rata	3	0	0	11,018	53,133	\$0.0	\$0.0	\$4.1	\$20.7	\$0.0	\$0.0	\$13.5	\$64.6
	AFA	2	0	0	11,018	53,133	\$0.0	\$0.0	\$4.1	\$20.7	\$0.0	\$0.0	\$13.5	\$64.6
550,000	3-yr average	2	0	0	6,931	48,589	\$0.0	\$0.0	\$2.5	\$17.9	\$0.0	\$0.0	\$8.6	\$57.5
	5-yr average	2	0	0	5,908	48,589	\$0.0	\$0.0	\$2.1	\$17.9	\$0.0	\$0.0	\$7.2	\$57.5
	Pro Rata	2	0	0	5,908	48,589	\$0.0	\$0.0	\$2.1	\$17.9	\$0.0	\$0.0	\$7.2	\$57.5
	AFA	2	0	0	2,347	28,221	\$0.0	\$0.0	\$0.8	\$10.0	\$0.0	\$0.0	\$3.0	\$36.6

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 4-15 Summary of pollock potentially left unharvested and associated forgone gross revenue for the CP sector as an upper bound if chum salmon PSC limits had been in place, 2011–2023

CP Sector			Pollock forgone (mt)				Ex-vessel rev forgone (millions 2022\$)				First wholesale rev forgone (millions 2022\$)			
PSC limit	Apportionment	Number of years closed (13 total)	Min	Median	Avg	Max	Min	Median	Avg	Max	Min	Median	Avg	Max
100,000	3-yr average	11	0	84,042	94,208	236,646	\$0.0	\$34.8	\$36.4	\$92.9	\$0.0	\$107.5	\$121.4	\$288.6
	5-yr average	10	0	84,042	90,735	236,646	\$0.0	\$34.8	\$35.1	\$92.9	\$0.0	\$107.5	\$117.0	\$288.6
	Pro rata	10	0	84,042	89,433	236,646	\$0.0	\$34.8	\$34.6	\$92.9	\$0.0	\$107.5	\$115.3	\$288.6
	AFA	10	0	38,220	67,622	218,962	\$0.0	\$15.8	\$25.7	\$85.8	\$0.0	\$48.9	\$85.7	\$266.8
325,000	3-yr average	6	0	0	47,803	171,330	\$0.0	\$0.0	\$17.9	\$67.3	\$0.0	\$0.0	\$60.5	\$212.1
	5-yr average	5	0	0	29,476	162,802	\$0.0	\$0.0	\$10.9	\$58.4	\$0.0	\$0.0	\$38.1	\$212.1
	Pro rata	5	0	0	29,476	162,802	\$0.0	\$0.0	\$10.9	\$58.4	\$0.0	\$0.0	\$38.1	\$212.1
	AFA	2	0	0	13,345	133,877	\$0.0	\$0.0	\$4.8	\$48.0	\$0.0	\$0.0	\$17.3	\$174.1
550,000	3-yr average	2	0	0	13,345	133,877	\$0.0	\$0.0	\$4.8	\$48.0	\$0.0	\$0.0	\$17.3	\$174.1
	5-yr average	1	0	0	10,298	133,877	\$0.0	\$0.0	\$3.7	\$48.0	\$0.0	\$0.0	\$13.4	\$174.1
	Pro rata	1	0	0	10,298	133,877	\$0.0	\$0.0	\$3.7	\$48.0	\$0.0	\$0.0	\$13.4	\$174.1
	AFA	1	0	0	171	2,225	\$0.0	\$0.0	\$0.1	\$0.8	\$0.0	\$0.0	\$0.2	\$2.9

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table 4-16 Summary of pollock potentially left unharvested and associated forgone gross revenue for the mothership sector as an upper bound if chum salmon PSC limits had been in place, 2011–2023

Mothership Sector			Pollock forgone (mt)				Ex-vessel rev forgone (millions 2022\$)				First wholesale rev forgone (millions 2022\$)			
PSC limit	Apportionment	Number of years closed (13 total)	Min	Median	Avg	Max	Min	Median	Avg	Max	Min	Median	Avg	Max
100,000	3-yr average	10	0	29,787	26,093	52,088	\$0.0	\$11.0	\$10.1	\$20.3	\$0.0	\$35.0	\$33.6	\$63.3
	5-yr average	10	0	29,787	24,963	52,088	\$0.0	\$11.0	\$9.7	\$20.3	\$0.0	\$35.0	\$32.2	\$63.3
	Pro rata	10	0	29,787	26,093	52,088	\$0.0	\$11.0	\$10.1	\$20.3	\$0.0	\$35.0	\$33.6	\$63.3
	AFA	10	0	29,787	26,093	52,088	\$0.0	\$11.0	\$10.1	\$20.3	\$0.0	\$35.0	\$33.6	\$63.3
325,000	3-yr average	4	0	0	4,681	32,775	\$0.0	\$0.0	\$1.7	\$12.1	\$0.0	\$0.0	\$5.8	\$38.8
	5-yr average	4	0	0	4,681	32,775	\$0.0	\$0.0	\$1.7	\$12.1	\$0.0	\$0.0	\$5.8	\$38.8
	Pro rata	4	0	0	4,681	32,775	\$0.0	\$0.0	\$1.7	\$12.1	\$0.0	\$0.0	\$5.8	\$38.8
	AFA	4	0	0	4,681	32,775	\$0.0	\$0.0	\$1.7	\$12.1	\$0.0	\$0.0	\$5.8	\$38.8
550,000	3-yr average	1	0	0	840	10,914	\$0.0	\$0.0	\$0.3	\$4.0	\$0.0	\$0.0	\$1.0	\$12.9
	5-yr average	0	0	0	0	0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	Pro rata	1	0	0	840	10,914	\$0.0	\$0.0	\$0.3	\$4.0	\$0.0	\$0.0	\$1.0	\$12.9
	AFA	1	0	0	1,767	22,968	\$0.0	\$0.0	\$0.7	\$8.5	\$0.0	\$0.0	\$2.1	\$27.2

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

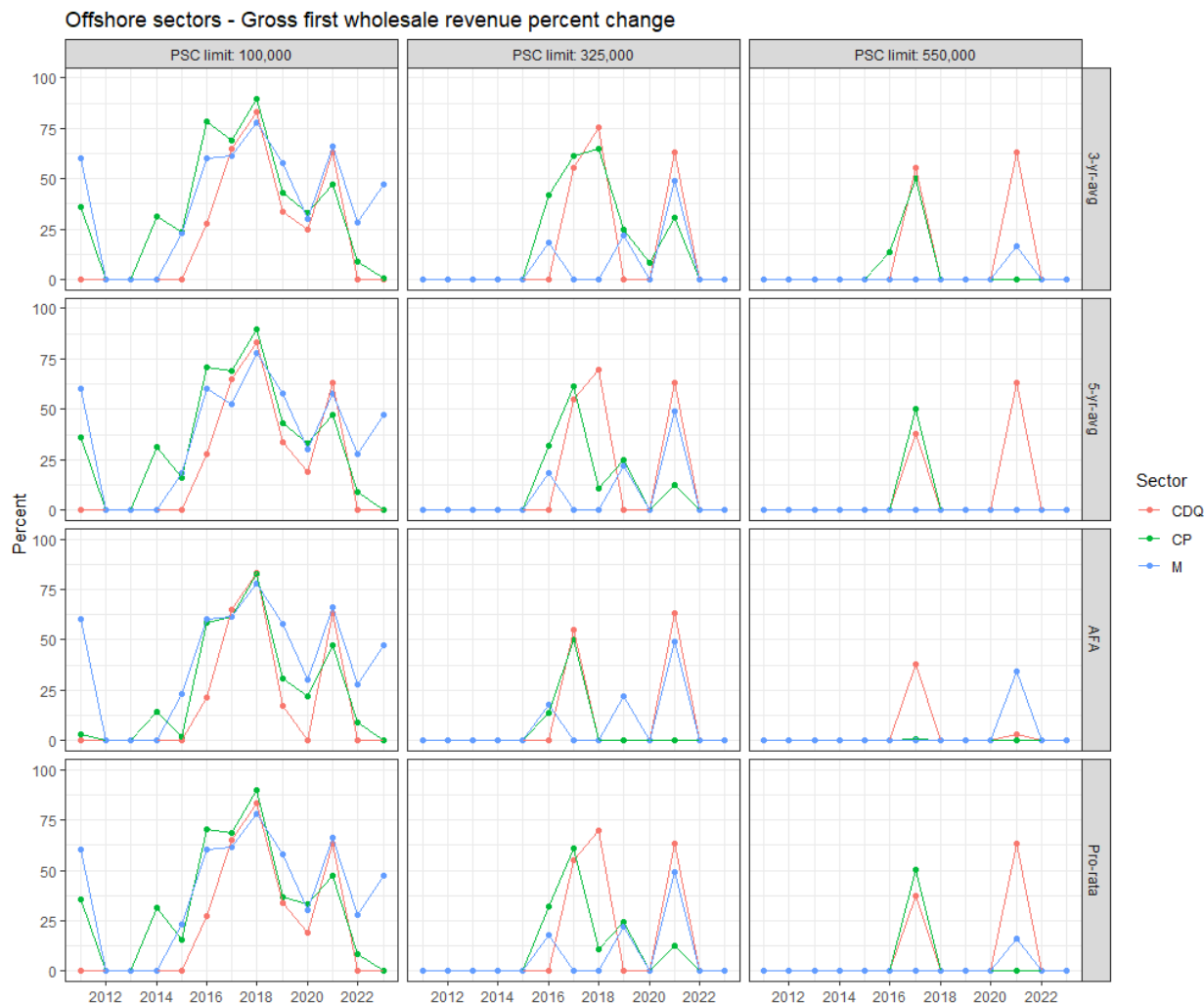


Figure 4-11 Percent of B season gross first wholesale revenue potentially forgone for the offshore sectors if chum salmon PSC limits had been in place, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

4.3.2.2.2 Communities Affiliated with the Offshore Sector

Communities engaged in or dependent on the B season pollock fishery through the offshore sectors could experience a variety of social and economic impacts, all of which would occur on a spectrum in terms of their likelihood and severity under Alternative 2 or 3. CP and mothership CV ownership was concentrated in Seattle MSA. Mothership ownership was split between Seattle MSA and Unalaska. CPs and motherships primarily offload product in Unalaska. For these reasons, the potential impacts to Seattle MSA and Unalaska through their relationship to the offshore sectors are addressed below.

Seattle MSA

Seattle MSA would be indirectly and adversely affected by a fishery closure under Alternative 2 or 3 if the CP and/or mothership sectors met the chum salmon PSC limit. The following data summaries provide a sense of scale for the potential forgone revenue for CPs and motherships affiliated with Seattle MSA, but the magnitude of the potential revenue impact would depend on when a sector reached the PSC limit and the amount of pollock forgone.

- **CPs** earned an average of \$450.05 million in gross wholesale revenue from B season pollock (2011–2023). This represented 55.37% of these entities’ total revenue from B season AFA and CDQ pollock and 21.0% of the total gross first wholesale revenue earned by the Seattle MSA/Anchorage community fleet.
- **Motherships** earned an average \$109.70 million in gross first wholesale revenue from B season pollock (2011–2023). This represented 58.19% of these entities’ total revenue and 32.8% of the total gross first wholesale revenue earned by the Seattle MSA/Dutch Harbor community fleet.
- **Mothership CVs** earned an average \$27.83 million in gross ex vessel revenue from B season pollock (2011–2023). This represented 47.37% of these entities’ total revenue and 3.0% of the total gross ex-vessel revenue earned by the community fleet. Note, due to confidentiality concerns these revenue data are not specific to only those mothership CVs registered to Seattle MSA. These values represent the gross revenue earned by mothership CVs, of which an average of 92.31% were registered to owners in the Seattle MSA.

While a vessel’s registered ownership address approximates the distribution and magnitude of ownership ties to a particular community/region, a vessel’s homeport location is generally understood to be the community where the vessel spends the majority of its time throughout the year and would likely generate some level of economic activity. All CPs with a registered ownership address in the Seattle MSA also listed the community as its homeport in 2022 and 2023. The majority of CVs associated with Seattle MSA listed Seattle, Newport, Kodiak, and Unalaska/Dutch Harbor as their homeport. These are consistent trends throughout the analyzed period which suggests the potential social and economic effects of the proposed alternatives would be relatively concentrated.

An overall hard cap under Alternative 2 or 3 could result in forgone revenue and/or avoidance costs due to changes in fishing behavior to stay below the hard cap. It is possible that consolidation could occur within the sectors affiliated with Seattle MSA if these new measures for chum salmon PSC result in early closures or repeatedly high avoidance costs. Firms or vessels that are less efficient at avoiding chum salmon may sell or lease to other firms that are more efficient at avoiding chum salmon PSC. It is challenging to discern the degree to which the community would be impacted by potential consolidation as consolidation could occur within Seattle-based firms.

Although vessels and companies affiliated with Seattle MSA could experience potential indirect and adverse effects under Alternative 2 and 3, it is challenging to scale these impacts *to the community*, when the level of economic activity generated by the B season pollock fishery is compared to the economic diversity of Seattle MSA. This community represents a large urban area and its relative dependence on the B season fishery is small compared to the scale of the area’s economy. Nevertheless, engagement in commercial fisheries has shaped the social fabric of certain neighborhoods like Ballard where a larger Scandinavian population are involved in the fishing industry, and there are distinct subareas where concentrations of businesses and infrastructure are focused on the community’s large and wide-ranging fleet (*e.g.*, Fishermen’s Terminal) (NOAA, 2014).

Crew and processing workers onboard CPs or motherships affiliated with Seattle MSA could be directly and adversely affected by the avoidance costs incurred prior to a PSC limit being reached, as well as after the PSC limit is met. On average, 1,628 crew positions were available on AFA CPs and 407 were available on motherships (Figure 4-9). There are no readily available data to determine the long-term community of residence for AFA skippers, crew, and processing workers. However, crew and processing workers would experience immediate financial hardship as a result of an early B season closure. Repeated B season closures could displace crew and processing workers from the fishery and that they would seek other forms of employment, which may be time-consuming, costly, and/or require additional education and training. Although there may be more alternative employment and income opportunities for displaced crew in a large urban area like Seattle, there may not be comparable employment in earning potential or general job satisfaction (Gatewood & McCay, 1990).

Unalaska

Dutch Harbor is the primary location for CP and mothership product transfers and was listed as the ownership address for two motherships during the baseline period (2011–2023). If either the CP or mothership sector experienced an early B season closure due to reaching a chum salmon PSC limit, the City of Unalaska (and the State of Alaska) would potentially forgo tax revenue which includes, but is not limited to, the FRLT. The City of Unalaska derives substantial economic and social benefits from the FRLT levied on B season pollock. Total revenue from the FRLT levied on B season pollock ranged from \$2.20 million (2020) to \$2.84 million (2012). FRLT revenue accounted for an average of 7.6% of the City’s total General Fund revenues (2011–2022). These estimates do not account for revenues derived from taxes and fees from other fishery-related activities in the community that may be paid by vessels or companies.

Table 4-17 Estimated revenue derived from the FRLT levied on B season pollock for the City of Unalaska compared to the City of Unalaska’s general fund revenue, 2011–2023

Year	Estimated Share of FRLT Levied on CPs	Estimated Share of FRLT Levied on Motherships	Estimated Share of FRLT Levied on CDQ	Total Estimated Revenue from FRLT Levied on B Season Pollock	City of Unalaska General Fund Revenues	B season FRLT Revenues as Percent of Total General Fund Revenues
2011	\$1,777,071	\$464,934	\$468,912	\$2,710,917	\$29,152,912	9.3%
2012	\$1,847,184	\$461,173	\$531,324	\$2,839,681	\$31,634,417	9.0%
2013	\$1,675,655	\$421,327	\$480,601	\$2,577,583	\$32,609,892	7.9%
2014	\$1,722,688	\$427,282	\$500,318	\$2,650,288	\$34,376,971	7.7%
2015	\$1,738,731	\$431,918	\$498,131	\$2,668,780	\$34,525,170	7.7%
2016	\$1,623,461	\$398,869	\$462,191	\$2,484,521	\$30,723,626	8.1%
2017	\$1,478,499	\$363,073	\$413,739	\$2,255,310	\$34,371,441	6.6%
2018	\$1,610,992	\$406,663	\$462,315	\$2,479,970	\$30,300,957	8.2%
2019	\$1,603,820	\$396,227	\$450,848	\$2,450,894	\$36,419,248	6.7%
2020	\$1,439,418	\$395,418	\$367,128	\$2,201,964	\$36,478,643	6.0%
2021	\$1,521,878	\$384,489	\$439,171	\$2,345,538	\$29,089,571	8.1%
2022	\$1,466,661	\$373,712	\$426,857	\$2,267,229	\$29,110,249	7.8%
2023	*	*	*	\$2,216,994	NA	NA

Source: AKFIN. City of Unalaska, Alaska. Comprehensive Financial Audits, Fiscal Years 2011 through 2023.

<https://www.commerce.alaska.gov/dcra/admin/Financial> Accessed August 28, 2024.

Since the City of Unalaska’s economy is primarily centered on the seafood industry, the tax base is subject to change with fluctuations in fishery harvest levels. A potential mitigating factor to some of the fluctuation during the status quo period with respect to seafood taxes has been the relative stability of the pollock fishery. This could change if frequent or erratic B season closures were to occur for the offshore sectors, as well as other the sectors in the fishery with connections to the community. The magnitude of this potential adverse effects would depend on the timing of a closure. General fund revenues support public safety, disaster preparedness efforts, public works and infrastructure like the city’s water supply and sewer system, administration, the school district, among others.

More broadly, the community’s economy is built on commercial fishing, seafood processing, fleet services, and marine transportation. The historical presence of CP and mothership activity in the community has driven investments into infrastructure such as docks, storage facilities and transportation. The Port of Dutch Harbor is the only deep draft port in the Arctic Region that is ice free year-round, and it has been designated a “port of refuge,” providing protection and repair for disabled or distressed vessels that fish or transit the waters surrounding the Aleutian Islands on a daily basis. Unalaska is also the western-most container terminal in the United States and one of the most productive ports for the transshipment of cargo in Alaska. In addition to product shipped domestically to and from this regional

hub, products are shipped to ports around the world with weekly shipments headed to Europe and Asia by container and freighter.

4.3.2.2.3 Impacts to CDQ Groups and Communities

CDQ affiliations add depth and complexity to the consideration of social and economic impacts because these groups have both a community-supporting mission, as well as stakeholder status in groundfish harvesting. The CDQ groups vary in the number of communities and residents they represent, the composition of their CDQ and non-CDQ quota portfolios, and the relative scale of fishery and non-fishery portions of their regional economies, among other attributes.

The CDQ groups could be adversely impacted by potential changes to regulations managing chum salmon bycatch in the Bering Sea pollock fishery in multiple ways, two of which are the most direct. First, all CDQ groups receive programmatic allocations of Bering Sea pollock and would be apportioned an amount of the overall chum salmon PSC limit (Alternative 2 and 3). As discussed in Section 4.2.2.1, recent closures and declining quota in BSAI crab fisheries (*i.e.*, Bristol Bay red king crab and Bering Sea snow crab in particular), have had an impact on the revenue from both the crab CDQ held by the groups as well as revenues from additional investments in BSAI crab harvesting and processing quota share. In light of these declines, pollock has made up a relatively greater proportion of total revenues in recent years (Figure 4-10).

In addition to representing the largest portion of cash flow from CDQ allocations, the pollock allocations, which are typically leased to vessels in the CP sector, have historically also represented a relatively stable source of revenue for the CDQ groups. Leasing agreements can often be in place for multiple years and may include harvest guarantees. In this way, CDQ groups that lease their pollock CDQ may be somewhat insulated from the annual fluctuations in the operational costs (*e.g.*, vessel maintenance) and the risk associated with global markets.

However, if there was a perceived risk of a B season pollock closure prior to the full harvest of the TAC (*i.e.*, under Alternative 2 or 3), this perception of risk may impact CDQ groups' leverage in negotiating harvesting agreements and lease rates, such that future contracts may not continue on the same terms as the past. If there was a medium to high risk of a B season closure, CDQ representatives have expressed concern that AFA companies that lease CDQ pollock may wish to reevaluate what they commit to harvesting. Since a non-CDQ CP company would need to pay a lease fee for access to the CDQ pollock, there may be a focus on harvesting direct allocations of AFA pollock first prior to committing or guaranteeing the harvest of CDQ. CDQ representatives have highlighted concerns that CDQ pollock would be saved to the end of the B season, being more likely to be forgone than the pollock quota associated with the vessel owners.¹²⁵ CDQ representatives highlighted that even for long-standing leasing relationships, these proposed changes in management structure of the AFA fisheries may trigger reevaluation of harvest agreements or terms may be reconsidered when the harvest contract is up.

Additionally, the apportionment chosen could also influence the risk of reaching the CDQ sector cap and future operational flexibility for harvesting CDQ pollock. Implications of the CDQ Reserve Pool (suboption to Alternative 2 or 3) and the overall PSC limit apportionments are further discussed in Section 4.3.3.1.

In addition to the CDQ pollock allocation, four¹²⁶ of the six groups have additional investments in the AFA offshore pollock fisheries outside of their CDQ allocation (as represented in Table 4-11). Thus, if a chum salmon PSC limit results in an early closure of the B season pollock fishery, CDQ groups may see reduced revenues through these investments as well. Like other AFA companies, they would still have their immediate fixed costs such as payments for existing debt payments and vessel insurance, etc. Given these factors, a B season closure, depending on the magnitude, could have adverse impacts on a CDQ

¹²⁵ Personal communication, S. Ricci.

¹²⁶ CBSFA has an indirect ownership in American Seafoods which is not captured here.

group's ability to support their community program (as described in 4.2.2.4) in the same way that they would under status quo.

An early B season closure could have adverse effects on CDQ communities, although the relative magnitude of these impacts is uncertain. Data are limited such that the exact proportion of CDQ groups' revenues and royalties that are derived from the B season pollock fishery cannot be determined. It is also not possible to quantify what proportion of any one program benefit is funded by either the harvest of CDQ pollock or CDQ groups' investments into this fishery.¹²⁷

If a B season closure occurs, the decrease in associated revenue through CDQ groups could decrease the funding available for public services like education, health care, and critical infrastructure. Further, all CDQ groups have worked to provide different employment opportunities, including administrative positions with the group or its subsidiaries, community liaison roles, or jobs on fishing vessels. These employment opportunities may be at risk in the future if there are erratic or frequent B season closures.

At the same time, many communities affiliated with the CDQ program are also engaged in WAK chum salmon fisheries. It is not possible to say whether the potential benefits in terms of chum salmon savings resulting from Alternative 2 or 3 would improve abundance to a degree where less or unrestricted directed fisheries opportunities could be provided would offset the adverse impacts of a B season closure for some CDQ communities. The potential impacts of the proposed action alternatives on communities dependent on subsistence and commercial harvests of chum salmon are discussed within the analysis of potential benefits in Section 4.4.4.2.

4.3.2.2.2.4 Possible Spillover Impacts on Other Fisheries

If the B season pollock fishery was closed early due to meeting a chum PSC limit or there was incentive to consolidate pollock quota, AFA vessels may try to shift effort into other fisheries.¹²⁸ If they are successful, this could alleviate some of the financial impacts of leaving pollock quota unharvested or not directly fishing their quota. However, it could also have spillover impacts to historical participants in these fisheries.

To summarize for the AFA CPs,¹²⁹ additional opportunities outside of B season pollock are limited. CPs listed in the AFA are prohibited from fishing in the GOA; therefore, if Bering Sea pollock fishing was less profitable or closed for the B season, CPs would not be able to shift effort into GOA fisheries. In the BSAI, the only fishery that was identified as a potential place for CP spillover is the yellowfin sole trawl limited access fishery. This was identified as a possibility because there has been some variable participation from these vessels over time. However, opportunities in this fishery are still expected to be limited. This fishery is supported by an apportionment shared by AFA CPs, CVs, and non-AFA CVs, and there are typically 1 or 2 CPs participating. Also, this fishery requires different fishing gear and may require different configuration of the processing factory relative to pollock fishing which is costly to convert. Therefore, participation is unlikely to occur on an ad hoc basis.

4.3.2.2.2.5 Market Impacts

If a chum salmon PSC limit was implemented and resulted in repeated or erratic closures in the Bering Sea pollock B season, this could exacerbate the current market challenges described in Section 4.2.1.3. In the U.S. harvesters and processors are facing higher operating costs due to domestic inflation for labor/materials/shipping/storage, high interest rates, high fuel prices, and labor supply shortfalls. Given

¹²⁷ Detailed revenue and royalty information was available for the CDQ groups until 2005, but this information is no longer available because the CDQ groups are no longer required to submit such reports to the State of Alaska or NMFS. As such, it is not possible to quantify CDQ groups' total revenues from fishery allocations and other investments, and it is not possible to determine the relative contribution of revenues earned from the Bering Sea pollock fishery (or the B season fishery) to the multiple social and economic programs the groups provide to their communities.

¹²⁸ Potential spillover impacts are discussed in more detail in Appendix 6 from the February 2025 preliminary DEIS. That appendix was prepared in response to a request from the AP at its April 2024 meeting.

¹²⁹ AFA CVs that deliver to motherhips are considered in the spillover impacts Section 4.3.2.3.2.6.

this multitude of challenging global factors in effect for Alaska seafood markets, including pollock, those that participate in and are affected by these markets may be more vulnerable to the potential adverse economic effects from a B season closure.

For instance, interrupted supply of pollock products, as well as changes in types of products or quality able to be produced could strain existing Asian markets when combined with increased competition from the Russian pollock fishery for these markets. U.S. pollock producers are working to remain competitive in global markets and to compete against foreign producers that have lower costs and lower regulatory standards. Russia, which also harvests pollock from the Bering Sea (outside U.S. waters), is the primary competitor to Alaskan pollock in global markets. Russian pollock can be labeled as “Alaska pollock” in many international markets, a labeling practice which can misrepresent the origin of Russian pollock harvests and be misinterpreted by consumers (AFSC, 2024). In recent years, Russia has increased its harvest of pollock and flooded the market with product. This oversupply puts downward pressure on the price of Alaskan pollock, especially in markets where Russian and Alaskan products directly compete. Recently, Russia has begun shifting away from European fillet markets that have imposed high tariffs for their imports and begun competing against the U.S. in Asian surimi markets. With very minimal production of surimi prior to 2021, production is expected to reach 115,000 mt by 2027 (Seaman, 2023). With the aid of Russian government subsidies, the largest seafood companies in Russia have invested in new fleet of highly efficient vessels allowing them to dramatically increase production of these higher value-added products (Chase, 2022).

While the majority of Alaska pollock supply enters export markets, approximately 21% of the supply goes directly to the domestic market (McKinley Research Group, 2023). In part due to foreign competition in other global markets like surimi, domestic markets have become of increasing importance for Alaska pollock producers and harvesters. Some opportunities have increased in recent years, with new commitments by the USDA for purchases of pollock, along with other Alaska seafood for the National School Lunch Program, food banks, and foreign aid programs among other channels. Additionally, a recent expansion on a U.S. ban of Russian seafood imports may create more space in domestic markets for U.S. seafood, such as pollock. However, maintaining new (and existing) domestic markets would be challenging with frequent or erratic closures in the B season.

4.3.2.3 Inshore Sector Impacts

The inshore sector has included 69–76 active vessels in recent years (2019–2023), operating under six cooperatives, with occasional participation in the open access fishery.¹³⁰ These vessels range from 73 ft LOA to 180 ft LOA and 700 hp to 6,600 hp. Between 2011–2022, for the A and B season combined, the inshore CV collectively harvested an average of 570,473 mt of pollock each year. Most of the inshore CVs rely on pollock B season gross revenue for 40%–60% of their total fisheries revenue (Table 4-4), with 62% of the inshore CV relying on AFA fishing for 80% or more of the vessels’ total revenue. A trip’s worth of catch is typically 2-3 hauls for the inshore CVs, which creates a data lag as salmon caught as bycatch undergo a census count and sampling at the shoreside plant they deliver to. The inshore CV sector’s B season harvest is typically concentrated in Unimak and Cluster 1; however, some of the larger CVs frequently harvest in Cluster 2 and further northwest.

4.3.2.3.1 Avoidance Costs

If a chum salmon PSC limit were implemented for the inshore sector and there is a perceived risk of reaching the PSC limit, as described in Section 4.3.2, pollock harvesters would be expected to alter their fishing operations to avoid a closure and to minimize losses associated with potentially forgone gross revenue, to the extent they can. From these operational changes, vessels could incur the avoidance costs described in Table 4-13. However, there are important operational differences between the various sectors

¹³⁰ In 2024, only five cooperatives were operating with ten vessels participating in the open access fishery.

that influence their avoidance behaviors and the strategies they can use and as well as the level of impact for the sector. Inshore CVs must stay within a certain proximity to their shoreside processor because of their delivery requirements, meaning they have less flexibility to move to different areas to target pollock. Given these operational differences, Table 4-18 described additional avoidance costs that may specifically affect the inshore vessels.

Table 4-18 Potential avoidance costs that may be incurred by the inshore sector under a chum salmon PSC limit in addition to those listed in Table 4-13

Decreased operational efficiency	If traveling further from port, the quality of delivered product may decrease. This may influence the types of products that can be produced and the ex vessel price received for the product. The inshore sector is constrained with an industry standard of 48 hours between pollock catch and desired delivery in order to produce the freshest quality product.
Travel costs	If the sector has to travel further, fuel costs would increase. If both ex vessel price paid goes down and operational cost go up, these two factors would compound the adverse impact to the inshore fleet.
Gear conflicts and safety at sea	Decreased flexibility in time or space for pollock fishing could possibly contribute to gear conflicts or safety concerns. Inshore vessels may need to travel further from shore which could increase risk if there is a safety issue.
Shoreside processor impacts	Decreased operational efficiencies could lead to lower quality of pollock deliveries, lower volumes of pollock deliveries, or intermittent and slower deliveries. These inefficiencies would increase processor's operating costs such that the economy of scale in its production is lost. A change in pollock quality due to vessels fishing further from port could result in production of lower quality products and lower wholesale prices.
Impacts on communities associated with pollock landings	Communities where shore-based processors are located may see reduced FBT and local raw seafood tax revenues from lower quality product deliveries. In a scenario where harvesters are catching lower quality pollock that can only be processed into certain product forms (such as fishmeal), it is expected the shoreside price and the estimated tax revenue would decrease. It is also possible that shoreside prices decrease as a result of domestic and global market conditions described above, but these dynamics exist outside of the regulatory changes being considered under the proposed management alternatives. In contrast to other avoidance costs, slower or intermittent deliveries that result in crew members spending more time in port may provide some level of benefit to a community and the support sector businesses within it. Crew members could book accommodations, patron local businesses, seek entertainment, among other activities generating marginally more economic activity.

Similar to the offshore sectors, a chum salmon PSC limit is expected to have a negative impact on operational costs and efficiency if a risk of a closure is perceived at the vessel level; however, the associated processor would also conduct their own risk-assessment which could elevate the perception of risk for the CVs. There are significant fixed costs associated with each season at a shore-based processing facility including maintenance, property tax, insurance, transporting processing crew to town and maintaining crew accommodations. Decisions of whether on how to operate must also be made by processors with imperfect information about catch and bycatch rates for the season.

4.3.2.3.2 Broader Implications of a B Season Closure for the Inshore Sector

If the inshore sector is unable to remain under the chum salmon PSC limits, this would result in an early B season closure, which could result in forgone revenue. In addition to the direct implications of forgone

revenue, a closure could have wider impacts, extending to shoreside processors, communities, CDQ groups and associated communities, other fisheries, as well as markets. The type of impacts, as well as the likelihood and potential magnitude of these are described below.

4.3.2.3.2.1 Potentially Forgone Revenue

The analysis of potentially forgone gross revenue for the inshore sector is conducted in the same manner as Section 4.3.2.2.1 for the offshore sectors. As previously stated, these values are based off of when the inshore sector hypothetically would have hit the various chum salmon PSC limits had the limits been in place in each of the years 2011–2023. With the expectation that the pollock fleet would react to a chum salmon PSC limit if implemented and alter their operations to the extent they can, in an effort to delay or prevent a B season closure, these values are expected to be an upper bound.

For the **Inshore sector**, Table 4-19 demonstrates that a PSC limit of 100,000 may have resulted in B season closures in 12 of the 13 years. In the most impacted year, this sector could have had to forgo \$97.8–\$108 million in gross ex vessel revenue, depending on apportionment selected. At the higher end of the range, this would have represented 73-84% of the CV sector’s B season gross revenue. Alternatively, a PSC limit of 550,000 may have resulted in B season closures in 0–1 of the 13 years. This implies that the sector would not have reached the PSC limit in most, if not all of the years, with the median value of \$0 forgone. The maximum that may have been forgone in one year was between \$0–\$54.7 million, depending on the apportionment selected. At the higher range, this would have represented 0%–44% of the CV sector’s B season gross revenue. This demonstrates the relatively high incremental difference in the potential impacts to the inshore sector depending on apportionment chosen. The retrospective analysis shows using the AFA apportionment has the greatest potential for adverse impacts to the inshore sector and the 3-yr average apportionment has the least potential for adverse impact.

Table 4-19 Upper bound of pollock potentially left unharvested and associated forgone gross revenue for the inshore sector if chum salmon PSC limits had been in place, 2011–2023

Inshore Sector			Pollock forgone (mt)				Ex-vessel rev forgone (millions 2022\$)				First wholesale rev forgone (millions 2022\$)			
PSC limit	Apportionment	Number of years closed (13 total)	Min	Median	Avg	Max	Min	Median	Avg	Max	Min	Median	Avg	Max
100,000	3-yr average	12	0	130,249	134,968	249,756	\$0.0	\$54.6	\$52.2	\$97.8	\$0.0	\$146.3	\$153.5	\$294.3
	5-yr average	12	0	135,011	139,091	249,756	\$0.0	\$55.2	\$53.9	\$97.8	\$0.0	\$146.3	\$158.6	\$294.3
	Pro rata	12	0	135,011	139,091	249,756	\$0.0	\$55.2	\$53.9	\$97.8	\$0.0	\$146.3	\$158.6	\$294.3
	AFA	12	0	142,044	158,061	291,563	\$0.0	\$56.0	\$61.6	\$108.3	\$0.0	\$164.1	\$181.8	\$345.8
325,000	3-yr average	2	0	0	15,404	172,796	\$0.0	\$0.0	\$5.7	\$63.5	\$0.0	\$0.0	\$15.9	\$178.7
	5-yr average	2	0	0	16,560	172,796	\$0.0	\$0.0	\$6.2	\$63.5	\$0.0	\$0.0	\$17.1	\$178.7
	Pro rata	2	0	0	16,560	172,796	\$0.0	\$0.0	\$6.2	\$63.5	\$0.0	\$0.0	\$17.1	\$178.7
	AFA	5	0	0	29,854	172,796	\$0.0	\$0.0	\$11.2	\$63.5	\$0.0	\$0.0	\$31.5	\$178.7
550,000	3-yr average	0	0	0	0	0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	5-yr average	1	0	0	11,457	148,936	\$0.0	\$0.0	\$4.2	\$54.7	\$0.0	\$0.0	\$11.8	\$153.8
	Pro rata	1	0	0	11,457	148,936	\$0.0	\$0.0	\$4.2	\$54.7	\$0.0	\$0.0	\$11.8	\$153.8
	AFA	1	0	0	11,457	148,936	\$0.0	\$0.0	\$4.2	\$54.7	\$0.0	\$0.0	\$11.8	\$153.8

Source: NMFS Alaska Region CAS, data compiled by AKFIN

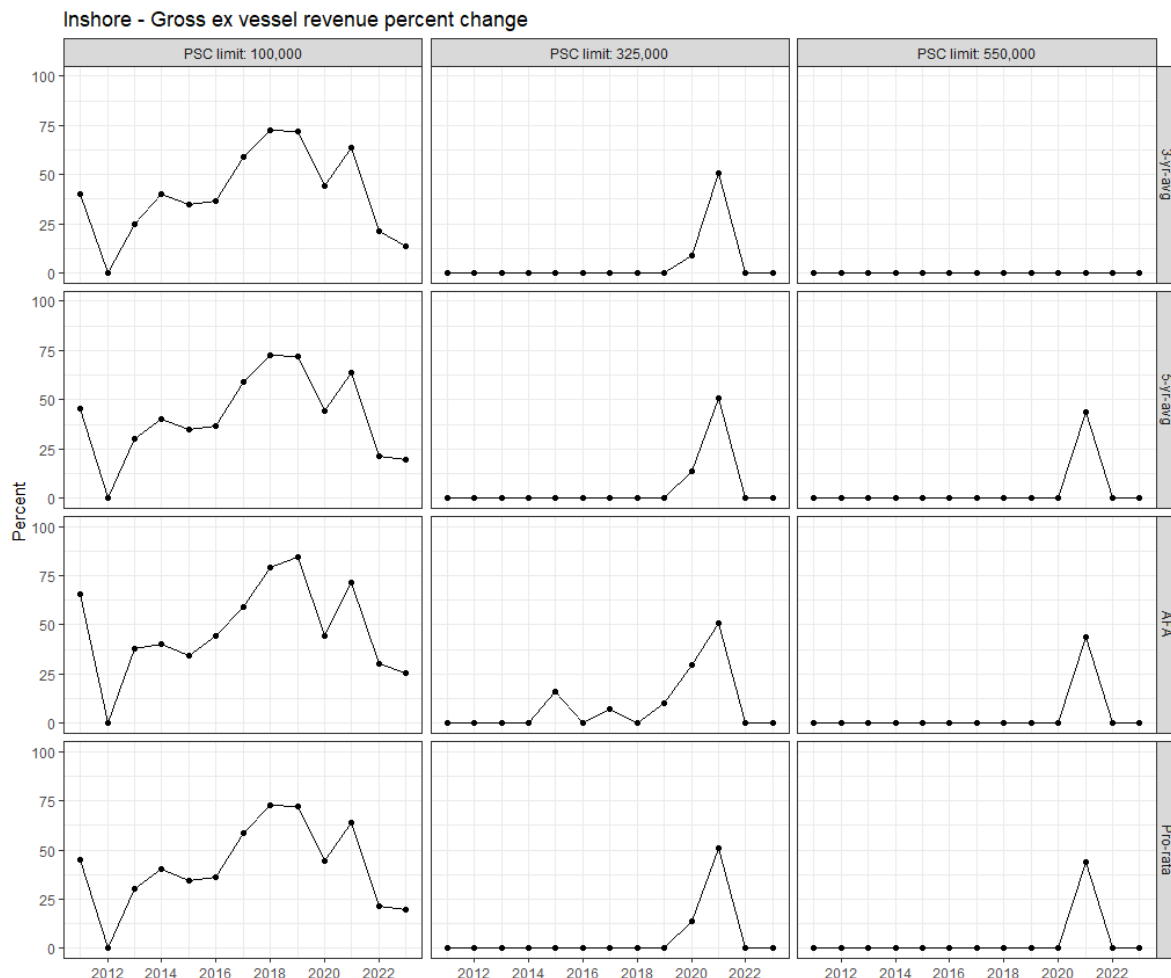


Figure 4-12 Percent of B season gross ex vessel revenue potentially forgone for the inshore sector if chum salmon PSC limits had been in place, 2011–2023

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

A constraining chum salmon PSC limit could result in a B season closure for the inshore sector, if the sector as a whole reached the cap. However, the inshore sector's apportionment of the PSC limit will be further divided among the cooperatives and thus it is possible for one or more cooperatives to close prior to the full sector. If pockets of pollock are stranded due to a sector or cooperative meeting their sub-apportionment of chum salmon PSC, they would be prohibited from fishing. Alternative 2 and 3 specify that chum salmon PSC would be transferable, so theoretically it could move between cooperatives. However, as described in Section 3.3.4.4, there are reasons to expect chum salmon PSC may not be transferred efficiently throughout the whole AFA fleet when there is a demand for it. Therefore, some cooperatives or vessels may be adversely affected even if the whole sector is not.

As described through tables in Section 4.2.1, AFA vessels and companies are not equally reliant on pollock revenue relative to revenue from other fisheries so the marginal impact of the proposed chum salmon PSC limits would fall more heavily on some participants than others. Additionally, companies have different cost portfolios that are not available to the analysts. For instance, fixed costs for maintaining and operating a vessel can be high (*e.g.*, debt payments, insurance, property taxes). In the event that total production is lower under Alternative 2 or 3, fixed costs would be distributed across a smaller volume of product output.

Overall, there is uncertainty about the inshore sectors' ability to prevent a B season closure under a chum salmon PSC limit. If the inshore cooperatives are successful in chum avoidance under a PSC limit prescribed, they may still harvest their full pollock allocation and there may be no forgone revenue at the sector-level. If a PSC limit results in an early B season closure, this is expected to have adverse economic impacts on the inshore CVs that would otherwise harvest this allocation. This means it could have direct adverse economic effects on the companies that own and maintain the vessels, those that lease their pollock allocation to be harvested on these vessels, and the skippers, fishing crew employed on these vessels.

4.3.2.3.2.2 Shore-based Processor Impacts

Six physical shore-based processors accepted deliveries of B season pollock from 2011–2023: UniSea, Westward Seafoods, and Alyeska Seafoods and the *Northern Victor* in Unalaska/Dutch Harbor; Trident Seafoods in Akutan; and until recently, Peter Pan Seafoods in King Cove.

A chum salmon PSC limit under Alternative 2 or 3 could adversely affect shore-based processors through avoidance measures or forgone pollock. Vessels may be required to take additional measures to avoid chum salmon, some of which could slow their pace of fishing. This could interrupt the coordinated flow of deliveries and overall efficiency of the plant. An increase in avoidance measures may also result in different types or quality of product able to be made (as discussed above in Section 4.3.2.3.1). If the inshore cooperative affiliated with the processor reached its chum salmon PSC apportionment and closed early, this would reduce the amount of landed pollock able to be processed and sold.

An early B season closure for specific cooperatives or the inshore sector as a whole would have direct and adverse impacts for the affiliated shore-based processor(s) and the communities they are located in. The retrospective analysis shows this could have been a maximum of ~250,000 mt less pollock to process, which could have represented up to ~73% of the inshore sectors total B season harvest (Table 3-8 and Table 3-9); under a 100,000 chum PSC limit in 2018).

An important dimension to understanding this impact is how a processing company would assess this risk. Table 3-8 and Table 3-9 demonstrate when the inshore sector would have closed without any behavioral changes. Under a 100,000-chum salmon PSC limit, the full inshore sector would have reached the limit prior to harvesting its pollock quota 12 of these 13 years considered, 2 of the 13 years under a 325,000 limit and 0–1 of the 13 years under a 550,000 limit. If the chum salmon PSC limit under Alternative 2 or 3 is *perceived as constraining*, the processor(s) would need to consider this prior to the start of the B season. The analysts are emphasizing the perception of a constraining cap because, while the scale of gross revenue generated from this fishery is substantial, the high costs associated with operations, processing labor, and transportation in this remote region of Alaska means the overall scale of the risk may also be substantial.

The Alaska seafood industry is currently facing many market challenges, and a number of processing companies are undergoing transitions (see Section 4.2.1.2 and AFSC, 2024). In 2024, multiple processors announced seasonal or permanent plant closures across Alaska fishing communities. This included the sale of four of Trident's largest processing facilities (Ketchikan, Petersburg, False Pass, and Kodiak), and an uncertain future for two other facilities (South Naknek Diamond NN Cannery and Chignik). Challenging global seafood market conditions, high costs, among other factors are likely to persist, and a changing regulatory landscape adds uncertainty to potential future impacts. Overall, these dimensions may result in processing companies being more risk adverse. Impacts from an overall chum salmon PSC limit could exacerbate some of these conditions, including if the cap is perceived to be constraining.

Analysts do not have access to operational cost data for processors, so a break-even point cannot be quantified. Lower wholesale prices and increased shipping costs may also make a processing company more vulnerable than they may otherwise be, when combined with additional changes in operating costs, product quality and value, and the changes in net revenue resulting from a chum salmon PSC limit. Processing companies will need to provide their own risk assessment given their operational cost structure.

and all other relevant factors for their company. However, representatives have highlighted substantial debt and investments at the start of the B season and that those costs are not accounted for until at least the majority of the way through the B season.¹³¹

Processing companies often work to establish their markets prior to the start of the fishing season. Pollock products (among other seafood products) are fast-moving consumer goods with a limited shelf-life, and restaurants or retail stores require consistent quantities to meet consumer demand. Thus, a limit that presents a risk of constraining harvest would affect processors' operational plans and market strategy, potentially influencing them to make costly decisions with imperfect information. It is possible that consolidation among shoreside processing entities could occur, depending on their ownership structures, market vulnerabilities, and the degree to which harvesting vessels delivering to the processor are able to adapt their fishing behavior under the PSC limit.

Frequent or erratic B season closures could negatively impact processors' ability to maintain their markets and remain profitable, which would have ripple effects on the other species and fisheries processed at these plants, the companies' partnerships and subsidiaries, as well as their labor forces. B season pollock is a high-volume fishery that is important to the annual cycle of these plants, and it contributes a substantial portion of the annual gross revenues for all shore-based processors (Table A5-16 in Appendix 5). These are multi-species plants that have been adversely affected by the recent Bering Sea snow crab closures, and small Bristol Bay red king crab TAC in recent years. Thus, pollock has become a greater proportion of the total net revenue for most of these processors. Changes in abundance for other key species historically processed by these facilities, among other factors, may limit their ability to diversify product lines.

In addition to species diversification, the regional or operational diversification of one processing company can help to balance out the volatility of seafood markets or support their existing investments. Some companies that own the shore-based processors addressed in this analysis have additional processing facilities in other communities, and these facilities specialize in other species to help diversify a company. Some companies also have part or full ownership in support sector businesses. For instance, UniSea owns the Grand Aleutian Hotel in Unalaska. If these processors' revenues are substantially reduced or unpredictable due to a hard cap that is perceived to be constraining or results in an early closure in the B season, there could be broader implications for their other partnerships or subsidiaries.

An important nuance to this discussion is that an early B season closure may not necessarily close a plant, depending on the timing of the closure. These are multispecies plants that may be able to sustain operations for a period of time, relying more on other species to keep the facility running. However, there is no guarantee a plant could sustain their operations in the face of an early B season closure, and if it could not there would be direct and adverse effects on processing workers. On average, shore-based processing facilities that accepted B season pollock deliveries employed 1,731 persons (see Section 4.2.1.5). It is assumed that not all employees were directly involved in processing pollock at the plant, but it is plausible that all employees would be affected given the important role this fishery plays in maintaining economies of scale and operational efficiencies. Employees at a shore-based facility that closed would face immediate financial hardship. Financial strain created by reduced income could lead to additional stress and anxiety among processing workers and their families.

4.3.2.3.2.3 Impacts to Communities Affiliated with a Shore-based Processing Facility

This section first discusses the potential impacts to communities identified as being directly engaged in or dependent upon the B season pollock fishery and affiliated with shore-based processors, namely Unalaska, Akutan, and King Cove. Next, the analysis discusses the possible impacts to a broader network of communities that are indirectly affiliated with pollock deliveries through the processing companies or tax revenue.

¹³¹ Personal communication, S. Carroll.

Unalaska

Relative to Alternative 1, Unalaska would experience direct and adverse impacts from early B season closures if a cooperative or the inshore sector as a whole met the overall PSC limit. Four shore-based processors accepted B season pollock deliveries and were located in Dutch Harbor from 2011–2023.

Table 4-20 provides estimates on the revenue the City of Unalaska earned from direct fisheries-related taxes levied on B season pollock. This includes the City's local raw seafood tax and the City's shared portion of the FBT. While estimates on FRLT revenues earned from the B season pollock fishery were previously provided for the offshore component, those data are also provided so the total estimated value can be compared to the City's general fund revenue. These estimates provide a way to scale the potential adverse effects early B season closures could have on the City of Unalaska, although the relative magnitude would depend on the timing of the closure, the amount of pollock catch forgone, and whether more than one inshore cooperative affiliated with the community reached the limit.

Estimates on the value of the City's local raw seafood tax ranged from \$1.36 million (2017) to \$1.83 million (2018), and the city's portion of the shared FBT ranged from \$1.02 million (2017) to \$1.37 million (2018). On average, the estimated revenue earned from all direct fishery-related taxes levied on B season pollock accounted for 16.5% of the City's general fund revenue (2011–2022). These estimates do not account for revenues derived from taxes and fees from activities in the community that are fishing related or may be paid by AFA vessels companies including, but not limited to, property taxes paid by fisheries businesses, fuel transfer tax revenues, and harbor fees.

Table 4-20 Estimated direct fishery related tax revenue earned from B season pollock for the City of Unalaska compared to all general fund revenue

Year	Estimated Local Raw Seafood Tax	Estimated Revenue Share of FBT	Estimated Revenue of Local Raw Seafood Tax and Share of FBT	Estimated Revenue from Local Raw Seafood Tax, FBT, and FRLT	City of Unalaska General Fund	Local Raw Seafood and Share of FBT as % of Total General Fund	Estimated B Season Tax Revenues as % of Total General Fund
2011	\$1,597,082	\$1,197,811	\$2,901,004	\$5,505,810	\$29,152,912	10.0%	18.9%
2012	\$1,738,564	\$1,303,923	\$2,963,970	\$5,882,168	\$31,634,417	9.4%	18.6%
2013	\$1,633,875	\$1,225,406	\$2,859,088	\$5,436,864	\$32,609,892	8.8%	16.7%
2014	\$1,633,617	\$1,225,213	\$2,853,411	\$5,509,118	\$34,376,971	8.3%	16.0%
2015	\$1,626,392	\$1,219,794	\$2,704,213	\$5,514,965	\$34,525,170	7.8%	16.0%
2016	\$1,437,095	\$1,077,822	\$2,455,718	\$4,999,438	\$30,723,626	8.0%	16.3%
2017	\$1,358,163	\$1,018,623	\$2,732,584	\$4,632,096	\$34,371,441	8.0%	13.5%
2018	\$1,832,560	\$1,374,420	\$3,013,308	\$5,686,951	\$30,300,957	9.9%	18.8%
2019	\$1,574,330	\$1,180,748	\$2,776,896	\$5,205,972	\$36,419,248	7.6%	14.3%
2020	\$1,603,421	\$1,202,566	\$2,845,571	\$5,007,951	\$36,478,643	7.8%	13.7%
2021	\$1,656,200	\$1,242,150	\$2,833,609	\$5,243,889	\$29,089,571	9.7%	18.0%
2022	\$1,569,878	\$1,177,408	\$2,798,959	\$5,014,515	\$29,110,249	9.6%	17.2%
2023	\$1,638,775	\$1,229,081	\$1,638,775	\$5,084,850	NA	NA	NA

Source: AKFIN. City of Unalaska, Alaska. Comprehensive Financial Audits, Fiscal Years 2011–2022.
<https://www.commerce.alaska.gov/dcra/admin/Financial> Accessed August 28, 2024.

A reduction in fishery-related tax revenue due to an early B season closures and/or with increased avoidance costs (see Section 4.3.2.3.1) would adversely impact the community's funding of public services including the port, roads, local school, healthcare facilities, and other essential services. In a community like Unalaska which is heavily reliant on the pollock fishery, a stable tax base is vital for maintaining the quality and availability of these services. Tax revenues also create and sustain jobs within the fishing industry as well as other support sectors including hospitality, transportation, or retail.

Section 4.1.1 describes the important role Unalaska plays in the BSAI region as a primary port for support sector businesses and transportation services. That information is provided in the context of community impacts, should one of the offshore sectors close early during a B season and it is not repeated here. However, if the inshore sector and one or more of the offshore sectors closed early, the adverse effects on local businesses would increase in magnitude.

Table 4-7 illustrates the important role pollock plays in the annual processing cycle of the shore-based processors addressed in this analysis. Specific to the community of Unalaska, the local small boat fleet has participated in halibut and sablefish IFQ, fixed gear groundfish, and local crab fisheries on a relatively small scale (Downs & Henry, 2023). Deliveries from the local small boat fleet are likely not a major source of income for the plant, but these deliveries have been an important source of income for local fishermen. If these shore-based processors were to close, it is anticipated local fishermen otherwise disconnected from the pollock fishery would be adversely affected.

Akutan and King Cove

Akutan and King Cove are directly engaged in the Bering Sea pollock fishery as the location of shore-based processing facilities. The two communities are grouped here because of that shared characteristic, and because both communities are located within the Aleutians East Borough. These remote communities have local economies built around the seafood industry, making them vulnerable to fluctuations in fish stocks, shifts in global seafood markets, and potential fishery closures resulting from the proposed regulatory changes under Alternative 2 or 3.

The analysis of potential impacts to communities engaged in or dependent on B season pollock under Alternative 2 and 3 includes King Cove because the community participated in the fishery from 2011–2023. However, King Cove’s participation and dependence on B season pollock has already changed as the Peter Pan Fleet Cooperative did not file an inshore AFA cooperative permit for the 2024 fishery. While some amount of AFA pollock could be delivered to the plant in the future, the analysis cannot predict if or when this would occur. Vessels that were previously in the Peter Pan Fleet Cooperative fished in the open access fishery (2023 and 2024) to move to a new cooperative. As a result, the analysis does not anticipate Alternative 2 or 3 would negatively affect the community of King Cove unless the processor and cooperative returned to the community.

Akutan/King Cove/Aleutians East Borough derived economic benefits from taxes levied on B season pollock. The estimated revenue earned by the community grouping from B season pollock fishery ranged between \$2.02 million (2023) and \$2.70 million (2019). The economic and social benefits tax revenues provide to a community were previously discussed in relation to Unalaska, as were the potential adverse effects of a B season closure for a community where a shore-based plant is located, and are not repeated.

Trident is the primary employer in Akutan with 800 to 1,200 employees present at the facility during the B season (Downs & Henry, 2023). While workers may be seasonal, and not all employees are directly involved in processing B season pollock, processing workers would be adversely affected by an early B season closure. If the plant closed early due to the proposed regulatory changes, it would have a direct and adverse impact on the local economy. This would a job and income opportunity losses. Alternative or additional employment opportunities can be relatively limited in a remote community like Akutan. The City of Akutan and the Aleutians East Borough employ people in administrative and educational roles (among others), but these entities may be limited in their capacity to do so if positions or sufficient funding are not available. These factors may in turn lead to population decline as people leave the community to seek employment opportunities elsewhere. If families leave, youth outmigration would have an impact on the sustainability of the community including school funding.

The important role that high-volume fisheries like pollock play in providing stability to a processor has been previously addressed (see Section 4.3.2.3.2.3). In Akutan, the local small boat fleet has historically made small deliveries of halibut and sablefish to Trident Seafoods. These fisheries are not a significant source of income for the plant, but they have been an important source of income for local fishermen.

While local fishermen are engaged in other means of employment beyond commercial fishing, they do depend to varying degrees on fishing as a part of an integrated, plural employment and income strategy in a community that has relatively limited employment and income opportunities (Downs & Henry, 2023).

The likelihood and magnitude of the adverse effects a B season closure could have on the community of Akutan are uncertain. The degree to which this community would be adversely impacted would depend on whether the PSC limit was perceived to be constraining such that the processor would need to adjust its business plan prior to a season starting, and whether or not pollock operators can modify their behavior to avoid reaching the limit. There are also uncertainties that stem from outside the proposed action, such as the possibility that Trident would pursue its “next generation processing plant” in Unalaska’s Captains Bay which would replace the Akutan plant.

Other Communities Affiliated with the Shore-based Processors

As described in Section 4.3.2.3.2.2, some shoreside processing companies have relied on the steady revenue stream provided by pollock to subsidize the cost of other operations. The high-volume nature of pollock provides processors economies of scale and it has been a reliable revenue source because of its stability in terms of TAC amounts and full utilization. Erratic or frequent early B season closures could limit these companies’ ability to continue to support facilities in other communities that are less profitable for the company but may be of central importance to the community in which they are located. This could also impact when a processor remains open throughout the season and what fisheries it is able to support. In this way, there may be an ‘invisible network’ of adverse economic and social impacts to fishermen and communities not otherwise engaged in or dependent on pollock.

For instance, Trident Seafoods receives deliveries of Bering Sea pollock at its Akutan plant, but it also owns shore-based plants that process groundfish, crab, and salmon in six Alaskan communities (Sand Point, St Paul, Cordova, North Naknek, and Wrangell). Representatives have emphasized that the stability of the Bering Sea pollock fishery allows the company to weather erratic salmon markets (potentially impacting Sand Point, Naknek and Wrangell and the fishermen who deliver to these plants).¹³²

Representatives have also highlighted the stability of this fishery allows Trident to maintain processing infrastructure in St Paul despite recent crash in Bering Sea crab, with an interest in reviving this plant to support local fishermen and crab fishermen in the future. The Akutan plant has also recently received deliveries of WGOA pollock from fishermen associated with Sand Point, King Cove and Kodiak, which runs from September – November. While it is possible other plants may be available for these deliveries in the future, an early B season closure for the Akutan Coop could mean this plant does not operate later in the fall to support other fisheries.¹³³ These kinds of broader implications could affect ‘non-pollock’ communities through tax revenue and availability of markets for non-pollock fishermen.

In addition, tax revenue from landings and product transfer can produce wider community benefits that extend beyond the community of delivery. For instance, communities in the Aleutians East Borough and throughout the State of Alaska have derived economic benefits from taxes levied on B season pollock. As described in Section 4.1.2, this revenue is shared with communities in the Borough and throughout the State of Alaska through the State’s General Fund.

Any broader impacts to a wider array of communities would be indirect and also depend on cumulative factors (*e.g.*, other sources of State of Alaska tax revenue, future seafood market opportunities or challenges, etc.). Therefore, the likelihood and possible magnitude of adverse effects are uncertain. However, if management measures selected result in B season closure of the Bering Sea pollock fishery, these broader impacts would be more likely to occur.

¹³² April 2024 testimony to the SSC, S. Carroll.

¹³³ Personal communication, S. Carroll.

4.3.2.3.2.4 Impacts to Communities Affiliated with the Inshore Sector by Vessel Registration**Newport and Kodiak**

Kodiak and Newport are grouped in this analysis because these communities are the registered ownership location of inshore CVs and not affiliated with the sector by way of a shore-based processor. Kodiak and Newport could experience adverse effects under Alternatives 2 or 3, and the following data summaries provide a way to scale the potential forgone revenue for CVs affiliated with these communities. The magnitude of potential forgone revenue would depend on when the cap was reached, and the amount of pollock catch forgone.

- Six CVs with a registered ownership address in Kodiak City participated in the B season fishery (2011–2023). Five of these vessels participated in the inshore sector. One vessel is dual qualified and participated in both the inshore and mothership sectors. CVs affiliated with Kodiak City earned an average of \$3.55 million in gross ex vessel revenue from B season pollock. This represented 27.57% of these vessels' total revenue and accounted for 2.81% of the total ex vessel revenue earned by the Kodiak community fleet.
- Ten CVs with a registered ownership address in Newport, Oregon participated in the B season pollock fishery (2011–2023). On average, CVs affiliated with Newport earned \$5.93 million in gross ex-vessel revenue from B season pollock (2011–2023). This represented 36.84% of these vessels' total revenue and 20.81% of the total ex vessel revenue earned by the Newport community fleet.

The CVs affiliated with these two communities have a relatively high reliance on the B season pollock fishery, and it plays a meaningful role in their business plans. Some vessels rely on AFA pollock to keep their operations busy through the summer months when they may not be able to participate in other fisheries. If CV owners affiliated with these communities perceived a cap would be constraining, they may try to lease their quota to another vessel in their cooperative and pursue salmon tendering contracts to insulate the vessel from the potential adverse effects of an early closure while keeping the boat operating during the summer months. The same opportunity is unlikely to be available if a vessel decided to fish their pollock quota but was later closed early due to the overlap in the timing of summer salmon fisheries and B season pollock. Tendering contracts have also become increasingly hard to get because challenges with salmon and other seafood markets are causing processors to reduce tendering costs.¹³⁴

Information on where vessels purchase support services, and the long-term residence of crew are not readily available. As such, a vessel's listed homeport can capture some cross-cutting community ties as it indicates where a vessel spends most of its time and generates some level of economic activity. In 2023, all CVs registered in Kodiak also listed the community as its homeport location. CVs registered in Newport listed Newport, Portland, and Unalaska as their homeport communities. In alignment with these homeport data, it has been common for crew working on Kodiak and Newport CVs to be hired from their respective communities as well as the Seattle MSA area and other communities in Oregon. However, specific to Kodiak, current economic conditions like low fish prices and ongoing social transitions have made it challenging to hire and retain crew and resulted in a much wider reach to hire crew.¹³⁵ If the inshore sector experienced erratic or frequent B season closures under Alternative 2 or 3, vessel owners and crew would be directly and adversely impacted. The income lost due to an early B season closure could create financial instability.

Many Kodiak and Newport families have been engaged in commercial fisheries for generations, passing down the skills and knowledge of working in the industry. Some Newport CVs are independent, family-owned vessels where family members work as crew. The shared experience can strengthen the social networks within and among families in these communities. There are meaningful kinship ties between

¹³⁴ Personal communication, C. Raddell.

¹³⁵ Personal communication, H. Mann and C. Raddell.

Kodiak and Newport. Many fishing families in Kodiak have extended relatives, friends, or business partners in Newport and vice versa. These ties are built around the fishing industry, including that Newport (and Lincoln County more broadly) has support sector businesses that can services catcher vessels of a scale not available in Alaska.

Kodiak and Newport each hold an identity as a fishing community, and this social fabric could change if the inshore sector experienced early closures as a result of reaching a hard cap on chum salmon under Alternative 2 or 3. Related to the points discussed above, pollock has provided a sense of stability for shore-based processors but also for vessel owners and their business plans. There are many factors external to the proposed regulatory changes and this impact analysis that discourage younger generations of fishermen from entering the fishery (*e.g.*, rising costs, poor seafood market conditions, access, among others). As younger fishermen weigh the many tradeoffs of entering the industry, the possibility of a constraining hard cap, or actual observed closures for the inshore sector in the future, would likely influence how younger fishermen perceive the viability of buying into the industry or fishery.

Seattle MSA

On average, 74.4 CVs participated in the inshore CV sector and the majority of ownership was concentrated in the Seattle MSA at 60.9 vessels or 81.90% of all vessels that participated in this sector (2011–2023). The potential effects of a B season closure on Seattle MSA were previously described in relation to the offshore components including forgone revenue, impacts to crew, and support sector businesses (see Section 4.1.1), which are expected to be similar in nature for the community if the inshore sector closed early in the B season. However, if the inshore sector and one or more of the offshore components (*i.e.*, CP or mothership) closed early, the adverse effects on the community would increase in magnitude.

4.3.2.3.2.5 Additional Impacts to CDQ Groups and Communities

As described in Section 4.3.2.2.3, CDQ groups would be impacted by a closure of the B season in several ways. In addition to the types of impacts described in that section, CDQ groups and their subsidiaries could see reduced revenues through their investments in inshore CVs (or companies that own them, as represented in Table 4-11).

If early closures in the B season result in forgone revenue for these vessels (or less efficient operations due to increased chum avoidance), this may reduce the dividends or other types of benefits the CDQ groups may receive through these investments. The way these adverse impacts manifest could be different depending on the ownership relationships and how risk/operational costs are absorbed (or not) through these investments.

The types of impacts to CDQ communities could be the same as those described above under Section 4.3.2.2.3 related to the offshore sectors. The 53 communities affiliated with BBEDC, CBSFA, CVRF, and NSEDC may be considered as more exposed to potential adverse effects resulting from a fishery closure, because their groups would receive an allocation of pollock and an apportionment of the hard cap, as well as having additional direct investments into the offshore sectors and the inshore sector.

4.3.2.3.2.6 Possible Spillover Impacts on Other Fisheries

This section summarizes potential spillover impacts on non-AFA fisheries from displaced CV effort (both mothership and inshore CVs).¹³⁶ This displaced effort could result from a B season closure or incentives to avoid chum salmon due to the presence of a PSC limit. Essentially, these options are limited and specific by vessel due to LLP endorsements, sideboard exemption status, and sideboard limits.

For instance, AFA CVs are either subject to **GOA** sideboards, which establish a strict limit on participation in these fisheries or they are exempt from GOA sideboards. Of the 20 permitted CVs that are

¹³⁶ Potential spillover impacts are discussed in more detail in Appendix 6 from the February 2025 preliminary DEIS, available at archived meeting agenda for February 2025 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3071>), agenda item C2.

exempt from GOA sideboards, 17 have been active between 2015-2023 and most of these vessels have had recent consistent participation in both the BS pollock fishery as well as GOA fisheries. This could be, at least in part, due to the restrictions created through the CV inter-cooperative agreement which essentially states that if a GOA exempt vessel fishes in the GOA above the established GOA sideboard amounts, it is not allowed to lease its AFA pollock allocation, or they could risk losing access to their exempt status in the GOA. Thus, if they do not fish their BS pollock, rather than lease it, a GOA exempt vessel could choose to leave it unharvested. Thus, if the Bering Sea pollock B season closed early or if the uncertainty of an early closure was too great to afford the trip to the Bering Sea, these vessels may choose not to participate in the Bering Sea pollock B season and only fish in the GOA. As some CVs less than 125 ft LOA typically participate in GOA B season pollock (Sept 1- Nov 1) prior to B season in the GOA, this may or may not affect their participation in the GOA.

For AFA CVs that are sideboarded in GOA, sideboard limits were recently reduced with the implementation of the Pacific cod Trawl Cooperative (PCTC) Program (see Appendix 6 in the February 2025 preliminary DEIS for a table of these reductions).¹³⁷ Moreover, vessels wishing to participate in these fisheries must have an LLP with the appropriate endorsements. Of the 96 GOA non-exempt CV permits, currently only 14 non-exempt vessels are endorsed to fish in the Central GOA with trawl gear and 10 are endorsed to fish in the Western GOA with trawl gear. This means that these vessels specifically might have limited opportunity to expand into GOA due to impacts from the BS pollock B season, but not more than the established sideboards.

In the **BSAI**, there are unlikely to be many external opportunities for AFA CVs. The BS pollock B season overlaps with the BSAI Pacific cod trawl C season (June 10- Nov 1), which receives 15% of the trawl CV apportionment and can also receive rollovers from the A and B seasons. This fishery has remained a limited access fishery open to all trawl CVs with an LLP license endorsed in the BS and/or AI with trawl gear, which qualifies all AFA CVs. Thus, there is potential opportunity here for AFA CVs that are impacted by chum PSC limits for the BS pollock B season. There is also a potential for spillover impacts on other Pacific cod user groups if participation increases in the Pacific cod C season. However, fishing for Pacific cod in the C season has been noted as particularly challenging with disaggregated Pacific cod, resulting in higher bycatch. Participation and prosecution of this fishery has been low in recent years, and it is unlikely there would be a large shift to this fishery.

4.3.3 Alternative 3

Alternative 3 is similar to Alternative 2 in that it would include an overall chum salmon PSC limit during the B season; however, the overall PSC limit would only be applied if an index of WAK chum salmon abundance did not have returns above its thresholds the prior year. In years when the PSC limit did not apply, impacts would mirror status quo. An overall PSC limit under Alternative 3 is expected to result in similar economic and social costs as Alternative 2 in the years a PSC limit would have been in effect. This means in these years, it is expected the economic impacts of chum salmon PSC limits would be either neutral (if a PSC limit is perceived as a low risk and does not change behavior), or generate a negative impact for the pollock fishery a medium or high degree of risk if perceived and this changes operational patterns or closes the B season early for a sector.

Related to this point, the range of potential chum salmon PSC limits under Alternative 3, Option 2 is the same as the range being considered for Alternative 2; however, **Alternative 3, Option 1 extends the lower bound of a possible PSC limit to 75,000 chum salmon.**

It is expected that this lower PSC limit would increase the adverse economic effects for the pollock fishery, relative to the other PSC limits currently considered in years when the limit is in effect. Based on historical chum salmon PSC trends, it is likely that a 75,000-chum salmon PSC limit would be perceived

¹³⁷ Available at the Council's archived meeting page for the February 2025 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3071>), agenda item C2.

as a high risk across the fleet and require changes in operational strategies. In this case, the fleet may incur greater avoidance costs or consolidation of quota if vessels determine the risk is too great to conduct a trip. As described in Section 4.3.2.2.1 and Section 4.3.2.3.1 under Alternative 2, avoidance costs could include increase fuel cost, decreased operational efficiency and/or product quality, as well as potential trade-offs with Chinook PSC and variable cost if the season is extended. These types of operational changes may also affect crew, CDQ groups through their quota as well as direct investments in AFA, shoreside processors and communities. If vessels were unsuccessful in remaining under the PSC limit with operational changes, they would also see reduced total revenues.

Section 3.3.4.3 demonstrates a 75,000-chum salmon PSC limit would have been possible retrospectively in 2021, 2022, or 2023 if the PSC limit selected when one area fails to meet its threshold was set at 100,000 chum salmon for Alternative 3, Option 1. Table 4-21 extends the Alternative 2 analysis of potentially forgone revenue to a 75,000-chum salmon PSC limit in these years. In 2021, all sectors were estimated to have exceeded all apportionments of a 75,000-chum salmon PSC limit. In this year, without changes in fishing strategies, CDQ, inshore, and mothership sectors would have left more than 60% of their B season pollock allocation unharvested. For the inshore sector, this could represent up to \$89 million in forgone gross ex vessel revenue. For the offshore sectors, this could represent up to \$46 million, \$16 million, and \$22 million in forgone gross first wholesale revenue for the CP, mothership and CDQ sectors respectively.

In 2022 and 2023, either due to heightened chum salmon avoidance, improved conditions relative to PSC encounters or both, the impact of this 75,000-chum salmon cap would have been less acute, but still present. For instance, in these years, low levels of CDQ pollock were estimated as forgone (up to 1% of the B season harvest under some apportionments). However, as previously described, the preseason risk of the PSC limit may motivate changes to fishing strategies that could affect the harvest of CDQ pollock in a way that is not represented in this table. Companies leasing CDQ may consider the risk of an early closure and choose to prioritize their quota in their direct ownership, depending on existing lease contracts. In addition, Table 4-21 demonstrates that the inshore and mothership sectors could still have a substantial percentage of the B season pollock and associated revenues forgone. If chum salmon avoidance strategies are unable to prevent a closure under a 75,000-chum salmon PSC limit, an early B season closure may result in broader implications for shoreside processors, communities, CDQ groups and associated communities, other fisheries, as well as markets as described under Alternative 2.

Table 4-21 Upper bound of pollock left unharvest and associated forgone gross revenue if a 75,000-chum salmon PSC limit had been in place in 2021, 2022, and 2023

Sector	Apportionment	Pollock forgone						Ex-vessel revenue forgone (millions 2022\$)			First wholesale revenue forgone (millions 2022\$)		
		2021		2022		2023		2021	2022	2023	2021	2022	2023
		Mt	% of B season	Mt	% of B season	Mt	% of B season						
CDQ	3-yr average	59,756	78%	579	1%		0%	\$21.97	\$0.26	\$0.00	\$70.71	\$0.81	\$0.00
	5-yr average	59,756	78%	579	1%		0%	\$21.97	\$0.26	\$0.00	\$70.71	\$0.81	\$0.00
	Pro rata	59,756	78%	579	1%		0%	\$21.97	\$0.26	\$0.00	\$70.71	\$0.81	\$0.00
	AFA	48,589	63%		0%		0%	\$17.87	\$0.00	\$0.00	\$57.52	\$0.00	\$0.00
CP	3-yr average	125,523	47%	34,084	16%	26,751	11%	\$46.45	\$15.44	\$9.86	\$148.83	\$47.58	\$31.29
	5-yr average	125,523	47%	18,381	9%	13,570	5%	\$46.45	\$8.33	\$5.00	\$148.83	\$25.68	\$15.87
	Pro rata	125,523	47%	18,381	9%	13,570	5%	\$46.45	\$8.33	\$5.00	\$148.83	\$25.68	\$15.87
	AFA	125,523	47%	18,381	9%		0%	\$46.45	\$8.33	\$0.00	\$148.83	\$25.68	\$0.00
Inshore	3-yr average	242,240	71%	78,690	30%	85,628	26%	\$89.29	\$35.95	\$30.73	\$251.14	\$104.21	\$105.04
	5-yr average	242,240	71%	78,690	30%	85,628	26%	\$89.29	\$35.95	\$30.73	\$251.14	\$104.21	\$105.04
	Pro rata	242,240	71%	78,690	30%	85,628	26%	\$89.29	\$35.95	\$30.73	\$251.14	\$104.21	\$105.04
	AFA	242,240	71%	104,821	40%	85,628	26%	\$89.29	\$47.78	\$30.73	\$251.14	\$138.78	\$105.04
Mothership	3-yr average	43,980	66%	15,107	28%	33,315	53%	\$16.27	\$6.77	\$12.32	\$52.07	\$20.93	\$39.16
	5-yr average	43,980	66%	15,107	28%	33,315	53%	\$16.27	\$6.77	\$12.32	\$52.07	\$20.93	\$39.16
	Pro rata	43,980	66%	15,107	28%	33,315	53%	\$16.27	\$6.77	\$12.32	\$52.07	\$20.93	\$39.16
	AFA	43,980	66%	15,107	28%	33,315	53%	\$16.27	\$6.77	\$12.32	\$52.07	\$20.93	\$39.16

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

4.3.3.1 CDQ Reserve Pool under Alternative 2 or 3

As highlighted in Section 4.3.2.2.2.3, the perception of risk from an overall chum salmon PSC limit may impact CDQ groups' leverage in negotiating harvesting agreements and lease rates, and depending on the apportionment selected, the ability to transfer CDQ pollock between sectors.

As described, CDQ groups have historically leased or directly fished CDQ pollock on CPs. Given the lower chum salmon PSC rates for the CDQ and CP sector, relative to the inshore or mothership sectors, any apportionment that depends fully or partially on historical fishing would result in a lower apportionment for the CDQ and CP sectors, relative to the AFA apportionment. Thus, an apportionment based on historical affiliation with the CP sector could affect a CDQ group's ability to lease CDQ pollock to an inshore CV. This reduction in flexibility may also affect the CDQ groups' ability to negotiate harvesting agreements and lease rates, even if the CDQ remains in the CP sector. The flexibility to receive an adjusted chum salmon PSC limit in the event that a CDQ group wishes to harvest all of its CDQ pollock with the inshore or mothership sectors, is expected to reduce any economic impacts.

4.3.4 Alternative 4

Alternative 4 would add six new provisions at 50 CFR 679.21(f)(12)(iii)(E) as described in Section 2.6. Alternative 4 would largely codify operational changes the fleet has adopted in recent years in response to Council requests and increased public attention, thus the expected impacts on costs or efficiencies that may have resulted from these operational changes are primarily discussed under Alternative 1. Without modifying the existing regulations to require these measures continue to be used in the future, it would be possible for the contracts to be modified and less stringent avoidance efforts could be used in the future. As such, it is likely Alternative 4 would have relatively neutral or slightly increased effects on harvesters' operating costs, compared with status quo. While operating costs could increase slightly under Alternative 4, it is anticipated the magnitude of these changes would not be to a degree where the effects on a pollock dependent communities could be measured.

4.3.5 Alternative 5

Three different inseason corridor options are being considered under Alternative 5 but only one may be selected for implementation. Among all three options, the inseason corridor, the range of PSC limits (50,000–350,000 chum salmon), apportionment options, and closure window of June 10 – August 31 are the same. All or part of the corridor would be closed to the sector or cooperative that attained the PSC limit during the closure window. The three inseason corridor options differ from one another based on the number and location of stat areas inside that would close and the entity that would implement the closure. **Option 1** would close the entire corridor (40 of 40 stat areas); **Suboption 1** would close 29 stat areas inside the corridor and exempt 11 from closure; **Option 2** would close between 19 and 29 stat areas. If the cap is met, a sector may continue to fish outside of that defined area. After August 31, a sector closed out of pollock fishing in the corridor could fish inside it from September 1 to the end of the B season on November 1.¹³⁸

The economic effects from Alternative 5 **prior to a corridor closure** will depend on the strength of the incentive generated by the closure as well as the cap and apportionment chosen. The strength of the incentive is a function of a vessel's perception of risk and consequences associated with a corridor closure. The consequences can be evaluated by a sector's historical dependency on an area that may close as well as physical and practical constraints of fishing elsewhere. Risk can be evaluated as the likelihood of a corridor closure, given the chum salmon PSC limits and apportionments proposed. The analysis relies

¹³⁸ Note that Appendix 2 highlights 10 smaller stat areas that are near the Aleutian Islands where some historical fishing has occurred that are not included in the identified corridor. The addition or exclusion of these areas are not expected to change the results presented in this section, as they are not expected to provide substantial additional fishing opportunities. The Council should consider whether these areas would be included in the final defined corridor area.

on hypothetical closures from 2011–2023 to provide some context of risk; however, a better evaluation of risk would occur by the fleet in the future after they had operated under a corridor cap. If there is high risk and consequence associated with this closure, the fleet may incur **avoidance costs** prior to and regardless of whether a corridor cap is met in an effort to prevent the closure.

Potential **economic effects of a closure** are evaluated through **displaced pollock catch** and ‘**revenue at risk**’. As described in Section 4.1.3, pollock and revenue values are based on the catch and gross revenue historically generated inside the closed corridor at the point in the B season when a sector would have met the corridor PSC limit. These metrics represent an *unlikely* maximum direct economic impact from the closed corridor, because vessels may preemptively increase their avoidance efforts prior to a closure, and if a closure occurred, vessels would likely shift effort to other areas to the extent they can. In most cases, it is expected that displaced catch would be made up in other areas and/or after the corridor reopens on September 1. The likelihood that some amount of B season pollock TAC would be left unharvested under the options in Alternative 5 varies by sector and is discussed in the corresponding section. Primarily, these are useful values to understand how much catch and gross revenue would need to be redistributed and recovered elsewhere to minimize the economic impacts. Additionally, these values provide a means to compare and contrast the impacts of different inseason corridor options under Alternative 5.

4.3.5.1 Option 1

The analysis of Alternative 5, Option 1 builds from Section 3.2.1.1.4.1 which considers each sector’s relative dependence on the fishing grounds inside the corridor for its pollock catch during the closure window (June 10 – August 31) and Section 3.3.4.6.3 that evaluates the expected fleet behavioral changes under Alternative 5. Expected fleet behavioral changes are included in the analysis of chum and WAK chum salmon impacts because operational responses to inseason corridors may have direct implication for chum salmon and WAK chum salmon avoidance. This section focuses more specifically on the likelihood and magnitude of potential economic effects from these behavioral changes and/or closures.

Option 1 would close the entire corridor (*i.e.*, all 40 stat areas) if the PSC limit were met. Impacted vessels would be able to continue fishing outside the corridor until September 1. Under Alternative 5, Option 1 the potentially **displaced pollock catch** is shown in Table 3-14 and the associated **revenue at risk** is shown in Table 4-22 and Table 4-23 for 2011–2023. Given the substantial sector-level differences in the spatial footprint of the fishery, as well as vessel characteristics and their mobility, the economic impacts of Option 1 are analyzed separately by sector. Within sectors, Option 1 could create distributional impacts among vessels which are described as practicable for each sector below.

Table 4-22 Gross ex vessel revenue at risk from Alternative 5, Option 1, 2011–2023 (millions of 2022\$)

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-Year Average												
2011			\$4.4	\$34.0								
2012												
2013				\$29.6								
2014				\$18.7								
2015				\$19.3								
2016	\$13.5	\$40.9	\$9.7	\$38.4	\$1.9	\$19.6	\$5.5			\$6.2		
2017	\$12.8	\$32.2	\$8.3	\$67.3	\$10.2	\$27.7		\$10.8	\$10.2	\$23.0		
2018	\$2.2	\$12.8	\$3.6	\$79.1		\$2.9						
2019		\$2.8		\$75.6								
2020				\$4.9								
2021	\$4.0	\$1.2	\$12.8	\$61.2	\$0.2	\$1.2	\$8.6	\$35.8	\$0.2	\$1.2	\$8.6	\$28.7
2022		\$8.9	\$1.9	\$42.8			\$0.4					
2023				\$6.0								
Option 2: 5-Year Average												
2011			\$5.6	\$34.0								
2012												
2013				\$29.6								
2014				\$18.7								
2015				\$19.3								
2016	\$17.0	\$40.9	\$11.6	\$38.4	\$2.7	\$19.6	\$8.1			\$6.2		
2017	\$12.8	\$32.2	\$8.3	\$67.3	\$12.8	\$23.0		\$10.8	\$10.2	\$23.0		
2018	\$2.2	\$12.8	\$3.6	\$79.1	\$0.2	\$2.9						
2019		\$2.8		\$75.6								
2020				\$4.9								
2021	\$4.0	\$1.2	\$14.5	\$61.2	\$0.2	\$1.2	\$8.6	\$35.8	\$0.2	\$1.2	\$8.6	\$28.7
2022		\$3.3	\$1.9	\$42.8			\$0.4					
2023				\$6.0								
Option 3: Pro Rata												
2011			\$4.4	\$39.6								
2012												
2013				\$29.6								
2014				\$27.5								
2015				\$26.8								
2016	\$13.5	\$35.0	\$9.7	\$38.4		\$6.2	\$5.5			\$6.2		
2017	\$12.8	\$32.2	\$8.3	\$67.3	\$10.2	\$23.0	\$0.0	\$29.2	\$10.2	\$23.0		
2018	\$2.2	\$12.8	\$3.6	\$79.1								
2019		\$2.8		\$75.6								
2020				\$12.0								
2021	\$4.0	\$1.2	\$14.5	\$61.2	\$0.2	\$1.2	\$8.6	\$35.8	\$0.2		\$8.6	\$35.8
2022		\$1.6	\$1.9	\$42.8			\$0.4					
2023				\$6.0								
Option 4: AFA												
2011			\$5.6	\$47.1								
2012												
2013				\$49.1								
2014				\$27.5				\$10.0				
2015				\$26.8				\$10.4				
2016	\$13.5	\$27.1	\$11.6	\$47.8			\$5.5	\$19.8				
2017	\$12.8	\$27.7	\$8.3	\$67.3	\$10.2	\$23.0		\$48.6	\$10.2	\$12.3		
2018	\$2.2	\$4.5	\$3.6	\$79.1				\$43.8				
2019				\$81.1								
2020				\$12.0								
2021	\$4.0	\$1.2	\$14.5	\$70.4	\$0.2		\$8.6	\$43.5	\$0.2		\$8.6	\$35.8
2022			\$1.9	\$42.8			\$0.4	\$12.4				
2023				\$9.0								

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

Table 4-23 Gross first wholesale revenue at risk from Alternative 5, Option 1, 2011–2023 (millions of 2022\$)

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-Year Average												
2011			\$15.4	\$103.8								
2012												
2013				\$87.4								
2014				\$55.4								
2015				\$51.1								
2016	\$47.3	\$143.3	\$34.0	\$118.5	\$6.6	\$68.5	\$19.1			\$21.8		
2017	\$46.8	\$116.9	\$30.3	\$195.6	\$37.2	\$100.3		\$31.7	\$37.2	\$83.5		
2018	\$6.9	\$39.5	\$11.1	\$226.9		\$8.7						
2019		\$9.8		\$241.7								
2020				\$13.4								
2021	\$12.7	\$3.7	\$40.7	\$171.5	\$0.5	\$3.7	\$27.4	\$100.1	\$0.5	\$3.7	\$27.4	\$80.0
2022		\$27.4	\$6.0	\$124.4			\$1.1					
2023				\$20.4								
Option 2: 5-Year Average												
2011			\$19.4	\$103.8								
2012												
2013				\$87.4								
2014				\$55.4								
2015				\$51.1								
2016	\$59.6	\$143.3	\$40.8	\$118.5	\$9.5	\$68.5	\$28.6			\$21.8		
2017	\$46.8	\$116.9	\$30.3	\$195.6	\$46.8	\$83.5		\$31.7	\$37.2	\$83.5		
2018	\$6.9	\$39.5	\$11.1	\$226.9	\$0.5	\$8.7						
2019		\$9.8		\$241.7								
2020				\$13.4								
2021	\$12.7	\$3.7	\$46.1	\$171.5	\$0.5	\$3.7	\$27.4	\$100.1	\$0.5	\$3.7	\$27.4	\$80.0
2022		\$10.0	\$6.0	\$124.4			\$1.1					
2023				\$20.4								
Option 3: Pro Rata												
2011			\$15.4	\$121.0								
2012												
2013				\$87.4								
2014				\$81.4								
2015				\$70.7								
2016	\$47.3	\$122.7	\$34.0	\$118.5		\$21.8	\$19.1			\$21.8		
2017	\$46.8	\$116.9	\$30.3	\$195.6	\$37.2	\$83.5		\$85.1	\$37.2	\$83.5		
2018	\$6.9	\$39.5	\$11.1	\$226.9								
2019		\$9.8		\$241.7								
2020				\$32.4								
2021	\$12.7	\$3.7	\$46.1	\$171.5	\$0.5	\$3.7	\$27.4	\$100.1	\$0.5		\$27.4	\$100.1
2022		\$4.7	\$6.0	\$124.4			\$1.1					
2023				\$20.4								
Option 4: AFA												
2011			\$19.4	\$143.7								
2012												
2013				\$143.9								
2014				\$81.4				\$29.4				
2015				\$70.7				\$27.7				
2016	\$47.3	\$94.8	\$40.8	\$147.5			\$19.1	\$61.3				
2017	\$46.8	\$100.3	\$30.3	\$195.6	\$37.2	\$83.5		\$141.3	\$37.2	\$44.3		
2018	\$6.9	\$13.9	\$11.1	\$226.9				\$125.6				
2019				\$260.3								
2020				\$32.4								
2021	\$12.7	\$3.7	\$46.1	\$197.1	\$0.5		\$27.4	\$121.9	\$0.5		\$27.4	\$100.1
2022			\$6.0	\$124.4			\$1.1	\$36.2				
2023				\$31.0								

Source: NMFS Alaska Region Catch Accounting System, data compiled by Alaska Fisheries Information Network.

4.3.5.1.1 Offshore Sector Impacts

Pre-Corridor Closure

The offshore (CP, CDQ and mothership) sectors' perception of risk and consequences of a full inseason corridor closure will likely drive any proactive measures these vessels take to prevent this closure from occurring for their sector. The consequences for each sector are evaluated here based on catch history in the inseason corridor during the closure window (June 10 – August 31) relative to total B season harvest and factors that may impede future movement. Table 3-12 demonstrates that all three of these offshore sectors have substantial variability in annual dependency on the corridor and during the closure window for pollock harvest, relative to its total B season harvest.

The **CP sector** fished in the corridor during the closure window of June 10 – August 31 in all 13 analyzed years (2011–2023; Table 4-25 below), but the proportion of the sector's total B season harvest inside the corridor during this period varied, ranging between a low of 2.5% in 2020 to a high of 52.0% in 2016 (Table 3-12). The CP sector harvested a median of 10.4% of their B season pollock in the corridor during the closure window.

CDQ pollock was harvested in the corridor during the closure window in 12 of the 13 analyzed years (2011–2023; Table 4-24 below) with a median B season harvest of 12.9% (Table 3-12). In the years with participation in this area, between 0.6% and 86.1% of the CDQ sector's B season pollock was harvested in the corridor. The CDQ sector had greater variability in their reliance on the corridor compared to the CP sector, which may be due to the opportunistic nature of when CDQ pollock is accounted for during a trip. For instance, a CP might begin a trip by harvesting CDQ pollock in the CVOA which would increase the CDQ sector's dependence on the corridor in this year and potentially increase the likelihood the sector meets the corridor PSC limit (depending on the fishing conditions that year). Alternatively, if CDQ pollock was harvested alongside AFA pollock in Cluster 3 or 4, dependency on the corridor in that year would be shown to be low.

The **mothership sector** has sometimes high dependency on the inseason corridor during the closure window. As shown in Table 3-12, the amount of pollock harvested by the mothership sector inside the corridor ranged between 4.7% in 2020 and 79.8% in 2022 of its total B season pollock, with a median catch of 31.0% of the sector's total B season pollock.

Relative to the inshore sector, the offshore sectors have greater mobility and operational flexibility as they can process offshore, thus the consequences of a closure may be lower in comparison. However, based on these sectors' variation in dependency on the corridor area during the closure window, the consequences of a closure are likely highly dependent on conditions of that particular year (*e.g.*, pollock aggregation, herring and salmon PSC rates) and the conditions of that year will not be known at the beginning of the B season. Therefore, the flexibility to use this area opportunistically likely still provides an incentive to these sectors to avoid chum salmon PSC (thereby incurring avoidance costs). The strength of that consequence would change inseason, with greater implications the earlier in the B season the cap is met.

The PSC limit and apportionment chosen would influence the risk of a corridor closure occurring. Table 4-24, Table 4-25, and Table 4-26 indicate how many of the years the sectors were estimated to meet the cap and be temporarily closed out of the area based on the retrospective analysis in 2011-2023. For all three offshore sectors, a corridor closure would have rarely been triggered with a 350,000-chum salmon PSC limit. A 50,000-chum salmon PSC limit would have hypothetically closed the corridor to CP sector in 4–6 of the 13 years they fished in the corridor, in 4 of the 12 years for the CDQ sector, and in 6 out of the 13 years for the mothership sector.

From the Alternative 5 apportionment table (Table 2-20), it is clear which apportionments will have the greatest adverse impact for each sector.

- The choice of apportionment option has the highest marginal impact for the CP sector because the least adverse apportionment Option 4 (AFA) would represent 36% of the corridor PSC limit,

compared to most adverse Option 1 (3-year average) which would represent 11.7% of the corridor cap.

- For the CDQ groups, apportionment Option 4 (AFA) would also represent the least adverse impacts with 10% of the corridor PSC limit and apportionment Option 2 (5-year average) would represent the most adverse impacts with 6.4% of the corridor PSC limit. Section 4.3.5.6 further discusses the Suboption which may allow groups to access the CDQ Reserve Pool.
- For the mothership sector, the apportionment option selected would have less of an impact. For instance, if the least adverse apportionment was selected (Option 1, 3-year average) this sector would receive 10.3% of the corridor PSC limit, but if the most adverse apportionment was selected, this sector would receive 8.7% of the corridor PSC limit (Option 2, 5-year average). Based on the retrospective data, the apportionment option would not have changed the outcome for the mothership sector under a 350,000-chum salmon PSC limit, and small marginal difference for a 50,000-chum salmon PSC limit.

Overall, relative to no action, Alternative 5, Option 1 could create adverse economic effects for the offshore sectors. If a higher PSC limit is chosen (*i.e.*, 350,000), the low risk and circumstantial consequences means the offshore sectors may not alter their fishing behavior in a way that would substantially impact current operations or associated costs. If a change in operation comes a low cost (*e.g.*, if they may have considered fishing further northwest regardless) offshore sectors may choose these harvesting strategies even with low risk of closures. For these sectors there is likely some threshold of perceived risk and consequence that triggers more costly proactive measures. If a lower PSC limit is chosen with Alternative 5, Option 1, the risk of a closure is greater. It is likely that preserving the flexibility to fish in the corridor will be perceived as valuable, in particular for the mothership sector that has shown a greater dependency on this area. The sector may choose to make strategic pre-season decisions, such as fishing outside the corridor in the early B season in order to protect fishing opportunity in the corridor later in the B season. This strategy may come at an opportunity cost if the pollock size, quality or aggregations were preferred in the corridor area. These strategic decisions may also result in an extended season, relative to Alternative 1, if vessels move to areas of lower pollock CPUE. The mothership sector may also choose to continue to fish in the corridor and employ additional avoidance techniques (*e.g.*, more test tows, moving more frequently, etc.) which could also lead to a marginal increase in operational or opportunities costs (Table 4-13 for examples of costs). The motivation to change fishing and incur additional avoidance costs may diminish the closer a closer is to August 31.

Post-Corridor Closure

If the inseason corridor closed to one or more of the offshore sectors, given the spatial constraints highlighted in Section 3.3.4.6.3, CPs would likely travel northwest into Cluster 3 and 4 to continue to fish. Mothership CVs may also move northwest or may choose to stand down until the corridor area reopens.¹³⁹ Table 4-24 – Table 4-26 provide context for the magnitude of catch and revenue that would need to be recovered outside of the corridor to minimize the economic impact.

A 350,000-chum salmon PSC limit was estimated to displace an average of 3.0% of the **CDQ** pollock, representing an average of 3.2% (\$2.9 million) of the CDQ groups' B season gross first wholesale revenue between 2011–2023 (Table 4-24). With a 50,000 cap, not accounting for behavioral changes, the CDQ groups could have an average of 8.8% to 9.7% of their pollock CDQ displaced, depending on apportionment. This represented 9.8% to 10.8% (\$8.7 to \$9.7 million) of their B season gross first wholesale revenue, on average during this time period. A 50,000-cap could have resulted in a range of \$0–\$59.6 million in first wholesale 'revenue at risk' for the CDQ groups in each year considered.

¹³⁹ Public testimony to the Council February 2025, J. Mize.

For the **CP sector**, Table 4-25 demonstrates that with a 350,000 cap, the CP sectors was estimated an average of 1.0% to 2.5% of their pollock displaced, depending on apportionment. This could have represented an average of 1.0% to 2.4% (\$3.4 to \$8.4 million) of their B season gross first wholesale revenue. With a 50,000 cap, not accounting for behavioral changes, the CP vessels could have an average of 4.7% to 7.6% of their pollock CDQ displaced, depending on apportionment. This represented 4.6% to 7.6% (\$16.4–\$26.2 million) of their B season gross first wholesale revenue, on average during this time period. The average amount of revenue at risk is greater for the CP sector, relative to the CDQ sector, but the average proportion of B season revenue this represents for the CDQ groups is greater than for the CP sector. A 50,000 cap could have resulted in a range of \$0–\$143.3 million in first wholesale revenue at risk for the CP sector in each year considered.

Table 4-26 shows the average proportion of revenue at risk is greatest for the **mothership sector** relative to the CP/ CDQ sectors. With a 350,000 cap, the mothership sector could have had an average of 2.7% of their pollock catch displaced, between 2011–2023, if pre-closure changes in fishing had not occurred. This could have represented an average of 2.1% (\$2.1 million) of the sector’s total B season gross first wholesale revenue. With a 50,000 cap, on average, 12.4% to 13.8% of the mothership sector’s pollock catch may be at risk. This could represent an average of between 10.8% and 11.6% (\$10.6–\$11.8 million) of the sector’s total B season gross first wholesale revenue. A 50,000 cap could have resulted in a range of \$0.0–\$46.1 million in first wholesale revenue at risk for the CP sector in each year considered.

Given the mobility of these vessels and their variable dependency on the corridor area, it is generally expected that revenue at risk from Alternative 5, Option 1 would be recovered outside of the corridor area or after the closure window. If these offshore vessels were already planning to travel toward northwestern fishing grounds in the B season and they were able to recover any displaced B season pollock catch outside of the corridor, there may be no forgone revenue or increased avoidance costs. However, even if the pollock quota is harvested, if vessels must move from areas with larger pollock, or better quality pollock this could have implications for products able to be made and the first wholesale price generated.

Table 4-24 Summary of CDQ pollock catch displaced and gross revenue at risk under the inseason corridor area closure in Alternative 5, Option 1, 2011–2023

CDQ Sector		Number of years -		Pollock harvest displaced				Ex-vessel revenue 'at risk'				First wholesale revenue 'at risk'			
PSC limit	Apportionment	Fished in this area	Closure triggered	Median mt	Average % of B season	Median mt	Average % of B season	Median \$Mil	Average % of B season	Median \$Mil	Average % of B season	Median \$Mil	Average % of B season	Median \$Mil	Average % of B season
50,000	3-yr average	12	4	0	0.0%	6,896	8.8%	\$0.0	0.0%	\$2.5	9.8%	\$0.0	0.0%	\$8.7	9.8%
	5-yr average	12	4	0	0.0%	7,635	9.7%	\$0.0	0.0%	\$2.8	10.8%	\$0.0	0.0%	\$9.7	10.8%
	Pro rata	12	4	0	0.0%	6,896	8.8%	\$0.0	0.0%	\$2.5	9.8%	\$0.0	0.0%	\$8.7	9.8%
	AFA	12	4	0	0.0%	6,896	8.8%	\$0.0	0.0%	\$2.5	9.8%	\$0.0	0.0%	\$8.7	9.8%
350,000	3-yr average	12	2	0	0.0%	2,250	3.0%	\$0.0	0.0%	\$0.8	3.2%	\$0.0	0.0%	\$2.9	3.2%
	5-yr average	12	2	0	0.0%	2,250	3.0%	\$0.0	0.0%	\$0.8	3.2%	\$0.0	0.0%	\$2.9	3.2%
	Pro rata	12	2	0	0.0%	2,250	3.0%	\$0.0	0.0%	\$0.8	3.2%	\$0.0	0.0%	\$2.9	3.2%
	AFA	12	2	0	0.0%	2,250	3.0%	\$0.0	0.0%	\$0.8	3.2%	\$0.0	0.0%	\$2.9	3.2%

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

Table 4-25 Summary of CP pollock catch displaced and gross revenue at risk under the inseason corridor area closure in Alternative 5, Option 1, 2011–2023

CP Sector		Number of years -		Pollock harvest displaced				Ex-vessel revenue 'at risk'				First wholesale revenue 'at risk'			
PSC limit	Apportionment	Fished in this area	Closure triggered	Median mt	Average % of B season	Median mt	Average % of B season	Median \$Mil	Average % of B season	Median \$Mil	Average % of B season	Median \$Mil	Average % of B season	Median \$Mil	Average % of B season
50,000	3-yr average	13	6	0	0.0%	20,344	7.6%	\$0.0	0.0%	\$7.6	7.6%	\$0.0	0.0%	\$26.2	7.6%
	5-yr average	13	6	0	0.0%	19,379	7.1%	\$0.0	0.0%	\$7.2	7.1%	\$0.0	0.0%	\$24.9	7.1%
	Pro rata	13	6	0	0.0%	17,852	6.6%	\$0.0	0.0%	\$6.6	6.6%	\$0.0	0.0%	\$22.9	6.5%
	AFA	13	4	0	0.0%	12,763	4.7%	\$0.0	0.0%	\$4.7	4.7%	\$0.0	0.0%	\$16.4	4.6%
350,000	3-yr average	13	3	0	0.0%	6,501	2.4%	\$0.0	0.0%	\$2.3	2.4%	\$0.0	0.0%	\$8.4	2.4%
	5-yr average	13	3	0	0.0%	6,501	2.4%	\$0.0	0.0%	\$2.3	2.4%	\$0.0	0.0%	\$8.4	2.4%
	Pro rata	13	2	0	0.0%	6,259	2.3%	\$0.0	0.0%	\$2.3	2.3%	\$0.0	0.0%	\$8.1	2.3%
	AFA	13	1	0	0.0%	2,621	1.0%	\$0.0	0.0%	\$0.9	1.0%	\$0.0	0.0%	\$3.4	1.0%

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

Table 4-26 Summary of mothership sector pollock catch displaced and gross revenue at risk under the inseason corridor area closure in Alternative 5, Option 1, 2011–2023

Mothership Sector		Number of years -		Pollock harvest displaced				Ex-vessel revenue 'at risk'				First wholesale revenue 'at risk'			
PSC limit	Apportionment	Fished in this area	Closure triggered	Median mt	% of B season	Average mt	% of B season	Median \$Mil	% of B season	Average \$Mil	% of B season	Median \$Mil	% of B season	Average \$Mil	% of B season
50,000	3-yr average	13	6	0	0.0%	8,287	12.4%	\$0.0	0.0%	\$3.1	12.4%	\$0.0	0.0%	\$10.6	10.4%
	5-yr average	13	6	0	0.0%	9,249	13.8%	\$0.0	0.0%	\$3.5	13.9%	\$0.0	0.0%	\$11.8	11.6%
	Pro rata	13	6	0	0.0%	8,635	12.9%	\$0.0	0.0%	\$3.3	13.0%	\$0.0	0.0%	\$11.0	10.8%
	AFA	13	6	0	0.0%	9,249	13.8%	\$0.0	0.0%	\$3.5	13.9%	\$0.0	0.0%	\$11.8	11.6%
350,000	3-yr average	13	1	0	0.0%	1,781	2.7%	\$0.0	0.0%	\$0.7	2.7%	\$0.0	0.0%	\$2.1	2.1%
	5-yr average	13	1	0	0.0%	1,781	2.7%	\$0.0	0.0%	\$0.7	2.7%	\$0.0	0.0%	\$2.1	2.1%
	Pro rata	13	1	0	0.0%	1,781	2.7%	\$0.0	0.0%	\$0.7	2.7%	\$0.0	0.0%	\$2.1	2.1%
	AFA	13	1	0	0.0%	1,781	2.7%	\$0.0	0.0%	\$0.7	2.7%	\$0.0	0.0%	\$2.1	2.1%

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

4.3.5.1.2 Inshore Sector Impacts

Pre-Corridor Closure

The inshore sector has heavily relied on the fishing grounds inside the corridor, suggesting an Option 1 closure would present a significant consequence to these vessels in the future. These vessels are constrained by the distance they can travel from port because there is an industry standard of delivering pollock within 48 hours of catching it. The inseason corridor covers a broad area including those fishing grounds nearest to the ports where these vessels make their deliveries.¹⁴⁰ As shown in Table 3-12, between 39.5% and 95.4% of this sector's total B season pollock was harvested in the corridor during the closure window with a median of 72.3% (2011–2023). This reliance is not solely dictated by strong pollock aggregations, but also because vessels also have incentives to minimize travel time and fuel costs while considering their capacity and processor's delivery requirements. For these reasons, it is expected the inseason corridor would continue to be important to inshore CVs in the future.

The potential for risk to the inshore sector from an inseason corridor closure is highly dependent on the cap level chosen. The inshore sector would have been closed out of the corridor in 1 of the 13 analyzed years under a 350,000-chum salmon cap (Table 4-29). However, Table 4-29 demonstrates a cap at 50,000 chum salmon could have resulted in 12 of 13 years with time/area closures being triggered if the fleet did not change their fishing behavior prior to the closure.

Similar to the expectations under Alternatives 2 and 3, the analysts assume that since the inshore fleet has high dependency on the corridor (and therefore higher consequence of a closure), the sector would work to avoid the area closure if reaching the cap was perceived to be a risk. Changes in fishing behavior and associated avoidance costs may occur prior to the cap being met to avoid getting closed out of the area. There is diversity in the size, capacity and horsepower of vessels within the inshore CV sector and cooperative managers may choose to be strategic in directing vessels based on their abilities. For instance, this may include encouraging more catch outside the corridor area from the larger vessels prior to any cap being met, as chum salmon PSC from outside the corridor area would not count towards the cap. These changes in behavior could result in avoidance costs, including many similar types of costs described in Table 4-13 and Table 4-18. This includes the potential for increased fuel needed to harvest pollock, diminished product quality due to longer running time, opportunity cost of time while traveling, and generally slower, less efficient operations. The likelihood of these types of costs being incurred and the magnitude of these potential costs are highly dependent on future fishing conditions, in addition to the limit and apportionment chosen.

Post-Corridor Closure

If the full inseason corridor were to close for the inshore sector, CVs would need to travel outside of this area in order to continue fishing. Given the same spatial constraints highlighted in Section 3.3.4.6.3, these vessels would likely travel northwest into Cluster 3 and/or 4 if they could make the trip safely and economically.

While the relative intensity of fishing effort beyond these corridor's perimeter further northwest would likely increase under an Option 1 closure, the total radius under which the inshore CVs would be able to travel would be expected to remain about the same. These CVs would still need to return to port for processing. Some of the larger inshore CVs have routinely fished further northwest of the Pribilof Islands and even beyond Zhemchug Canyon and may respond to an area closure by fishing these areas more intensely. However, smaller inshore CVs, with lower capacity will likely be more challenged in where they can fish. If it is not possible for the smaller, lower capacity CVs to fish outside of the corridor area due to limited economies of scale, fuel capacity, safety, or some other reason, these vessels may stand

¹⁴⁰ The exception to this stat is includes the 10 smaller stat areas identified in Appendix 2 to this DEIS. While the continued exclusion of these stat areas from the definition of the corridor would provide some nearshore fishing opportunities, based on historical catch, this amount is not substantial and would not be expected to accommodate all of the potentially displaced pollock catch highlighted in this section.

down if and when a corridor cap is met. They may try to lease their pollock quota to a vessel capable of traveling outside the corridor area or they may wait under the closure is over to continue to fish.

Table 4-27 provides the length overall (LOA) for inshore CVs that were active in the 2023 B season and demonstrates the range of maximum distances each size category of CV traveled between the period of 2019–2024, including A or B season. Although the spatial footprint of the seasons are different, this approach was used to get a sense for the possible realm of distances vessels are able to travel. In order to reach the nearest outside point of the inseason corridor area from port, vessels would need to travel northwest ~130 nautical miles (nm) from Dutch Harbor and ~139 nm from Akutan. Therefore, fishing would need to take place somewhere beyond this point. For a general reference, the southern end of St George Island or directly east of St Paul Island is ~250 nm from Dutch Harbor and Akutan and this distance is indicated in the red dashed line in Figure 4-13. As shown in Figure 4-13, 9 of the 59 inshore CVs never travelled beyond this point between 2019–2024. Thus, while many inshore CVs have demonstrated the ability to travel beyond the corridor, a portion of this fleet has not.

Table 4-27 Length and maximum distances traveled from port (between the period of 2019–2024 A or B season) by inshore CVs active in 2023

Vessel Length Overall (ft)	Count of 2023 vessels	Min. Maximum distance by vessel (nm)	Max. maximum distance by vessel (nm)
<90	1	209	209
90-99	9	160	344
100-109	4	179	309
110-120	6	375	539
>120	39	199	644

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

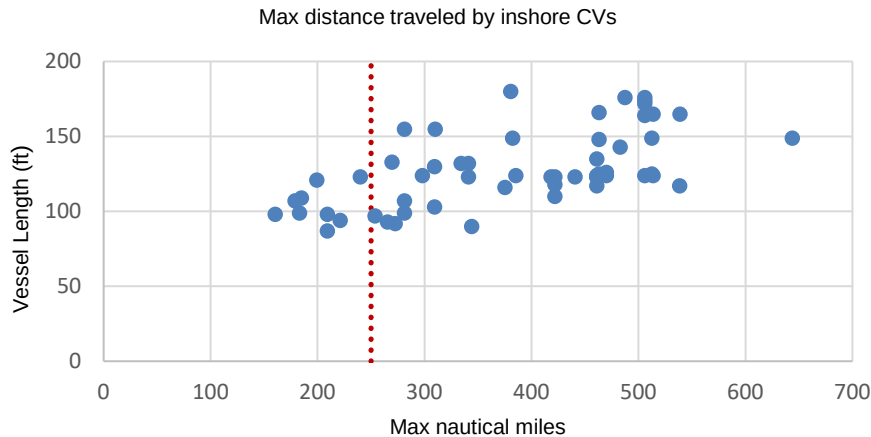


Figure 4-13 Maximum distance from port traveled (2019–2024) by vessels active in the 2023 B season

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Note: Red dashed line is 250nm for reference, which represents approximately the distance from Dutch Harbor or Akutan to the southern end of St George Island or directly east of St Paul Island.

This vessel-level boundary could be due to a number of reasons, including safety concerns. Hold capacity would be another important factor in whether a trip further from port with its increased costs may be economically worthwhile. Figure 4-14 demonstrates the maximum pounds landed by a vessel between the period of 2019–2025 (including A or B season) to get a sense for the possible capacity of vessels that were active in the 2023 B season. Between 2019–2024, 11 of the CVs consistently packed less than 500,000 lbs. of groundfish catch. Depending on the length of a corridor closure, and the future

distribution of pollock aggregations in the Bering Sea, it is conceivable that there could be consolidation among quota within an inshore cooperatives, with more pollock quota harvested on larger CVs that have the economies of scale to balance the additional costs of traveling further. Table 4-28 demonstrates the size composition for active inshore CVs in 2023 by cooperative. For instance, the Northern Victor and (former) Peter Pan cooperative may be more challenged with fewer vessels > 120 ft LOA. While the Peter Pan vessels have since moved into the open access fishery, an inseason corridor closure may present greater challenges to these vessels without the flexibility of a cooperative.

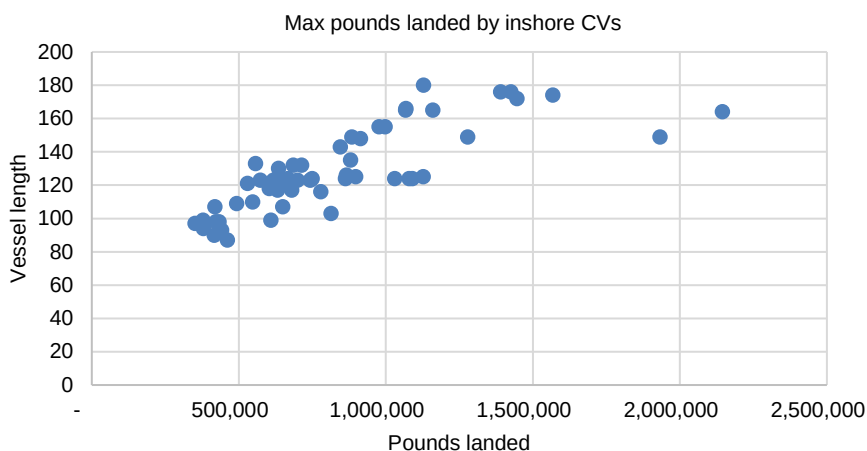


Figure 4-14 Maximum pounds landed (2019-2024) by vessels active in the 2023 B season

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

Table 4-28 Length of active inshore CVs by cooperative, 2023

Vessel Length Overall (ft)	Akutan Catcher Vessel Association	Northern Victor Fleet Cooperative	Peter Pan Fleet Cooperative	Unalaska Fleet Cooperative	UniSea Fleet Cooperative	Westward Fleet Cooperative	AFA Open Access Total
≤120	8	7	2	1	0	1	1
>120	13	3	1	5	10	7	0
Grand Total	21	10	3	6	10	8	1

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

While this discussion highlights possible constraints from vessel capacity and movement beyond the corridor, it is important to note that vessel captains typically do not make trips of greater distances without knowing higher pollock catches (or catch rates) can be found by traveling those greater distances. There is of course no guarantee that higher pollock catch rates could be realized outside these areas and this distance will limit the overall flexibility in where smaller or lower capacity CVs can go to find aggregations of pollock or to avoid salmon and herring PSC. If equally good fishing cannot be found outside of these closures during the period, vessels may return to port without full loads or stand down to wait for the area to reopen. Thus, a full corridor closure would likely present disproportionate adverse impacts to smaller, lower capacity vessels.

A corridor closure may also result in additional adverse economic impacts for shoreside processors. Vessels in a cooperative stagger their deliveries, so a plant has a consistent flow of fish moving through at any given point in time. The pace of these deliveries is coordinated for efficient and cost-effective plant operations. All vessels would need to travel outside the closed corridor to harvest pollock, and this additional travel time between deliveries could result in interrupted and inefficient processing. Additionally, depending on when a corridor closure occurs, it may stretch the B season longer than it

otherwise would have. This could increase the variable costs of operation and potentially result in PSC tradeoffs with Chinook later in the season. The overall impacts would be expected to diminish as the PSC limit is met closer to August 31.

Given the inshore sector's heavy historical reliance on the corridor, in addition to the operational constraints of the inshore fleet, it is not clear whether the inshore sector would be able to fully recover the harvest displaced from the corridor. This would depend on many factors, including the point in the B season when the closure occurred and how much of the pollock TAC was still unharvested. Compared to other options under Alternative 5, an early B season closure of the corridor by the inshore sector appears to present the greatest risk of leaving B season pollock unharvested.

If pollock TAC was left unharvested, there may be direct implications for gross revenue for harvesters and processors. The revenue at risk values in Table 4-29 provide some context to this magnitude, understanding these values are an unlikely upper bound of revenue impacts in the event of a closure.

A 350,000 cap would put less revenue at risk and likely be triggered less often than lower limits. With only 1 of the 13 years 2011–2023 hypothetically closed, the average gross ex vessel revenue at risk is \$2.2–\$2.8 million, representing an average of 1.5%–1.9% of the inshore sector's total B season gross ex vessel revenue. Table 4-29 also demonstrates that, without additional adjustments to fishing prior to a closure or redistributed effort during a closure, the inshore fleet would have seen its greatest revenue at risk under a 50,000 cap. This was estimated to result in an average of \$36.7 to \$43.1 million gross ex vessel revenue forgone, between 2011–2023. This represents an average of 26.4%–31.0% of the inshore sector's B season gross ex vessel revenue. In each year 2011–2023, the ex-vessel revenue at risk from a 50,000-cap ranged from \$0 to \$79 million.

If a corridor cap frequently or erratically resulted in unharvested B season pollock, this could generate some of the broader adverse impacts across processors, communities, CDQ groups and potentially other fisheries in the North Pacific that are highlighted in Section 4.3.2.3.2.

Table 4-29 Inshore sector pollock catch displaced and gross revenue at risk under the inseason corridor area closure in Alternative 5, Option 1, 2011–2023

Inshore Sector		Number of years -		Pollock harvest displaced				Ex-vessel revenue 'at risk'				First wholesale revenue 'at risk'			
PSC limit	Apportionment	Fished in this area	Closure triggered	Median		Average		Median		Average		Median		Average	
				mt	% of B season	mt	% of B season	\$Mil	% of B season	\$Mil	% of B season	\$Mil	% of B season	\$Mil	% of B season
50,000	3-yr average	13	12	75,319	25.2%	94,641	28.4%	\$35.2	25.7%	\$36.7	26.4%	\$107.5	26.2%	\$108.5	26.4%
	5-yr average	13	12	75,319	25.2%	94,641	28.4%	\$35.2	25.7%	\$36.7	26.4%	\$107.5	26.2%	\$108.5	26.4%
	Pro rata	13	12	87,972	29.4%	100,051	30.1%	\$39.8	30.0%	\$38.5	27.9%	\$122.9	30.5%	\$114.8	27.9%
	AFA	13	12	104,448	35.7%	110,713	33.3%	\$48.8	37.5%	\$43.1	31.0%	\$149.0	37.2%	\$127.3	31.0%
350,000	3-yr average	13	1	0	0.0%	5,959	1.8%	\$0.0	0.0%	\$2.2	1.5%	\$0.0	0.0%	\$6.2	1.6%
	5-yr average	13	1	0	0.0%	5,959	1.8%	\$0.0	0.0%	\$2.2	1.5%	\$0.0	0.0%	\$6.2	1.6%
	Pro rata	13	1	0	0.0%	7,431	2.2%	\$0.0	0.0%	\$2.8	1.9%	\$0.0	0.0%	\$7.7	2.0%
	AFA	13	1	0	0.0%	7,431	2.2%	\$0.0	0.0%	\$2.8	1.9%	\$0.0	0.0%	\$7.7	2.0%

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.

4.3.5.2 Suboption 1

Under Suboption 1, the risk of a partial corridor closure and the magnitude of impact are highly dependent on the corridor chum salmon PSC limit and apportionment chosen. These risks could lead to increased avoidance costs if the vessels perceived the operational flexibility these areas provide as worth preserving. Additionally, Suboption 1 could possibly lead to changes in product value due to changes in pollock size, flesh quality, and recovery rates from fishing in sub-optimal locations. Similar to a full corridor closure under Option 1, a partial corridor closure under Suboption 1 is most expected to affect the inshore sector, which is less mobile than the other sectors and heavily dependent on the corridor area. The adverse impacts could extend to shoreside processors and support businesses in these communities in the form of slower or interrupted deliveries, and changes in product size, quality and value.

Relative to Option 1, Suboption 1 would present no inherent changes in risk that the corridor is triggered, as the perimeter for chum salmon PSC accounting matches that in Option 1. However, there are some distinct differences in the expected impacts of Suboption 1 relative to Option 1. For instance, relative to Option 1, Suboption 1 is expected to:

1. decrease the amount of pollock catch that would be displaced in the event of a closure, due to fewer closed areas, which would result in less revenue at risk,
2. provide more options for pollock fishing to be redistributed to by including the 11 exempted stat areas, which would increase the likelihood that any revenue at risk could be achieved outside of the closed stat areas,
3. provide near-port fishing opportunities during a corridor closure, which would reduce the adverse distributional impacts on smaller/ lower capacity CVs that may otherwise be challenged to continue fishing outside of the corridor closure area, and
4. change the magnitude of the consequence of a closure, which may influence the proactive measures taken and the avoidance costs willing to be incurred in order to prevent a closure.

Relative to no action, Alternative 5, Suboption 1 could create adverse economic effects for the Bering Sea pollock fleet. However, for these reasons, Alternative 5, Suboption 1 is expected to lessen some of the adverse economic effects for the pollock sectors relative to Option 1.

As discussed in Section 3.2.1.1.4.2, the 11 stat areas identified in Suboption 1 can represent denser areas of pollock fishing effort within the corridor, in particular for the inshore sector. Table 3-16 demonstrates the proportion of pollock catch during the closure window that has been caught in the 11 stat areas identified as exempt for closure under Suboption 1. This shows an average of 53.6% and 48.9% of the inshore and mothership sectors' respective pollock catch, that comes from the corridor area during the closure window, coming from the 11 exempt stat areas during this time period. The CP and CDQ sectors have demonstrated less dependency on the 11 stat areas in addition to less overall dependency on the corridor in general (Table 3-16). The inverse of these percentages (100% - proportion shown) demonstrates the amount of each sector's pollock catch has come from the portion of the corridor that could be closed during the closure window.

To provide further context to the potential economic effects of Alternative 5, Suboption 1, a retrospective assessment for the years 2011–2023 has been done and compared to the potential pollock harvest displaced and revenue at risk under Option 1.¹⁴¹ Table 4-30 and Table 4-31 demonstrate the percent reduction in gross revenue at risk (ex-vessel and first wholesale, respectively) from Alternative 5 Suboption 1, compared to what may be at risk under Option 1.

¹⁴¹ Gross ex vessel and gross first wholesale revenue at risk tables for Alternative 5, Suboption 1 are provided in Appendix 7.

Given the relative importance of the 11 exempted stat areas under Suboption 1, in some years these additional open areas were shown to substantially alleviate the revenue at risk from a corridor closure. These situations are nuanced and include spatial and temporal considerations based on retrospective catch and bycatch patterns. For example:

- In 2020 only the inshore sector would have met its apportionment of a 50,000-chum salmon corridor cap under any apportionment considered. In that year, (if there were no behavioral changes), the inshore sector would have been closed out of the 29 stat areas on either August 15 or August 22, depending on the apportionment chosen. In this scenario one or two weeks of pollock catch was displaced. In 2020, in those last weeks of August, the inshore sector caught 88%–99% of its pollock in the 11 stat areas that would be exempt under Suboption 1. Thus, based on the circumstances of that year, the Suboption would have reduced the revenue at risk by 89%–99%, depending on the apportionment.
- 2021 is an example of a year where a partial corridor closure under Suboption 1 may have had adverse economic effects compared to status quo but the impact would likely be reduced from Option 1. In this year, the inshore sector caught 72.4% of its B season pollock (253,658 mt) in the full corridor area between June 10 – August 31 (Table 3-12). Of that amount, the inshore sector caught 52.6% in the 11 exempted stat areas (133,520 mt; Table 3-15). Under a 50,000-chum salmon corridor cap, with no behavioral changes, the inshore sector could have met the cap on July 3 or 10 depending on the apportionment selected. The corridor would have closed to the inshore sector for 9–10 weeks and displaced either 81,988 mt or 83,323 mt of fishing could have been displaced under Suboption 1 (Table 3-17). This represented ~24% of their B season catch and ~\$31 million in that year in gross ex vessel revenue. However, it is a ~50%–56% reduction in gross ex vessel revenue at risk for the inshore sector compared to Option 1. This is a similar situation for the mothership sector in 2021.
- As demonstrated in Table 3-12, the CP and CDQ sectors have lower but highly variable dependency on the corridor area for their B season pollock harvest. This means the percent reduction in pollock displaced and revenue at risk from Suboption 1 relative to Option 1 could either be driven by that year’s reliance on the corridor or its reliance on the 11 exempt stat areas, in addition to the timing and location of chum salmon PSC.

For example, Table 4-32 demonstrates the 11 exempted stat areas provided the greatest percent reduction in economic impacts for these sectors in 2016 and 2018 compared to Option 1, but for different reasons, as explained in the examples below. The absolute value of this difference is much greater in 2016 based on total reliance on fishing in the corridor in these years.

- In 2016, under a 50,000-chum salmon corridor cap, a 3-year or 5-year average apportionment and a full corridor closure (Option 1) the CP sector’s revenue at risk was estimated at \$143.3 million in gross first wholesale revenue. Under a 50,000-chum salmon corridor cap and a partial corridor closure (Suboption 1) the CP sector’s revenue at risk is \$111.2 million in gross first wholesale revenue. This is a ~25% reduction in first wholesale revenue at risk relative to Option 1.
- In 2018, under a 50,000-chum salmon corridor cap and any apportionment other than AFA, Table 4-32 demonstrates a ~25% reduction in first wholesale revenue at risk for the CP sector, relative to Option 1. However, compared to the \$32.2 million difference in gross first wholesale revenue at risk between Option 1 and Suboption 1 in 2016, there could have been an \$10.0 million difference between Option 1 and Suboption 1 in 2018. Thus, because of the more limited corridor fishing for the CP sector in 2018, a corridor closure would have likely already had less of an economic impact on the CP sector in 2018 relative to 2016.

- Table 4-30 and Table 4-31 also demonstrate that at higher cap amounts, the marginal effect of the 11 exempted stat areas becomes less pronounced for the offshore sectors but continues to reduce the revenue at risk for the inshore sector relative to Option 1.

These examples demonstrate Suboption 1 has the potential for adverse economic impacts to the pollock sectors compared to status quo, but the economic impacts of the Suboption would likely be less than what would be incurred under Option 1. This is an important comparison to make because the inseason corridor options are mutually exclusive. The impacts relative to status quo are still highly influenced by timing of a closure (*i.e.*, when chum salmon PSC is encountered in a year and how much) as well as the sector's dependence on the corridor and the 11 stat areas. In the event of a closure, it is unclear whether the amount of displaced pollock could be fully recovered in the 11 open stat areas. However, the combination of less pollock displaced and more nearshore fishing opportunities increases the likelihood of pollock quota still being caught in the event of a corridor closure.

Additionally, the 11 exempt stat areas under Alternative 5, Suboption 1 would likely result in a reduction of adverse impacts to smaller, lower capacity CVs that deliver inshore, relative to Option 1. As identified in the analysis of Option 1, a corridor closure would be expected to disproportionately adversely impact smaller, lower capacity, inshore CVs. These vessels may not be able to make a trip outside of the corridor safely or economically worthwhile. For instance, Section 4.3.5.1.2, highlights that 9 of the 59 inshore CVs active in 2023 never travelled further than 250nm in either the A or B season between 2019-2024. This could still be the case under Suboption 1, if the 11 exempted stat areas did not provide sufficient opportunity to make up displaced pollock catch. However, the additional nearshore area is expected to increase opportunities for these vessels in particular.

This suboption opens seven additional stat areas near the ports of landing in the Aleutian Islands (*i.e.*, Dutch Harbor and Akutan) where vessels may continue to fish if and when a cap is triggered. As discussed further in Section 2.7.2, these areas were identified at the AP based on known areas of routinely good pollock fishing with low chum salmon bycatch rates due to oceanographic conditions (*e.g.*, depth and contours). However, their close proximity to port communities may reduce the adverse impacts for smaller CVs. These additional fishing grounds may also benefit the flow of deliveries to shoreside processing plants, relative to Option 1 in which vessels must all travel at least 130 nm to begin fishing in the event of a corridor closure. It is possible these areas close to the Aleutian Islands/Alaska Peninsula would experience congestion with increased fishing effort, or CPUE would not be large enough to support the full displaced harvest. However, cooperative and inter-cooperative managers may work to coordinate efforts, giving priority to certain smaller vessels in the event of a corridor closure.

Table 4-30 Percent reduction in gross ex vessel revenue at risk from Alternative 5, Suboption 1, relative to Option 1, 2011-2023 (millions of 2022\$)

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-Year Average												
2011			32%	32%								
2012												
2013				15%								
2014				58%								
2015				77%								
2016	69%	22%	64%	91%	100%	5%	57%			0%		
2017	30%	1%	97%	77%	37%	1%		94%	37%	1%		
2018	36%	25%	54%	73%		0%						
2019		0%		93%								
2020				99%								
2021	0%	0%	54%	50%	0%	0%	44%	46%	0%	0%	44%	48%
2022		3%	19%	71%			100%					
2023				48%								
Option 2: 5-Year Average												
2011			27%	32%								
2012												
2013				15%								
2014				58%								
2015				77%								
2016	70%	22%	60%	91%	95%	5%	63%			0%		
2017	30%	1%	97%	77%	30%	1%		94%	37%	1%		
2018	36%	25%	54%	73%	0%	0%						
2019		0%		93%								
2020				99%								
2021	0%	0%	54%	50%	0%	0%	44%	46%	0%	0%	44%	48%
2022		1%	19%	71%			100%					
2023				48%								
Option 3: Pro Rata												
2011			32%	38%								
2012												
2013				15%								
2014				48%								
2015				77%								
2016	69%	23%	64%	91%		0%	57%			0%		
2017	30%	1%	97%	77%	37%	1%		89%	37%	1%		
2018	36%	25%	54%	73%								
2019		0%		93%								
2020				89%								
2021	0%	0%	54%	50%	0%	0%	44%	46%	0%		44%	46%
2022		0%	19%	71%			100%					
2023				48%								
Option 4: AFA												
2011			27%	44%								
2012												
2013				14%								
2014				48%				83%				
2015				77%				91%				
2016	69%	16%	60%	87%			57%	93%				
2017	30%	1%	97%	77%	37%	1%		79%	37%	2%		
2018	36%	0%	54%	73%				85%				
2019				90%								
2020				89%								
2021	0%	0%	54%	56%	0%		44%	46%	0%		44%	46%
2022			19%	71%			100%	98%				
2023				51%								

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN; Chum_Caps_Cluster12_subption(5-21-15).

Table 4-31 Percent reduction in gross first wholesale revenue at risk from Alternative 5, Suboption 1, relative to Option 1, 2011-2023 (millions of 2022\$)

Cap:	50,000				200,000				350,000			
Sector:	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-Year Average												
2011			32%	32%								
2012												
2013				15%								
2014				58%								
2015				78%								
2016	68%	22%	64%	92%	100%	5%	57%			0%		
2017	30%	1%	97%	77%	37%	1%		94%	37%	1%		
2018	36%	25%	54%	74%		0%						
2019		0%		93%								
2020				99%								
2021	0%	0%	54%	51%	0%	0%	44%	46%	0%	0%	44%	49%
2022		3%	19%	70%			100%					
2023				48%								
Option 2: 5-Year Average												
2011			27%	32%								
2012												
2013				15%								
2014				58%								
2015				78%								
2016	70%	22%	60%	92%	95%	5%	63%			0%		
2017	30%	1%	97%	77%	30%	1%		94%	37%	1%		
2018	36%	25%	54%	74%	0%	0%						
2019		0%		93%								
2020				99%								
2021	0%	0%	53%	51%	0%	0%	44%	46%	0%	0%	44%	49%
2022		1%	19%	70%			100%					
2023				48%								
Option 3: Pro Rata												
2011			32%	38%								
2012												
2013				15%								
2014				48%								
2015				78%								
2016	68%	23%	64%	92%		100%	57%			0%		
2017	30%	1%	97%	77%	37%	1%		64%	37%	1%		
2018	36%	25%	54%	74%								
2019		0%		93%								
2020				88%								
2021	0%	0%	53%	51%	0%	100%	44%	35%	0%		44%	46%
2022		0%	19%	70%			100%					
2023				48%								
Option 4: AFA												
2011			27%	45%								
2012												
2013				14%								
2014				48%				100%				
2015				78%				100%				
2016	68%	16%	60%	87%			57%	100%				
2017	30%	1%	97%	77%	37%	1%		93%	37%	2%		
2018	36%	0%	54%	74%				100%				
2019				91%								
2020				88%								
2021	0%	0%	53%	56%	0%		44%	56%	0%		44%	46%
2022			19%	70%			100%	100%				
2023				49%								

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN; Chum_Caps_Cluster12_subption(5-21-15).

4.3.5.3 Option 2

Relative to no action, Option 2 could generate adverse economic effects for the Bering Sea pollock fleet. Implementation of the corridor may motivate or require changes in fishing that could slow the pace or result in fishing in suboptimal places. The risk of a closure would result from the same accounting of chum salmon PSC as under Option 1 or Suboption 1, which would count towards the cap if chum salmon were caught *anywhere* within the corridor perimeter. The IPAs would be required to select the stat areas to close based on historical pollock CPUE, chum salmon bycatch, and relevant genetic data, which may exclude some areas of productive pollock fishing within the corridor. The effects of these tradeoffs could look similar to the impacts seen in the current RHS program, with one difference being that the closure areas would be identified prior to the season.

However, compared to Alternative 5, Option 1 and Suboption 1, Option 2 provides the most operational flexibility for the pollock fleet and would generally be expected to reduce the adverse economic effects compared to other options. The economic effects of Option 2 could mirror those of Suboption 1, if the IPAs defined the same 11 stat areas to be exempt from the corridor closures. However, Option 2 includes the possibility for a greater number of stat areas inside the corridor to remain open (up to 21 of 40), and these stat areas could change over time to be responsive to shifting conditions. This means, compared to the other options, Option 2 would likely result in 1) less pollock harvest displaced and less revenue at risk, 2) more options for pollock fishing to be redistributed, increasing the likelihood that revenue at risk could be achieved elsewhere, and 3) a lower consequence of a closure which may affect proactive avoidance costs and a reduced willingness to compromise pollock size or quality to prevent a closure.

The IPAs would select the stat areas to close based on the defined factors, but the option does not dictate how these metrics must be weighed or balanced. In addition, the IPAs could consider other factors in their choice of exempted stat areas, such as areas closer to ports. In this way, Option 2 may reduce disproportionate distributional effects on the smaller/lower capacity inshore CVs.

The IPAs' selections of exempted stat areas would influence the potential for, and magnitude of, the economic impacts of Option 2. The analysis cannot project the stat areas the IPAs may select to be exempted from closure under Option 2. However, Section 3.3.4.6.5 describes pollock catch and chum salmon PSC trends for 2011–2023 by stat area for additional context. Each year, between 2011–2023, pollock was harvested in 25–36 of the 40 stat areas. If the IPAs were able to select the 21 stat areas that generated the greatest pollock catch on average during the analyzed period, this would account for ~92% of the total corridor pollock catch (Table 3-60 showing the distribution of catch among corridor stat areas). Only a small percentage of pollock catch from the corridor (*i.e.*, ~8%) would be at risk of being displaced based on historical fishing patterns. This reduced consequence from a closure could mean a lower willingness to incur additional avoidance costs or risk extending the season to prevent the closure, in which case overall costs under this option could be low.

That being said, the IPAs must also take into account chum salmon bycatch, and relevant genetic data rather than just pollock catch and they would be required to identify stat areas for review and approval by NMFS prior to the start of the B season. For instance, the 11 stat areas identified under Suboption 1 do not represent the 11 stat areas with the greatest average pollock catch in the corridor. These tradeoffs mean that the magnitude of the true impacts would vary based on the conditions in that year.

4.3.5.4 Option 3

Option 3 would include an abundance-based threshold that may be selected with any inseason corridor option under consideration (see Section 2.7.5). If the abundance-based thresholds are met (*i.e.*, abundance is greater than the threshold), the inseason corridor with closure provisions would not be in effect the following year. Section 3.3.4.6.6 provides an assessment of when the corridor and closure provisions would not have applied retrospectively (2011–2023) and shows the inseason corridor would have been in

place in 11 of 13 years under Option 3, Suboption 1 (75th percentile) and in all 13 years under Suboption 2 (90th percentile; 2011–2023).

Adopting Option 3 as an element of Alternative 5 could reduce the economic impacts from the management measures in years when summer and fall chum salmon returns to the Yukon River are high. In these years, there may be no marginal impact from the corridor measures because there would be no risk or consequences of a closure. In years where the thresholds are below the 75th and 90th percentiles of historical abundance for the Yukon River summer and fall chum salmon runs, the corridor limits would be in place and in these years the expected economic impacts would mirror those described without Option 3. In other words, vessels would evaluate the risks and consequences of a full (Option 1) or partial (Suboption 1 or Option 2) closure, which may result in additional costs associated with prioritizing more chum salmon avoidance. If a closure occurs, the economic consequences vary by sector and the amount of the corridor that is closed, among other annual factors.

4.3.5.5 Option 4

Alternative 5, Option 4 would delay the start date of the Winter HSA from September 1 to September 30 for the pollock fishery if the herring PSC limit were met during the fishing year. Option 4 could provide the fleet additional flexibility by allowing directed fishing for pollock with trawl gear to continue inside the Winter HSA throughout the month of September, *if the pollock fishery had attained its apportionment of the herring PSC limit*. Directed fishing may otherwise occur inside the Winter HSA in September and some sectors do target pollock in the area in some years in September. This option is intended to provide the pollock fleet with some additional flexibility as increased prioritization of chum salmon PSC avoidance may increase the likelihood of triggering the herring PSC cap.

The Winter HSA is located Northwest of the Pribilof Islands (Figure 3-52) and accounts for low pollock catch as a proportion of the total B season catch (between 0%–1.3% from 2011–2023; Table 3-22), and generally low, but more variable pollock catch for the Winter HSA as a proportion of the total September catch (between 0%–8.4% from 2011–2023; see also Table 3-22).

When pollock fishing has occurred in the Winter HSA in September, it was primarily from the CP sector (Table 4-34). However, in 2013 the mothership focused in this area for ~47% of its September harvest and this area has been relied on for some CDQ pollock harvest in years that correlate with CP harvest. Therefore, to the extent this option provides additional cost savings to the pollock fleet, it will likely be as an operational flexibility to the CP, CDQ or possibly the mothership sectors in years where chum salmon PSC and herring PSC are difficult to avoid in tandem. While this area has not accounted for substantial B season harvest in previous years, future pollock aggregations may be different and additional fishing ground in the month of September may provide beneficial flexibility.

Table 4-32 Proportion of September pollock harvest from inside the Winter HSA by sector, 2011–2023

Year	CDQ	CP	Mothership	Inshore
2011	18.7%	14.6%	2.8%	0.0%
2012	0.0%	0.0%	6.6%	0.5%
2013	12.1%	11.0%	47.2%	0.5%
2014	0.0%	1.3%	2.1%	0.0%
2015	0.0%	0.9%	6.4%	0.0%
2016	0.0%	0.0%	0.0%	0.0%
2017	0.0%	1.1%	0.0%	0.0%
2018	3.5%	11.5%	1.8%	0.0%
2019	0.3%	3.9%	0.0%	0.0%
2020	1.1%	4.1%	0.0%	0.0%
2021	0.0%	1.5%	0.0%	0.0%
2022	0.0%	0.0%	0.0%	0.0%
2023	0.0%	0.0%	0.0%	0.0%
Average	2.7%	3.8%	5.2%	0.1%
Median	0.0%	1.3%	0.0%	0.0%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

4.3.5.6 CDQ Reserve Pool

A CDQ Reserve Pool Suboption is included for consideration under the apportionment for Alternative 5. Similar to its consideration under an overall chum salmon PSC limit (Alternative 2 or 3), this suboption was added for consideration to reduce adverse economic impacts to CDQ groups that may occur in the future with the implementation of the proposed measures. This process, requirements, and amounts potentially available overall and by CDQ group under Alternative 5 are shown in Section 2.7.4.1.

Table 3-11 demonstrates that the CDQ sector has had variable dependency on the corridor area during the closure window for its B season pollock catch. Apportionments based on full or partial history (as opposed to the AFA apportionment) from 2011–2022 result in a lower chum salmon to pollock apportionment for the CDQ sector relative to the inshore or mothership sectors (Table 2-9). This means if a CDQ group wishes to harvest CDQ pollock on an inshore or mothership CV, it may be more likely to meet its vessel-level limit (assuming the IPAs choose to apportion chum salmon to the vessel-level) than an inshore CV with the same amount of pollock quota issued.

Similar to how this suboption would work under Alternative 2 or 3, this suboption would not be expected to be heavily used if selected with Alternative 5. CDQ groups would likely prefer to remain fishing CDQ pollock on CPs, particularly with the implementation of an inseason corridor that may disproportionately impact the inshore sector. Additionally, the requirements of this suboption (*e.g.*, a group cannot switch sectors mid-season) are expected to make it difficult to take advantage of and may prevent it from being used in unexpected scenarios.¹⁴² However, for example, if a CDQ group cannot find a CP harvesting partner or it does not make economic sense, this suboption would provide a chum salmon PSC adjustment based on the sector the CDQ pollock is committed to. The adjustments described in Section 2.7.4.1 would be an amount of chum salmon PSC apportioned to an individual CDQ group based on associated with a sector by November 15 in the prior year. If an adjustment is made to the groups' chum salmon PSC apportionment, this amount cannot be changed inseason.

An increase in a group's chum salmon PSC apportionment means that group (and the vessels fishing this quota) is less likely to reach the corridor cap, relative to not having a CDQ Reserve Pool. Relative to Option 1, the inshore or mothership CVs would have more flexibility under Suboption 1 or Option 2 to fish pollock CDQ outside of the closure area if they the closure was triggered for their sector. Therefore, in particular, the reduction in adverse impacts from a CDQ reserve pool may be most acute under

¹⁴² Section 5.1.2 further describes how CDQ groups could create a reserve pool through contractual agreements that may be more flexibility to extenuating circumstances than NMFS pre-season apportionment.

Alternative 5, Option 1. Similar to Alternative 2 and 3, the rationale for consideration of a CDQ reserve pool is to provide the CDQ groups with the flexibility to harvest their CDQ pollock differently than they have in the past if they should choose.

4.3.5.7 Pollock Community Impacts

This section describes how an inseason corridor with closure provisions under Alternative 5 may affect communities engaged in or dependent on the B season pollock fishery (including CDQ communities). Note this is a cross-cutting discussion that addresses all three inseason corridor options. The potential social and economic impacts that could be realized at the community-level are similar to those identified and evaluated under Alternative 2 and 3. The relative impacts of a corridor closure on a community would depend on the number of sectors that are tied to the community (*i.e.*, degree of exposure), the historical reliance of those sectors on the corridor for their pollock catch, the ability of vessels to modify their fishing behavior, as well as the cap amount and the apportionment.

Communities Affiliated with the Inshore Sector

Newport, Kodiak City, Seattle MSA, Akutan, King Cove, and Unalaska are communities affiliated with the inshore sector either by vessel's registered ownership or as the location of a shore-based processor that accepted deliveries of B season pollock. Similar to Alternatives 2 and 3, the analysis does not anticipate Alternative 5 would have adverse effects on the community of King Cove unless the processor and cooperative returned to the community.

The retrospective analysis prepared for Alternative 5 indicates the greatest potential for adverse effects on the inshore sector, including revenue at risk, would result from Option 1 at the lowest cap amount of 50,000 chum salmon and apportionment Option 4 (AFA). Relative to the other closure options, Alternative 5, Option 1 could displace greater amounts of pollock catch with fewer stat areas available to recover this fishing effort. Therefore, vessels would be expected to preemptively change their fishing behavior to avoid the consequence of a corridor closure. The additional run time to fish outside the entire perimeter of the inseason corridor under Option 1 could result in additional fuel costs to the vessel (potentially benefiting fuel providers) and potentially a reduction in product quality, the latter of which could affect either Akutan or Unalaska through reduced fishery-related tax revenues.

Vessel owners and crew may be financially impacted by the additional costs to avoid a corridor closure or to travel outside of the corridor in the event of reaching the limit. A full corridor closure under Alternative 5, Option 1 could disproportionately challenge smaller, lower capacity inshore CVs due to their lack of hold capacity which would be weighed against the additional fuel and travel costs, safety, or fuel capacity. As shown in Table 4-33, most of the Kodiak and Newport CVs active in the 2023 B season were less than 120 ft length overall (LOA), as were some CVs from Seattle and other parts of Washington.

Table 4-33 Inshore CV count by owner community and vessel length overall, 2023

Vessel Length Overall (ft)	Alaska		Oregon	Washington	Total
	Kodiak City	Anchorage/Wasilla	Newport	Seattle MSA/Other	
<90				1	1
90-99	3		3	3	9
100-109				3	4
110-120				6	6
>120		2	1	22	39
Grand Total	3	2	4	50	59

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

Notes: Cells without a numerical value indicate a vessel of that size (LOA) was not active and affiliated with the community in 2023.

As noted above, if vessels and cooperative managers perceive there is a risk of reaching the area- specific cap, it is expected the CV fleet would slow the pace of fishing trips and deliveries. This strategy would allow cooperative managers to account for the delay in observer data from the plant where the census

count of salmon is completed. However, slower deliveries would reduce the efficiency of a plant, potentially resulting in processing stand-downs, which may prove too costly for a processor to withstand over many weeks in a B season or even year-to-year. Akutan and Unalaska would be adversely affected in these scenarios as would the processing labor forces at the plants that may experience temporary loss of pay or job losses if the facility could not maintain its operations.

Alternative 5, Option 1 presents the greatest possibility of unharvested B season TAC, relative to the other inseason corridor options. If the inshore sector reached the inseason corridor limit early in the B season, Table 3-15 demonstrates up to ~80% of the inshore sector's B season harvest displaced to outside of the corridor or after the closure window and it is unclear whether that level of harvest would be recovered in this time or space. Similar to what is described in Section 4.3.2 under Alternative 2 or 3, reduced B season deliveries would have implications for shoreside processing communities from reduced tax revenues associated with landings (Akutan and Unalaska). This could also extend to other communities that rely on fisheries taxes collected through the State of Alaska or Aleutians East Borough.

Suboption 1 and Option 2 would have the same types of effects on communities engaged in or dependent on the B season fishery, but the magnitude of impact compared to status quo would likely be less than Option 1. Suboption 1 and Option 2 would allow directed fishing to continue in 11 stat areas (Suboption 1) or between 11 and 19 stat areas (Option 2) inside the corridor and all outside areas through August 31. Many of the stat areas exempt from closure under Suboption 1 were historically important fishing grounds for the inshore sector. The analysis expects inshore CVs to continue to target pollock inside these exempted stat areas after a corridor closure. Similarly, under Option 2 the IPAs could select stat areas to close with relatively low impact on the fleet's ability to fully utilize the B season TAC in an efficient manner. To the extent the IPAs are able to 1) accurately predict stat areas with good CPUE and quality pollock preseason and 2) balance their selections with tradeoffs among the PSC rates in corridor stat areas, the potential impacts to communities under Option 2 would be minimal compared to status quo.

Communities Affiliated with the Offshore Sectors

Unalaska/Dutch Harbor is affiliated with the CP and mothership sectors as the primary location for product transfers and vessel ownership is primarily concentrated in **Seattle MSA**. As described in Section 4.3.5.1.1, adverse impacts to the offshore sectors from Alternative 5 are most likely under Option 1 (which would close the full corridor) at a PSC limit in the lower range considered. Chum salmon PSC limits analyzed at the mid-point or upper end of the range were shown to substantially reduce the potential these vessels would be displaced from the corridor. At these amounts, a corridor PSC limit may not motivate large changes in fishing behavior prior to a corridor closure, so the impact to these vessels and their affiliated communities would be minimal. Suboption 1 and Option 2 (which would close a portion of the corridor) may reduce the consequences of a corridor closure relative to Option 1. Although these vessels, companies and crew could be adversely affected by the implementation of an inseason corridor chum salmon PSC limit, affiliated communities may be somewhat insulated from the impacts experienced by the offshore fleet.

For instance, if CPs and mothership operations are able fish northwest of the corridor and find suitable aggregations of pollock to recover any displaced harvest, product transfers may continue in the same magnitude for these sectors and community FRLT may not be impacted. As described in Section 4.3.5.1.1, these offshore vessels have had fairly consistent, yet variable reliance on the corridor area defined under Alternative 5. This area likely provides valuable operational flexibility and may be worth incurring additional costs to preserve this fishing opportunity later in the B season. However, it is not anticipated that a corridor closure for an offshore sector would have adverse effects on Unalaska because it would not directly curtail the B season. Compared with inshore CVs, CPs and motherships have more operational flexibility to move to new fishing grounds if a corridor under Alternative 5 is closed.

CP and mothership CV ownership is primarily concentrated in Seattle MSA, with some recent participation from Anchorage. Seattle MSA and Anchorage represent larger metropolitan areas with a

more diversified economic base, thus any changes in spending induced from vessels owners or crew that reside in these communities due to the impacts of Alternative 5 are unlikely to have community-based implications.

CDQ Groups and Associated Communities

The communities affiliated with CDQ groups may be affected by the options proposed in Alternative 5 if these options affect the groups' ability to support community programs in the same way as they have in recent years. For instance, impacts could occur if the action diminishes returns on CDQ investments or changes in the groups' leverage in negotiating harvest contracts. At the same time, communities affiliated with the CDQ program are also engaged in WAK chum salmon fisheries and could benefit from any WAK chum salmon saved because of additional management measures as described in Section 4.5.

Under Alternative 5, the inshore sector is expected to be most impacted by an inseason corridor because of both its consistent reliance on the area and constraints in mobility. The 53 communities affiliated with BBEDC, CBSFA, CVRF, and NSEDC may be considered as more exposed to potential adverse effects resulting from an inseason corridor PSC limit, because these groups rely on direct investments from the inshore sector (Table 4-13). Relative to the options considered under Alternative 5, the inshore sector is expected to be most adversely impacted by a full corridor closure (Option 1) at a PSC limit in the lower range considered as described at length in Section 4.3.5.1.2.

For CDQ pollock, impacts may look similar to those described for the CP sector if these vessels continue to harvest this quota. Given the mobility of CPs and their frequent reliance on fishing grounds Northwest of the corridor, impacts are not expected to be as pronounced as for the inshore sector. However, Section 2.4.1.1 highlights that if conditions change in the future such that CP capacity is not available for CDQ pollock harvest in the B season, a chum salmon PSC limit apportionment based on historical encounter rates may make it more difficult to harvest CDQ pollock with a different sector. The suboption under Alternative 5 for a CDQ Reserve Pool is intended to address this concern as described in the previous Section 4.3.5.6.

4.3.6 Combined Effects of the Alternatives on the Pollock Industry

Chapter 2 describes whether and how the alternatives and options may be selected in combination with one another. Some of the expected impacts change or change in magnitude when alternatives and options are considered in combination with one another. This section highlights the expected combined effects on the pollock industry and communities if a combination of alternatives are adopted together.

Alternative 2 or 3 + Alternative 5

Compared to Alternative 2, 3, or 5 being selected in isolation, selecting an overall chum salmon PSC limit (Alternative 2 or 3) alongside any of the three inseason corridor options under Alternative 5 could result in greater direct and adverse impacts on the pollock industry. The magnitude of the potential impacts would depend on the PSC limit and apportionment selected, the inseason corridor selected, vessels' ability to change their fishing behavior and operations to stay below multiple chum salmon PSC limits, and the relative overlap in distributions of pollock and chum salmon. The magnitude of potential impacts would also be tied to the sector's assessment of the risk and consequence associated with the different management measures, which would likely drive their fishing/avoidance behavior.

An overall chum salmon PSC limit would generate the greatest consequence for any sector compared to any of the other proposed actions because it would halt the B season for that sector with no opportunity to fish Bering Sea pollock elsewhere. However, depending on where each PSC limit is set, the risk of a corridor closure could be greater and thus drive behavior. Consider the following scenario where an overall PSC limit of 550,000 chum salmon is selected as well as inseason corridor Option 1 and a 50,000 corridor PSC limit. Prior to the start of the B season, individual vessels and cooperative managers would consider the risk and consequences these two caps may pose to their operations. As shown in Table 4-19,

based on retrospective fishing from 2011–2023 with no behavioral changes, the inshore sector would have met an overall chum salmon 550,000 PSC limit in 0–1 of the 13 years, depending on the apportionment. In comparison, Table 4-29 shows the inshore sector would have met its apportionment of a 50,000-chum salmon PSC limit in 12 of the 13 years. In this scenario, inshore vessels and cooperative managers would monitor both PSC limits carefully, but the more likely closure of the corridor may first drive operational choices. For example, if larger/more efficient CVs can harvest more of their cooperative’s pollock outside of the corridor, they are less likely to trigger a corridor closure. In contrast, if an overall chum salmon PSC limit of 100,000 fish is paired with a corridor PSC limit of 50,000 fish, it would create a high-risk scenario for both PSC limits. Thus, unless the larger vessel has lower intrinsic chum salmon rates, fishing outside the corridor may not inherently lower the risk of an overall closure and this operational strategy may not provide any advantage to the cooperative.

A combination of both the overall and inseason corridor chum salmon PSC limits set at relatively low amounts, and where Option 1 of Alternative 5 is selected to the entire corridor would close, likely presents the greatest set of adverse impacts for pollock harvesters, processors and associated communities, with the potential to have broader implications. It is difficult to predict how vessels and processors may react to a scenario with a high likelihood of an early B season closure. Companies may estimate they will not recover their fixed operating costs and choose not to participate in the B season. Quota may be consolidated onto fewer, better performing vessels. Alternatively, it may be that operations will continue with current avoidance strategies (*e.g.*, test tows, communication, and fleet movement), with a high likelihood of a mid-season closure. If vessels continue to participate with the combination of management measures adopted, this would likely result in more complex avoidance decisions and increased avoidance costs. These types of avoidance costs are described in Section 4.3.2.2.1 and Section 4.3.2.3.1 include costs such as impacts on operational efficiency as vessels move more often/further and potentially into less desirable pollock fishing. As described in Section 4.3.2.3, shoreside processors will also conduct their own risk assessment, as the fixed costs associated with opening and operating these facilities are substantial. There may be a scenario where processor decisions drive B season opportunities for inshore CVs.

The combination of Alternative 2 or 3 and 5 would likely have the greatest potential for adverse impacts on the inshore sector, including smaller/ lower capacity inshore CVs. These vessels would continue to be constrained in how far from shore they can travel. Under a corridor cap alone this is also the case. However, layering on an overall PSC limit may require more avoidance techniques (*e.g.*, additional movement) and smaller/lower capacity vessels do not have as much flexibility in locations in order to avoid reaching one of the PSC limits.

If the sector determines that one or both types of the PSC limits are not of high risk of being triggered, or the corridor cap is lower consequence, the adverse impacts may look more like the evaluation of Alternative 2/3 alone. For example, the CP sector has historical effort in the corridor; however, it is highly variable year to year. If in a given year, pollock aggregations are strong in out in Cluster 4, this sector may respond to and therefore be most impacted by an overall chum salmon PSC limit.

If Alternative 3 was adopted in combination with a corridor cap it would essentially only result in “layered impacts” in a year following low WAK chum salmon returns. If the threshold for low abundance is not triggered, a corridor cap would be in place alone. If Alternative 3 was adopted in combination with a corridor cap, the corridor cap would not “turn on/ turn off” with abundance because Alternative 5, Option 3 was determined to be mutually exclusive from Alternative 3. However, Alternative 5, Option 3 could be adopted in combination with Alternative 2. Therefore, the corridor cap could not be in effect in periods of high WAK chum salmon abundance, but an overall chum salmon PSC limit would remain in place. As previously discussed, the selection of Alternative 5, Option 4, is expected to provide the potential for marginally beneficial increases in flexibility for the CP sector, but is not expected to have other impacts when considered in the context of selecting multiple alternatives

Additionally, Alternative 3 also presents the possibility of a lower overall cap (75,000 chum salmon). If a 100,000-chum salmon limit is selected under Alternative 3 in combination with a corridor cap and the reduced abundance results in a 75,000-chum salmon PSC limit, it is likely that the high risk and consequences of the overall limit would drive operational strategies. A corridor cap could still layer on high risk and consequences for a sector, considering that the limit would need to be below 75,000 chum salmon. The high likelihood of an early B season closures and/ or corridor closure makes it difficult to predict the operational response from the fleet and shoreside processors. Vessels and processors will be evaluating the risk of not achieving their baseline fixed operational cost in determining whether or how to participate in the B season.

Alternative 2 or 3 + Alternative 4 and/or Alternative 5

Since the IPAs have been recently amended to include measures that respond to most of the provisions being considered under Alternative 4, it is not anticipated these regulatory changes would increase costs to the fleet outside of those evaluated for each alternative individually.

4.4 Western Alaska Chum Salmon Fisheries Description

4.4.1 Description of State Management of Subsistence Chum Salmon Stocks

After conservation, the highest priority for use in Alaska under both state and Federal law is subsistence. In Alaska, subsistence has a preference over all other consumptive uses of the stock when harvests must be restricted (AS 16.05.258). The state defines subsistence uses of wild resources as noncommercial, customary, and traditional uses including “direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption” (AS 16.05.940(34)).

Under Alaska’s subsistence statute (AS 16.05.258), the BOF must identify fish stocks that are associated with customary and traditional subsistence fisheries. Next, the BOF determines whether there is a harvestable surplus of these stocks. The harvestable surplus is the amount of fish that can be taken by various uses (subsistence, personal use, commercial) after conservation (escapement) is accounted for. If there is a harvestable surplus of these stocks that have been identified as having been customarily and traditionally used, the BOF must determine the amount of the harvestable surplus that is reasonably necessary for subsistence uses. Then, the BOF must adopt regulations that provide reasonable opportunities for these subsistence uses to take place. A “reasonable opportunity” is defined in statute to mean an opportunity that allows a subsistence user to participate in a subsistence fishery that provides a normally diligent participant with a reasonable expectation of success of taking of fish (AS 16.05.258(f)).

The BOF evaluates whether reasonable opportunities are provided for in the existing or proposed regulations by reviewing harvest estimates relative to the “amount reasonably necessary for subsistence use” (ANS) findings as well as subsistence fishing schedules, gear restrictions, and other management considerations. ANS is typically set as a range but is not a consistent metric across all areas. Some areas like the Yukon and Kuskokwim have species-specific ANS ranges for salmon while others like Norton Sound and Bristol Bay lump all salmon species together under a single ANS range. ANS ranges are based on the harvest histories in each area (Table 4-34). As a run develops, inseason managers will assess what portion of the run can be harvested after accounting for escapement. **If the harvestable surplus is within or higher than the ANS range, other nonsubsistence uses, such as commercial or sport fishing, may be allowed.**

Harvest levels within or above the ANS range typically suggest regulations do provide a reasonable opportunity to harvest a resource for subsistence as long as subsistence patterns have not changed significantly. Subsistence harvests may fall below the lower bound of an ANS range for a number of reasons including changes in species use and relative dependence, weather conditions, or fishing

restrictions in a given year. However, a retroactive look at subsistence harvests that fall below the ANS range in a given year or across multiple years can provide additional context to inform understandings of run abundance or stock status. Subsistence harvests below the lower bound of the ANS range may indicate, with other evidence, that there was not reasonable opportunity for subsistence harvests during the season and that subsistence needs may not have been met.

Personal Use Fisheries

The State of Alaska defines personal use fishing as the “taking, fishing for, or possession of finfish, shellfish, or other fishery resources, by Alaska residents for personal use and not for sale or barter, with gill or dip net, seine, fish wheel, longline, or other means defined by the BOF” (AS 16.05.940(25)). Personal use fisheries are different from subsistence fisheries because they either do not meet the criteria established by the Joint Board of Fisheries and Game (Joint Board) for identifying customary and traditional fisheries (5 AAC 99.010) or because they occur within nonsubsistence areas. The Joint Board is required to identify nonsubsistence areas using the 13 criteria outlined in statute, where “dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community” (AS 16.05.258(c)). The BOF may not authorize subsistence fisheries in nonsubsistence areas (5 AAC 99.016). Personal use fisheries provide opportunities for harvesting fish with gear other than rod and reel in nonsubsistence areas. Ketchikan, Juneau, Anchorage-Matsu-Kenai, Fairbanks, and Valdez have been identified as nonsubsistence areas (5 AAC 99.015) where persons may harvest wild resources for food under personal use or sport fishing regulations. Generally, fish may be taken for personal use under authority of a permit issued by ADF&G. ADF&G’s Division of Commercial Fisheries primarily manages personal use fisheries, although some are managed by the Division of Sport Fish.

Table 4-34 ANS for Arctic-Yukon-Kuskokwim Areas by Salmon Species

Fisheries Management Area	Year of ANS Finding	Chinook Salmon	Chum Salmon	Summer Chum Salmon	Fall Chum Salmon	Sockeye Salmon	Coho Salmon	Pink Salmon	All Salmon
Kotzebue	None	-	-	-	-	-	-	-	-
Norton Sound-Port Clarence	1998	-	-	-	-	-	-	-	96,000-160,000
Nome Subdistrict	1999	-	3,430-5,716	-	-	-	-	-	-
Yukon Area	2001	45,500 - 66,704	-	83,500-142,192	89,500-167,900	-	20,500-51,980	2,100 - 9,700	-
Kuskokwim Area	2013								
Kuskokwim River		67,200-109,800	41,200-116,400	-	-	32,200-58,700	27,400-57,600	500-2,000	
Districts 4 and 5									6,900-17,000
Remainder of Area									12,500 - 14,400
Bristol Bay	2001	-	-	-	-	55,000-65,000 ¹⁴³	-	-	157,000-172,171
Alaska Peninsula	1998	-	-	-	-	-	-	-	34,000 - 56,000

Source: ADF&G.

4.4.2 Federal Management of Subsistence Chum Salmon Stocks

Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) mandates that rural residents of Alaska be given a priority opportunity for customary and traditional subsistence uses, among consumptive uses of fish and wildlife, on Federal lands (16 U.S.C. 3114). ANILCA was passed in 1980, and in 1986, the State of Alaska amended its subsistence law to mandate a rural subsistence priority in

¹⁴³ The ANS finding for Bristol Bay sockeye salmon represents a nested ANS finding for the Kvichak river drainage, from the overall Bristol Bay area finding of 157,000-172,171 salmon (5 AAC 01.336(b)(1)).

order to bring the statute into compliance with ANILCA. However, in the 1989 *McDowell* decision, the Alaska Supreme Court ruled that the priority in the state's subsistence law could not be exclusively based on location of residence (*i.e.*, rural residents) under provisions of the Alaska Constitution. Meanwhile, other Federal court cases on the state's administration of Title VIII of ANILCA ruled that the state would not be given deference in interpreting Federal statute.

These court cases created conflicting rulings; proposed amendments to ANILCA and the Alaska constitution were not adopted to rectify them. As a result, the Secretaries of Interior and Agriculture implemented a parallel regulatory program to assure the rural subsistence priority is applied under ANILCA on Federal lands. Both state and Federal governments provide subsistence uses on Federal public lands and waters in Alaska. Federal public lands in Alaska encompass approximately 230 million acres (60%) of the land within the state.

ANILCA defines "public lands" as lands situated "in Alaska" which, after December 2, 1980, are federal lands. Exceptions include 1) those lands selected by or granted to the State of Alaska; 2) lands selected by an Alaska Native Corporation under the Alaska Native Claims Settlement Act (ANCSA); 3) and lands referred to in section 19(b) of ANCSA (16 U.S.C. 3102(3)). The U.S. Supreme Court has ruled that ANILCA's use of "in Alaska" refers to the boundaries of the State of Alaska and concluded that ANILCA does not apply to the outer continental shelf (OCS) region where the NMFS and the Council hold jurisdiction (*Amoco Prod. Co. v. Village of Gambell*, 480 U.S. 531, 546-47 (1987)). In 1992, the Secretaries of the Interior and Agriculture established the Federal Subsistence Board (FSB) and ten Regional Advisory Councils (RACs) to administer this responsibility.¹⁴⁴ Through the FSB, these agencies participate in development of regulations which establish the program structure, determine which Alaska residents are eligible to take specific species for subsistence uses, and establish seasons, harvest limits, and methods and means for subsistence take of species in specific Federal areas. The RACs provide recommendations and information to the FSB; review proposed regulations, policies, and management plans; and provide a public forum for subsistence issues. Each RAC consists of regional residents representing subsistence, sport, and commercial fishing and hunting interests.

4.4.3 Subsistence Harvests of Chum Salmon

Of the estimated 34.0 million pounds of wild foods that are annually harvested for subsistence purposes in rural Alaska communities, subsistence fisheries contribute 54% of the total; salmon contribute the majority of this amount at 32.3% of all subsistence harvests of wild foods, although Pacific halibut, herring, and whitefishes also play an important role in subsistence economies (Fall, 2018).

Salmon are an important food source, and are central to the customs, traditions, wellbeing, and cultural identities of many rural and Indigenous communities across Alaska including the Unanga, Athabaskan, Alutiiq, Haida, Inupiaq, Tlingit, Tsimshian, and Yup'ik peoples, among others. This section provides information on historical and recent years' subsistence harvests of salmon, and the role that chum salmon play in the subsistence economies, in the Kotzebue, Norton Sound-Port Clarence, Yukon, Kuskokwim, and Bristol Bay Management Areas which broadly represent Western Alaska.

Table 4-35 provides information on select social and economic indicators for select Boroughs and Census Areas which broadly represent Western and Interior Alaska. Indicators for these areas are compared with Alaska as a reference population. As shown, the total population residing in these areas varies – the Bethel Census Area had the largest population at 18,666 persons in 35 communities and the Bristol Bay Borough had the smallest population at 844 persons in four communities. The minority percentage population is highest in the Kuslivak Census Area at 97.9% but the minority percentage population in all analyzed areas is greater than Alaska's general population. The low-income percentage population in the

¹⁴⁴ The FSB's composition includes a chair appointed by the Secretary of the Interior with concurrence of the Secretary of Agriculture; the Alaska Regional Director, U.S. Fish and Wildlife Service; the Alaska Regional Director, National Park Service; the Alaska State Director, Bureau of Land Management; the Alaska Regional Director, Bureau of Indian Affairs; and the Alaska Regional Forester, USDA Forest Service; and two public members representing rural subsistence users.

Bristol Bay Borough (9.4% of total) is lower than Alaska's general population. The low-income population components of all other analyzed areas are greater than the general population of Alaska, ranging from a low of 20.3% of the population in the Dillingham Census Area to 41.7% of the population in the Kuslivak Census Area.

Table 4-35 Select social and economic indicators for select Western and Interior Alaska Census Areas and Boroughs compared to the State of Alaska

Area	No. of Communities	2020 U.S. Census			2022 5-Year ACS Estimates			
		Total Pop.	Alaska Native/ American Indian Residents as Percentage of Total	Minority Pop. as Percentage of Total	Per Capita Income	Number of Households	Median Household Income	Low- Income Residents as Percentage of Total
Bethel	35	18,666	83.70%	91.30%	\$25,859	4,565	\$64,094	32.80%
Bristol Bay	4	844	36.10%	57.70%	\$45,499	284	\$94,167	9.40%
Dillingham	10	4,850	71.20%	84.10%	\$45,499	1,384	\$94,167	20.30%
Kuslivak	13	8,368	95.00%	97.90%	\$31,948	1,864	\$69,412	41.70%
Lake and Peninsula	18	1,476	67.30%	79.90%	\$17,166	326	\$42,663	21.60%
Nome	15	10,046	75.20%	86.10%	\$28,678	2,786	\$70,121	29.20%
Northwest Arctic	17	7,793	83.00%	91.20%	\$32,133	1,776	\$77,647	25.50%
Yukon-Koyukuk	38	5,343	71.70%	79.00%	\$29,382	2,078	\$47,826	28.60%
Alaska	-	733,391	15.20%	42.50%	\$43,054	274,574	\$88,121	14.20%

Notes: That Aleutians East Borough and the Aleutians West Census Area are not included in this categorization of impacts is not meant to suggest no minority, low-income, or Alaska Native tribal populations rely on chum salmon for subsistence and other economic uses. These areas are beyond the southern boundary (Bristol Bay) of the CWAK reporting group.

4.4.3.1 Regional Patterns of Subsistence Harvests of Salmon

This section provides information on the patterns of subsistence harvests of salmon in the Kotzebue, Norton Sound-Port Clarence, Yukon, Kuskokwim, and Bristol Bay Management Areas based on ADF&G subsistence salmon harvest information and comprehensive subsistence surveys. Subsistence harvest information is collected via voluntary daily harvest calendars, voluntary postseason household harvest surveys, and mandatory permit programs by the Division of Subsistence or Division of Commercial Fisheries staff, depending on the area. Comprehensive subsistence surveys are door-to-door studies that document all major subsistence harvests in select communities to provide an overall subsistence proxy profile for a region conducted by the Division of Subsistence.¹⁴⁵ These studies are not conducted annually but document all major subsistence harvests in communities to provide an overall subsistence proxy profile for a region and contextualize these data with ethnographic information about subsistence uses by a community.

4.4.3.1.1 Kotzebue

Kotzebue District encompasses all waters from Point Hope to Cape Prince of Wales, including those waters draining into the Chukchi Sea. This district includes the subsistence fishing areas used by Point Hope, Kivalina, Noatak, Kotzebue, Kiana, Noorvik, Selawik, Ambler, Shungnak, Kobuk, Buckland, Deering, Shishmaref, and Wales. Kotzebue Sound residents have relied on fish as a key nutritional and cultural resource for thousands of years, and many continue to participate in mixed subsistence economies. The role of salmon in the wild food diet varies from community to community and is driven primarily by salmon abundance. Communities that harvest few salmon typically harvest large numbers of sheefish, other whitefishes and Dolly Varden (Brown et al., 2023).

¹⁴⁵ Community data are available on the [Community Subsistence Information System website](#).

From 1994–2022¹⁴⁶, subsistence harvests of all salmon ranged from 30,888 fish (2003) to 101,426 fish (1996) and averaged 58,549 fish across the time series. Chum salmon is the primary species of salmon harvested by residents and ranged from 27,444 fish (2003) to 99,137 fish (1996). In 2022, it was estimated that 53,586 chum salmon were harvested for subsistence in the district, slightly above the most recent 5-year average (2017–2021) of 52,540 chum salmon.

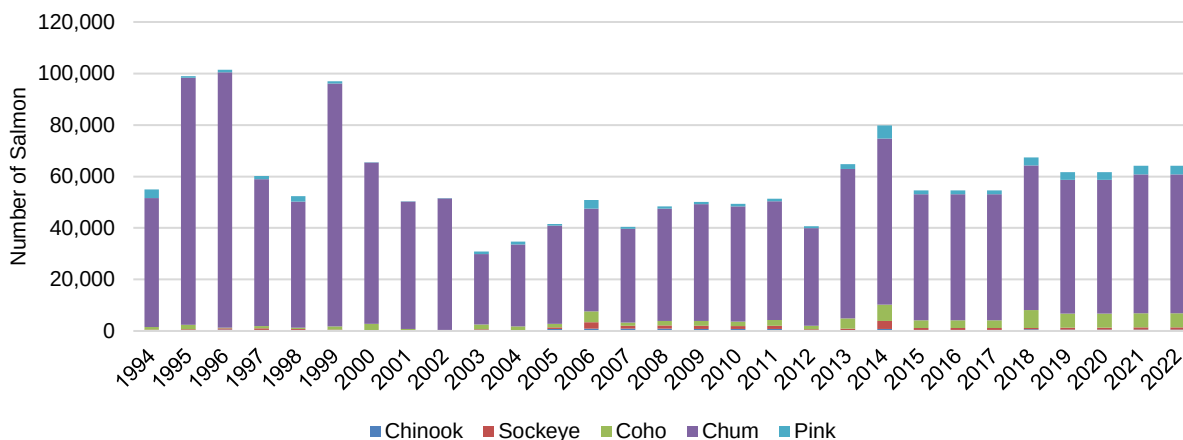


Figure 4-15 Historical estimates of subsistence harvests of all salmon in the Kotzebue District, 1994–2022
Source: ADF&G.

Table 4-36 shows subsistence harvest data in usable (or edible) pounds so subsistence harvests of chum salmon can be compared to other resource categories or species to better understand the subsistence economies within and across communities in the Kotzebue Sound region. Chum salmon play an important role in the subsistence economies and sharing networks of communities in this District. For instance, chum salmon accounted for 84% of the usable pounds of all salmon harvested for subsistence and 13% of the usable pounds of all resources harvested for subsistence by communities in the district. Compared to total resources harvested for subsistence, chum salmon tends to contribute a small proportion of the usable pounds because of the large harvests of marine mammals.

Table 4-36 Usable pounds (lb.) of chum salmon harvested for subsistence compared to all salmon species (lb.) and all subsistence harvests (lb.) for surveyed communities in Kotzebue Sound

Chum Salmon (Usable lb.)	322,162
All Salmon Species (Usable lb.)	382,512
As Percent of Total Salmon Harvests	84%
All Subsistence Harvests (Usable lb.)	2,349,059
Chum as Percent of Total Subsistence Harvest	13%

Source: ADF&G. Includes results from comprehensive subsistence surveys in Kotzebue (2014), Selawik (2011), Kiana (2006), Deering (2013), Noorvik (2012), Shismaref (2014), and Buckland (2018).

Along the Noatak and Kobuk Rivers where chum salmon runs have historically been strong, households' subsistence activities in middle and late summer revolve around catching, drying, and storing salmon. In southern Kotzebue Sound, fewer salmon are taken for subsistence because of small runs. Some fishery

¹⁴⁶ Subsistence harvest estimates for the Kotzebue District are available from 1994–2022. ADF&G Division of Subsistence conducted annual salmon harvest surveys in a select number of Kotzebue District communities from 1994–2004. Little systematic or comprehensive subsistence harvest information has been collected since 2004, although there was a three-year effort to collect some harvest monitoring data from 2012–2014. As such, ADF&G relies on interpolated harvest estimates for a core set of communities. This is the best scientific information available for this region but may warrant some caution when comparing to other areas.

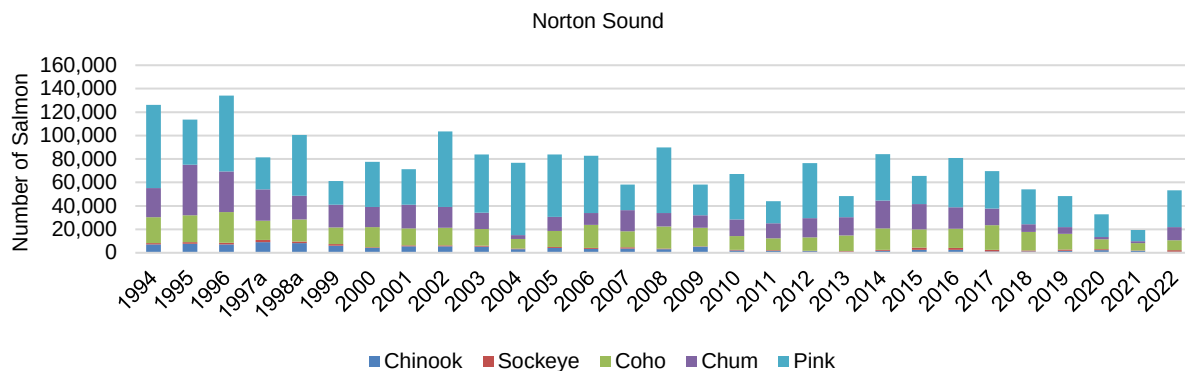
participants base their fishing effort out of their village, whereas others move seasonally to fish camps where they stay for several days to several weeks (Menard et al., 2022).

Chum salmon returns have been strong in the region, the timing of the runs widening, and the fish were reported to remain in prime condition later into the season; all of these conditions led to good subsistence and commercial fishing opportunities. However, rainy weather in recent years has made preserving subsistence harvests of chum salmon more difficult (Braem, Mikow & Kostick, 2017). While 2024 subsistence harvest estimates are not yet available, the chum salmon run was very low this year. Some fishermen reported their subsistence needs were being met while others indicated that fishing was slow, and their needs may not be met. The 2024 subsistence fishery was hindered by several periods of heavy rain that caused the river systems in the area to experience high water levels ([2024 ADF&G Kotzebue Sound Salmon Season Summary](#)).

4.4.3.1.2 Norton Sound

The Norton Sound region includes the Port Clarence and Norton Sound Districts. Subsistence salmon fishing has been a major feature of the subsistence economies and ways of life in these region for centuries. Chum and pink salmon are the most abundant salmon species across the region, and Chinook and coho salmon are also present throughout the region but are more common in eastern and southern Norton Sound. Sockeye salmon are found in a few Seward Peninsula streams. In the summer, subsistence fishermen harvest salmon with gillnets or seines in the main Seward Peninsula rivers and in the coastal marine waters. Beach seines are used near the spawning grounds to harvest schooling or spawning salmon and other species of fish.

Estimates of all salmon harvests for subsistence ranged between 19,331 fish (2021) and 134,050 fish (1996) in the Norton Sound District and between 6,223 fish (1999) and 28,411 fish (2017) in the Port Clarence District (Figure 4-16). In the Norton Sound District, subsistence harvests of chum salmon ranged between 1,681 fish (2021) and 43,014 fish (1995). The estimated subsistence harvest of 10,961 chum salmon in 2022 was a notable increase from the very low harvest levels observed in 2021 and 2020. In the Port Clarence District, subsistence harvests of chum salmon have ranged between 1,275 fish (2000) and 7,802 fish (2012). The estimated 2022 subsistence harvest of 4,621 chum salmon was an increase from the 2020 and 2021 harvest levels of 2,297 and 1,719 chum salmon, respectively.



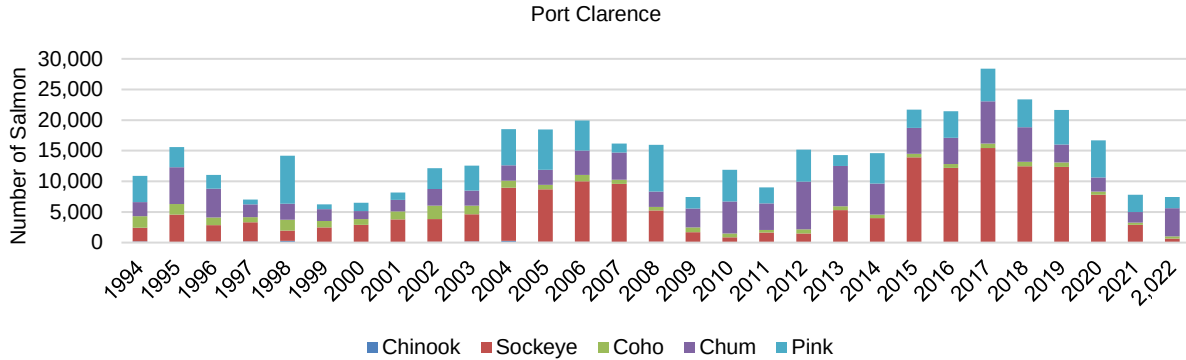


Figure 4-16 Historical estimates of subsistence harvests of all salmon in the Norton sound and Port Clarence Districts, 1994–2022

Source: ADF&G.

A specific ANS range for chum salmon was established at 3,430–5,716 fish in Subdistrict 1 of the Norton Sound District. Subsistence harvests of chum salmon in Subdistrict 1 have fallen below the lower bound (orange) of the ANS range (3,430 chum salmon) since 2016 (Figure 4-17). While subsistence harvests of chum salmon have declined in the region in recent years, this pattern does not appear to be solely driven by declines in chum salmon abundance. Subsistence harvests of chum salmon in Subdistrict 1 (Nome) have been low in recent years, but there have also been strong returns in the region. One explanation is that subsistence permit holders preferred traveling to Pilgrim River to harvest a large run of sockeye salmon instead of chum fishing in Subdistrict 1. A large pink salmon run for an odd-numbered year (2019) in the Nome Subdistrict may have also resulted in gillnets plugged with pink salmon, potentially limiting chum salmon harvests (Menard et al., 2022). These two districts have a history of variation and change in run strength and subsistence opportunities, which motivate fishers to travel to nearby areas for subsistence fishing opportunities, as may be feasible and necessary (Brown et al., 2023).

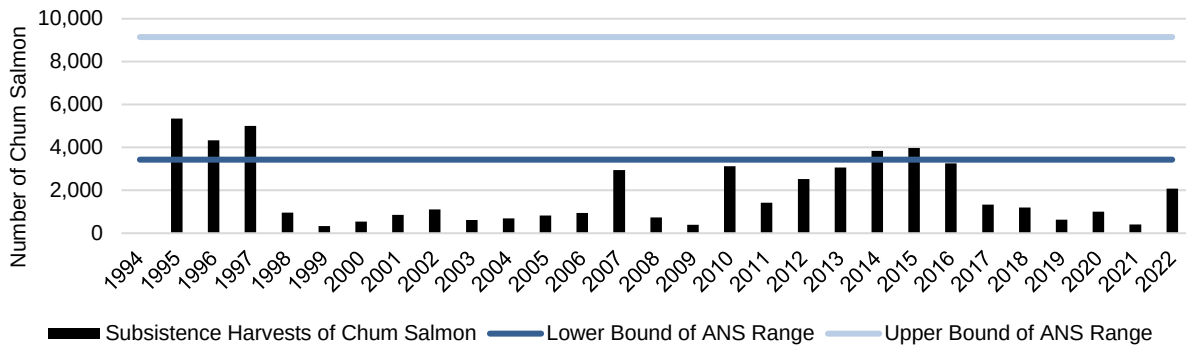


Figure 4-17 Subsistence harvests of chum salmon in District 1 (Nome) compared with ANS range, 1994 – 2022

Source: ADF&G.

Table 4-37 provides subsistence harvest data represented in usable (or edible) pounds so subsistence harvests of chum salmon can be compared to other resource categories or species to better understand the subsistence economies within and across communities in the Norton Sound region. Subsistence harvests of chum salmon accounted for 22% of the total harvest of all species of salmon by weight (pounds or lbs.) and 7% of the total subsistence harvest of all species and resources for these communities.

Table 4-37 Usable pounds (lb.) of chum salmon harvested for subsistence compared with all salmon species (lb.) and all subsistence harvests (lb.) for surveyed communities in Norton Sound

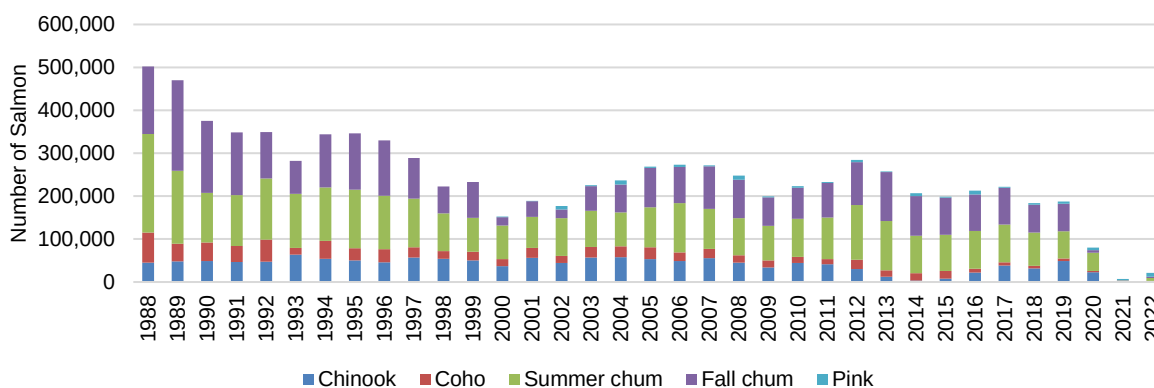
Chum Salmon (Usable lb.)	92,452
All Salmon Species (Usable lb.)	420,112
As Percent of Total Salmon Harvests	22%
All Subsistence Harvests (Usable lb.)	1,215,475
Chum as Percent of Total Subsistence Harvest	7%

Source: ADF&G. Includes results from comprehensive subsistence surveys in Brevig Mission (2006), Elim (2006), Golovin (2012), White Mountain (2006), Teller (2006), Stebbins (2013), Unalakleet (2006), and Koyuk (2006) from the Norton Sound region.

4.4.3.1.3 Yukon Area

Residents across the Yukon River drainage have long relied on subsistence harvests of Chinook salmon, summer and fall chum salmon, and coho salmon.¹⁴⁷ Drift gillnets, set gillnets, and fish wheels are the primary gear types used by subsistence fishermen. Fish wheels are a legal subsistence or non-commercial gear type throughout the Yukon drainage, although due to river conditions and the availability of wood, they are used almost exclusively on the upper Yukon and Tanana rivers. Subsistence harvesters typically base their fishing activities from fish camps or from their home communities. Throughout the Yukon Area, extended family groups, typically representing several households, often cooperate to harvest, process, preserve, and store salmon for subsistence uses (Brown et al., 2015). As people work together to harvest and process salmon, they form and strengthen social relationships that connect people within and among families (Trainor et al., 2021).

Subsistence harvest estimates are available for the Yukon Area from 1988–2022. Across the time series, subsistence harvests have declined and dramatically so in recent years. For instance, subsistence harvests of all species of salmon were at their highest level in 1988 at 502,087 fish compared to 6,869 salmon in 2021. The 2022 estimated subsistence harvest of all salmon was 20,911 fish.

**Figure 4-18 Historical estimates of subsistence harvests of all salmon in the Yukon Area, 1988–2022**

Source: ADF&G.

Summer and fall chum salmon are harvested in greater numbers for subsistence compared to other species of salmon. However, comparing the harvested amounts of different species likely does not fully account for other important considerations like the relative size, flavor, drying qualities, or sociocultural significance of salmon. Summer chum salmon do not typically migrate further upriver than the Tanana

¹⁴⁷ In the Yukon Area, management of coho salmon is tied to fall chum salmon management due to run timing and so it is difficult to assess the reasons for coho harvests, especially considering they are not specifically targeted by a large number of fishing households for subsistence. This is due to their lower abundance compared to fall chum salmon and late run timing. Pink salmon harvests are typically only reported in lower river communities, although the species is included on harvest surveys and catch calendars in all regions of the drainage. Although sockeye salmon are occasionally found in the lower portion of the Yukon River, their numbers are so low that they are not actively managed in the Yukon Area.

River drainage and thus contribute in greater magnitude to the total subsistence harvests of salmon in communities across the lower and middle river. Chinook salmon, fall chum, and a small number of coho salmon migrate the full length of the Yukon River into Canada and thus are available to most communities across the Yukon River.

Subsistence harvests of summer chum salmon ranged from 1,234 (2021) and 229,939 (1988) fish. The 2022 subsistence harvest of summer chum salmon was 6,692 fish, an 88% reduction from the recent 5-year average of 54,547 summer chum (2017–2021). The summer chum salmon ANS range is set at 83,500–142,192 summer chum salmon, and there are two distinct periods in which subsistence harvests fell below the lower bound of the ANS range, 1998–2004 and 2018–2022. In between these periods, subsistence harvests of summer chum salmon were relatively stable from 2011 to 2020, and harvests were primarily restricted by efforts to conserve Chinook salmon which co-migrate with summer chum salmon. This pattern changed in 2021 when the summer chum run returned to the Yukon River at a historically low level which continued in 2022–2024.

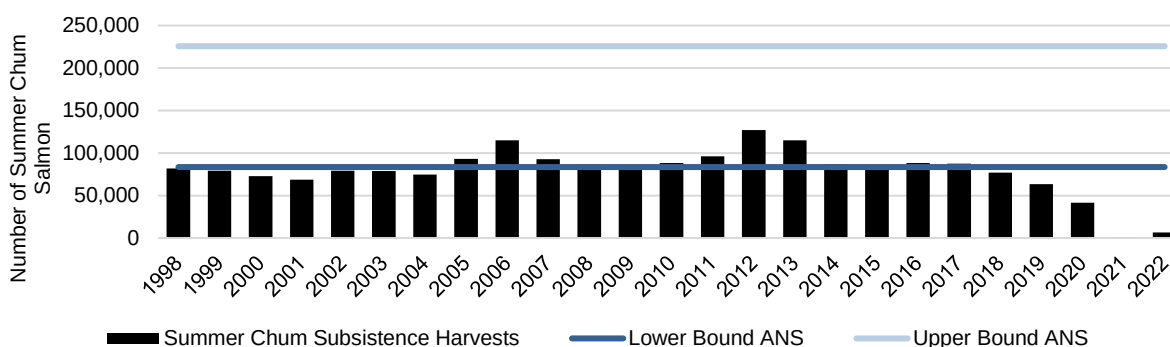


Figure 4-19 Subsistence harvests of Yukon summer chum salmon compared with lower and upper bounds of the ANS range, 1998–2022

Source: ADF&G.

Subsistence harvests of fall chum ranged between 705 (2021) and 211,303 (1989) fish. The 2022 subsistence harvest of fall chum salmon was 2,766 fish which was well below the recent 5-year average of 44,382 fish (2017–2021). The fall chum salmon ANS range is set at 89,500–167,900 fish and subsistence harvests have fallen below the lower bound of the ANS range in all but five years. The historical time series shows two periods of very low harvests of fall chum salmon, one in 2000–2002 and another in 2020–2022. Subsistence fishing opportunities for fall chum salmon have been limited since 2015 and were closed in 2021, 2022, 2023, and 2024.

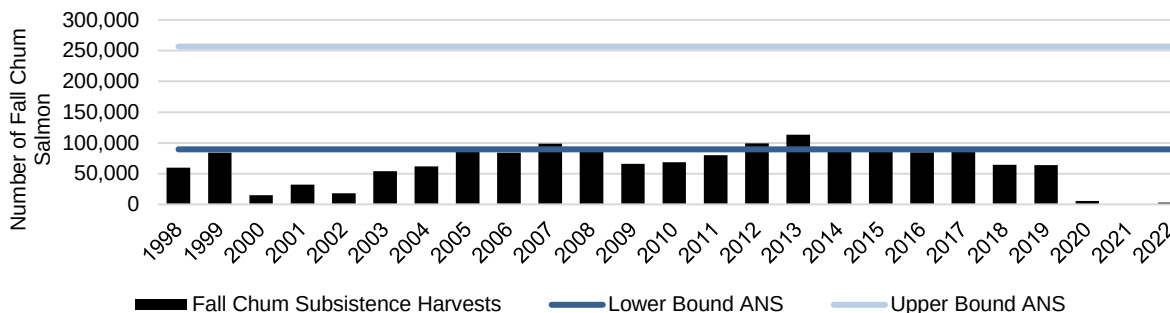


Figure 4-20 Subsistence harvests of Yukon fall chum salmon compared with lower and upper bounds of the ANS range, 1998–2022

Source: ADF&G.

Chum salmon are important for their nutritional and cultural value for communities across all subregions of the Yukon River. Comprehensive subsistence surveys in 35 communities show summer and fall chum accounted for approximately 69% of the total salmon harvest by weight for study communities in the upper and middle regions and 56% of total salmon harvest by weight for study communities in the lower region. Summer and fall chum accounted for approximately 43% of the total subsistence harvest weight for study communities in the Upper region, 36% of total subsistence harvest weight in the Middle region, and 19% of the total subsistence weight in the lower region. In the lower region of the river there are generally more subsistence resources available, primarily because of marine mammals and higher density moose populations. Subsistence harvests of salmon contribute a relatively smaller proportion of total subsistence harvests for these communities. However, summer chum salmon are harvested in the largest proportion compared to all species of salmon (Table 4-38). Moving upriver there is a gradual shift in the subsistence use towards fall chum salmon. More broadly, among upriver communities, salmon, and chum salmon in particular, play an increasingly important role.

Table 4-38 Usable pounds (lb.) of summer and fall chum salmon harvested for subsistence compared with all salmon species (lb.) and all subsistence harvests (lb.) for surveyed communities in the Yukon

	Upper Region	Middle Region	Lower Region
Summer and Fall Chum (Usable lb.)	210,745	353,411	406,039
All Salmon Species (Usable lb.)	305,034	514,292	730,258
Percent of Total Salmon Harvests	69%	69%	56%
All Subsistence Harvests (Usable lb.)	489,089	970,580	2,127,795
Percent of Total Subsistence Harvest	43%	36%	19%

Source: ADF&G. **Upper River:** Central (2016), Circle (2017), Eagle (2017), Eagle Village (2017), Fort Yukon (2017), Stevens Village (2014), Venetie (2009), Beaver (2011); **Middle River:** Hughes (2014), Huslia (1983), Galena (2010), Kaltag (2018), Manley Hot Springs (2012), Minto (2012), Nenana (2015), Nulato (2010), Rampart (2014), Ruby City (2010), Tanana (2014), Alatna (2011), Allakaket (2011), Bettles (2011); **Lower River:** Alakanuk (1980), Emmonak (2008), Kotlik (1980), Marshall (2010), Mountain Village (2010), Nunam Iqua (Sheldon Point) (1980), Pilot Station (2013), Russian Mission (2011), Scammon Bay (2017), Anvik (2011), Holy Cross (1990), Grayling (2011), Shageluk (2013).

4.4.3.1.4 Kuskokwim Area

Kuskokwim Area residents harvest Chinook, chum, sockeye, coho, and pink salmon for subsistence. Salmon harvested for subsistence uses along the lower Kuskokwim River were traditionally prepared by a variety of techniques including drying, smoking, freezing, salting, canning, and fermenting (Coffing, 1991), as they are today. From June – August, daily activities for many households revolve around the harvesting, processing, and preserving of salmon for subsistence uses. Subsistence harvests of salmon have declined over recent decades and have been especially low in recent years. Subsistence harvests of all salmon ranged between 383,390 fish (1990) and 117,693 fish (2021) from 1989–2022.

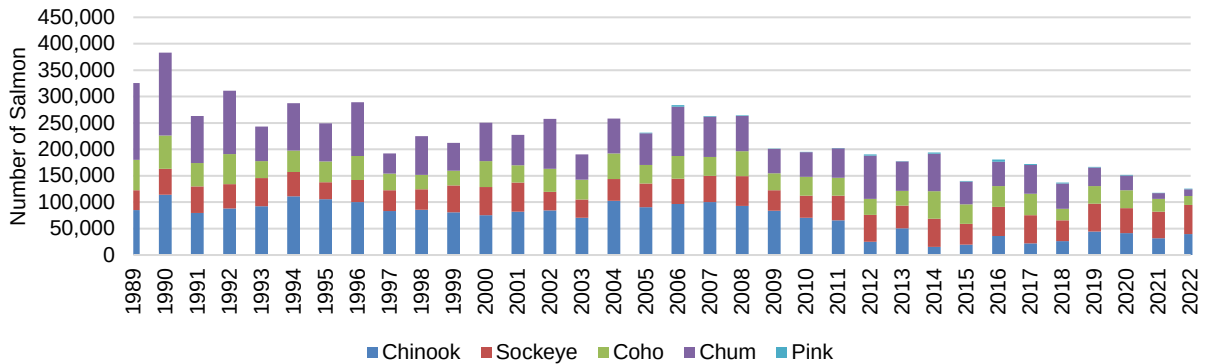


Figure 4-21 Historical estimates of subsistence harvests of salmon in the Kuskokwim Area, 1989–2022

Source: ADF&G.

Subsistence harvests of chum salmon ranged between 10,690 (2021) and 157,335 fish (1990). The most recent three-year average harvest of 17,228 chum salmon (2020–2022) reflects the recent period of declines and is a 76% reduction from the historical average of 71,702 chum salmon (1989–2019). The 2022 subsistence harvest of chum salmon was 12,844 fish, though it should be noted that the Kuskokwim Area experienced multi-species salmon declines in 2022, with record-low coho salmon abundance and subsequent fishing closures coupled with continued Chinook salmon subsistence harvest restrictions limiting region-wide harvests of these species. The proportional contribution of sockeye harvests to total subsistence harvests has increased in recent years because of the harvest restrictions placed on other species, although the number of sockeye salmon harvested has remained relatively stable.

In 2001, the BOF modified the ANS ranges in the Kuskokwim Management Area to reflect species-specific harvest and use patterns. In 2013, the BOF again modified ANS ranges by species for the Kuskokwim River drainage and other portions of the Kuskokwim Area. The current ANS range for chum salmon is 41,200–116,400 fish in the Kuskokwim River drainage. The estimated subsistence harvests of chum salmon have fallen below the lower bound of the chum salmon ANS range since 2019 (Figure 4-22).

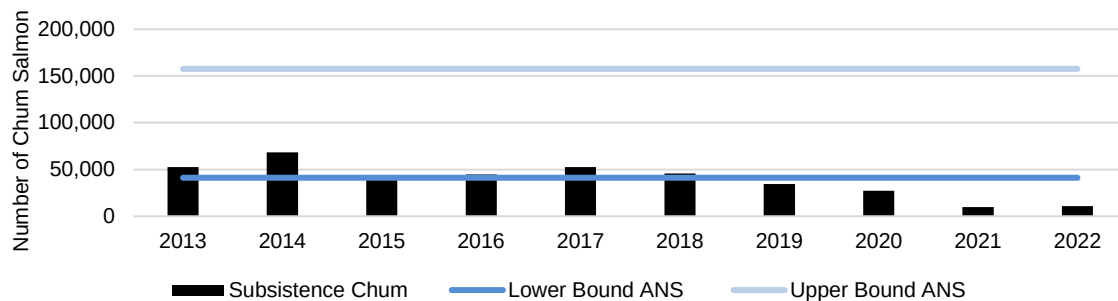


Figure 4-22 Subsistence harvests of Kuskokwim chum salmon compared with the lower and upper bounds of the ANS range, 2013–2022

Source: ADF&G.

As shown in Table 4-39 chum salmon accounted for approximately 26% of the total subsistence salmon harvest by weight for study communities in the lower region, 23% of the total salmon harvest for communities in the middle region, and 14% of the communities in the upper region. Although chum salmon may not contribute to the majority of subsistence salmon harvests for communities in the upper region, sockeye salmon do not migrate to the headwaters of the Kuskokwim River, increasing that region's dependence on other salmon species, particularly chum, Chinook, and coho salmon. Chum salmon accounted for the largest proportion of all resources harvested for subsistence in the middle region

at 14% which includes the study communities of Aniak, Chuathbaluk, Crooked Creek, Lower Kalskag, Red Devil, Sleetmute, Stony River, and Upper Kalskag.

Table 4-39 Usable pounds (lb.) of chum salmon harvested for subsistence compared with all salmon species (lb.) and all subsistence harvests (lb.) for surveyed communities in the Kuskokwim Area

	Lower Region	Middle Region	Upper Region
Chum (Usable lb.)	369,440	59,411	7,680
All Salmon Species (Usable lb.)	1,422,649	252,908	53,807
Percent of Total Salmon Harvests	26%	23%	14%
All Subsistence Harvests (Usable lb.)	3,517,975	411,137	176,004
Percent of Total Subsistence Harvest	11%	14%	4%

Source: ADF&G Includes **Upper Region:** Lake Minchumina (2002), Lime Village (2007), McGrath (2011), Nikolai (2011), Takotna (2011); **Middle Region:** Aniak (2009), Chuathbaluk (2009), Crooked Creek (2009), Lower Kalskag (2009), Red Devil (2009), Sleetmute (2009), Stony River (2009), Upper Kalskag (2009); **Upper Region:** Lake Minchumina (2002), Lime Village (2007), McGrath (2011), Nikolai (2011), Takotna (2011).

4.4.3.1.5 Bristol Bay

The Bristol Bay area consists of all waters of Bristol Bay including drainages enclosed by a line from Cape Newenham on the west side to Cape Menshikof on the Alaska Peninsula on the east. Pilot Point at the mouth of the Ugashik River on the Alaska Peninsula is the most easterly coastal village and Togiak at the mouth of the Togiak River is the most westerly coastal village of Bristol Bay. The major rivers flowing into Bristol Bay from east to west are the Ugashik, Egegik, Naknek, Kvichak, Nushagak and Togiak. Many residents continue to preserve large quantities of fish through traditional methods, such as dried and smoked, and frozen, canned, salted, pickled, fermented, and eaten fresh. The vast majority of households in the Bristol Bay Area use fish other than salmon for subsistence purposes. The harvest and use of nonsalmon fish for home use occurs throughout the entire year. Spring fishing begins when river and lake ice break up. During this transition, Bristol Bay residents shift from fishing through the ice for rainbow smelt, northern pike, and Dolly Varden to harvesting these freshwater fish with nets in river sloughs and lake outlets. Spring is important for harvesting Pacific herring and herring spawn on kelp. Also, as early summer approaches, Pacific halibut are targeted in marine waters.

Of the five species of salmon used for subsistence by residents in the Bristol Bay Area, Chinook, sockeye, and coho salmon contribute to the majority of harvests. Subsistence harvests of salmon have ranged from 83,307 (2022) to 217,612 fish (1984). The 2022 subsistence salmon harvest of 83,307 fish was the lowest on record, followed by 96,561 fish in 2020. The decline in the number of permits being issued and returned in recent years may account for the decrease in harvest estimates (Brown et al., 2023).¹⁴⁸

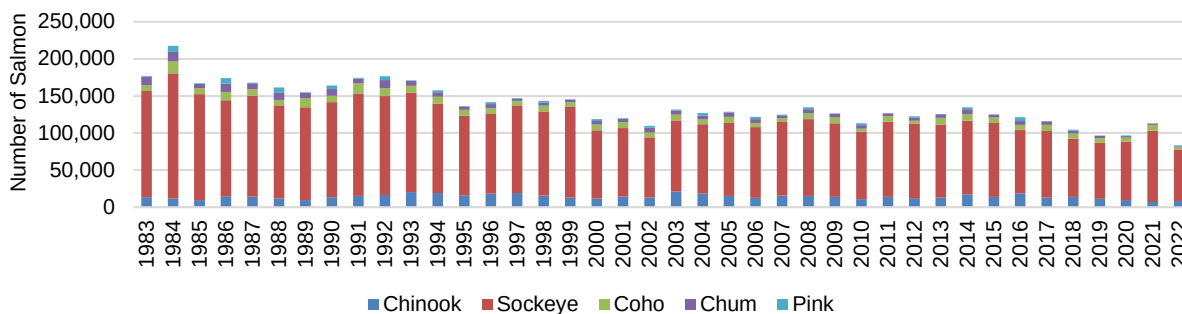


Figure 4-23 Historical estimates of subsistence harvests of salmon in the Bristol Bay area, 1983–2022

Source: ADF&G.

¹⁴⁸ Since 1983, overall permit returns have averaged between 75% and 95%. However, most reported subsistence harvest totals do not include fish removed for personal use from commercial catches. Also, fish caught later in the season, such as coho salmon and spawning sockeye salmon, may not be documented as consistently as Chinook and prespawn sockeye salmon.

Subsistence harvests of chum salmon have ranged from 1,479 (2022) to 13,009 fish (1984). The estimated subsistence harvest of 1,479 chum salmon in 2022 is the lowest on record, 75% less than the historical average of 5,873 (1984–2021). Table 4-40 shows the subsistence harvest composition for 23 communities within the Bristol Bay Area. Chum salmon accounted for approximately 5% of the total salmon harvest by weight for study communities and 3% of the total harvest of resources harvested for subsistence. These trends are largely explained by residents' reliance on other species of salmon, such as sockeye and Chinook salmon. Moose and caribou also accounted for a larger proportion of all subsistence resources harvested by weight.

Table 4-40 Usable pounds (lb.) of chum salmon harvested for subsistence compared with all salmon species (lb.) and all subsistence harvests (lb.) for surveyed communities in the Bristol Bay Area

Chum Salmon (Usable lb.)	54,175
All Salmon Species (Usable lb.)	1,039,567
As Percent of Total Salmon Harvests	5%
All Subsistence Harvests (Usable lb.)	1,983,442
Chum as Percent of Total Subsistence Harvest	3%

Source: ADF&G. Includes: Aleknagik (2008), Clarks Point (2008), Dillingham (2021), Ekwok (1987), Igiugig (2005), Iliamna (2004), King Salmon (2007), Kokhanok (2005), Koliganek (2005), Levelock (2005), Manokotak (2008), Naknek (2007), New Stuyahok (2005), Newhalen (2004), Nondalton (2004), Pedro Bay (2004), Pilot Point (2014), Port Alsworth (2004), Port Heidon (2018), South Naknek (2007), Togiak (2008), Twin Hills (2009), Ugashik (2014).

4.4.3.2 Importance of Chum Salmon for Indigenous Peoples in the Yukon and Kuskokwim Regions

This section was primarily co-authored by KRITFC and TCC with contributions from analytical staff. Additional information about the importance of subsistence in rural Western and Interior Alaska can be found in Section 4.3.5 of the April 2024 SIA, which is incorporated by reference here.

Over 27,800 Indigenous Alaska Native people reside in the Yukon and Kuskokwim regions of Alaska (Alaska Department of Labor, 2023), home to 98 Federally-recognized Tribal nations, named in Appendix 8 and 9. All of the citizens of these Tribes are Salmon People, and traditional ways of life, including salmon fishing, are continually practiced supporting the health, wellbeing, and identity of these people.

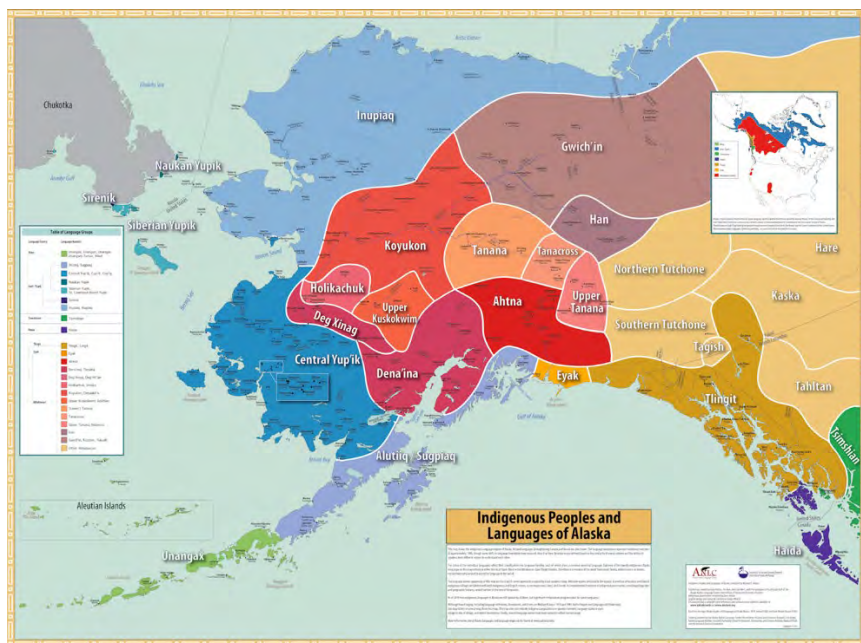


Figure 4-24 Indigenous Peoples and Languages of Alaska

Source: Krauss et al., 2021. The Alaska Language Center and UAA Institute of Social and Economic Research.

Figure 4-24 depicts the traditional ethnolinguistic groups of Alaska. At least 12 traditional languages are spoken within the Yukon-Kuskokwim region of Alaska: Dinjii Zhuh K'yaa (Gwich'in), Hän, Benhti Kokhwt'ana Kenaga' (Lower Tanana), Sahcheeg Xut'een Xneege' (Middle Tanana), Nee'aanèegn' (Upper Tanana), Dihthaad Xt'een Iin Aandeeg' (Tanacross), Dena'inaq', Dinak'i (Upper Kuskokwim), Denaakk'e (Koyukon), Holikachuk, Deg Xinag, Cup'ig (Nunivak Island Yupik), and Yugtun/Cugtun (Central Yup'ik) (ANLPAC, 2024). Words and phrases in each of these languages express the centrality of salmon in the lives of their language-bearers. For instance, *neqa* is the Yugtun word for both “fish” (typically referring to salmon) and “food,” and *Khii Zhrii*, the Dinjii Zhuh K'yaa word for the month of August, literally translated means “Month of Chum Salmon.”

It is important to the co-authors—whose special expertise resides in the Yukon-Kuskokwim region of Alaska—that we note there are other watersheds, Tribal Nations, traditional language speakers, and people who are affected by recent chum salmon declines and impacted by this action. These include the Bristol Bay region, Norton Sound/Bering Strait Region, and Kotzebue Sound regions of Alaska, and First Nations peoples in Canada, the latter of whom rely on returns of fall chum salmon. Information and knowledge from these regions are not included in this section with the same scope and depth, though the following discussion may apply to these regions and people. It is also worth noting that providing information at the regional scale may not fully capture the differential impacts low abundance has on some communities, such as those communities along the Koyukuk River region. These varied and at times intensified impacts are further detailed in Appendices 8 and 9 independently-authored by KRITFC and TCC, respectively.

4.4.3.2.1 Traditional and Modern Salmon Fishing

Traditional chum salmon fishing methods practiced by Indigenous peoples across Western and Interior Alaska, including the Indigenous communities along the Yukon River, Kuskokwim River, and their tributaries, are deeply intertwined with cultural, spiritual, and subsistence traditions, honed over centuries in harmony with the environment. These customary practices reflect the deep connection between Indigenous communities and the natural world.

For instance, Indigenous communities along the Yukon River developed sustainable fishing methods that have endured for generations. Practicing selective fishing techniques to maintain salmon populations across generations, rather than overharvesting or indiscriminately catching fish, Indigenous salmon harvesters used methods such as weirs, traps, and hand-held nets, allowing them to target specific species, sizes, and age classes of salmon. These techniques often focused on harvesting fewer mature fish, ensuring that sufficient numbers could continue upriver to spawn. This selective approach prevented the depletion of salmon populations, maintaining the ecological balance within the river systems.

Apart from the lower stretches of the river, Yukon fishers traditionally harvested salmon in terminal fisheries, meaning salmon were harvested as they approached or reached their tributary spawning grounds at the end of their life cycle. By focusing on sustainable harvest methods, ancestral Indigenous fishers of the Yukon River and its tributaries were able to adapt their practices according to the seasonal abundance of different salmon species. For example, some communities would harvest certain species only during peak runs or only after other species had already successfully spawned, allowing fish stocks to naturally replenish. This level of selectivity was based on an intimate understanding of the salmon life cycle and the river ecosystems.

In the Kuskokwim region, numerous traditional methods for harvesting chum salmon exist, including drift and set gillnets, once hand-woven from materials like cotton, sinew, or tree bark; fish traps and fences; spears; dipnets; and hook-and-line gear. Historically, as on the Yukon, these tools were mainly employed in terminal subsistence fisheries rather than in the main channel of the Kuskokwim, except for the lower stretch of the river where few salmon-bearing tributaries exist. Most contemporary Kuskokwim fishers, when permitted by regulations, use drift and set gillnets made of nylon for both commercial and subsistence chum salmon fishing. There has also been a noticeable shift toward fishing in the main channel of the Kuskokwim, influenced by commercial practices and recent regulations that close subsistence fishing in salmon-bearing tributaries.

For Indigenous communities along the Yukon River, Kuskokwim River, and their tributaries, chum salmon have long been a crucial subsistence resource, providing essential nutrients for the long winter months, as well as material for clothing and fueling dog teams. The harvest of chum salmon holds deep cultural significance and helps communities pass down traditions across generations. Subsistence fishing offsets high food costs in remote areas, where access to store-bought food is limited or prohibitively expensive, and also supports local barter systems, trading salmon for other essential goods such as moose meat and berries.

Salmon fishing plays a central role in the cultural practices of communities across Western and Interior Alaska, with different ceremonies and rituals honoring the fish and fostering community bonds. Salmon is often shared within the community, especially with Elders, reinforcing collective well-being. TK guides sustainable harvesting practices, which account for not only human consumption needs but also the needs of the non-human relatives that rely on salmon, ensuring the long-term health of salmon populations and sustaining ecological biodiversity. Fishers monitor salmon runs closely, adjusting their harvest to protect the species during years of lower abundance. This reciprocal relationship with nature emphasizes environmental stewardship, where only what is needed is taken, ensuring future generations can continue the subsistence way of life.

As this discussion on traditional Indigenous salmon fishing highlights, Indigenous peoples have had long-standing systems for managing salmon populations, which were deeply intertwined with their spiritual and cultural practices and based on respect, reciprocity, and sustainability. The arrival of European settlers and imposed colonial systems disrupted these long-standing Indigenous management practices while also introducing new sociopolitical and economic systems (Atlas, 2020). Modern fishery management approaches have been critiqued for using a one-size-fits-all regulatory framework that does not account for the unique ecological conditions of different river systems or the traditional practices of Indigenous communities (Voinot-Baron, 2020, 2022).

For example, seasonal fishing closures conflict with Indigenous fishing seasons and cultural practices, leading to tensions and further marginalizing Indigenous fishers from participating in the stewardship of their own lands and waters. The imposition of Western management frameworks that restrict when or how subsistence harvests can take place have criminalized traditional fishing and hunting practices, encouraging Alaska Natives to hide activities or face legal penalties (Stevens and Black 2019). This has caused significant hardship, as salmon and other resources were vital not only for sustenance but also for maintaining cultural and spiritual practices.

Beginning in 2020, WAK chum salmon runs declined dramatically and nearly all river systems had chum salmon run sizes below recent year averages with run sizes similar to those observed in the previous record poor run of 2000. Since 2020, subsistence users along both the Yukon and Kuskokwim rivers have faced severe, if not total, restrictions on chum salmon fishing due to declining stocks. Any discussion of modern fishing in these regions must acknowledge the profound disruption of these vital salmon-human relationships and the traditional seasonal harvest cycles that have sustained these communities for generations.

4.4.3.2.2 Chum Salmon Support Holistic Wellbeing of Indigenous People

Chum salmon play a vital role in the individual, communal, and ecological wellbeing of Indigenous peoples across Western and Interior Alaska (KRITFC, 2024). The following discussion explores how chum salmon support the physical health (including food security), emotional and mental wellbeing, cultural integrity, family structures, local economies, livelihoods, and ecosystems of Tribal communities with a particular focus on the Kuskokwim and Yukon regions.

4.4.3.2.2.1 Physical, Mental, and Emotional Health

Chum salmon—and all salmon species—are cornerstones of the physical health of Indigenous communities across Western and Interior Alaska. Salmon are a traditional food that provides essential protein and nutrients. Food security is defined by the U.S. Department of Agriculture (USDA) as “access by all people at all times to enough food for an active, healthy life.” Food security has multiple dimensions, including food production, processing capacity, distribution systems, price, food quality, among others (Hanna et al., 2012). The Inuit Circumpolar Council (ICC, 2015: 14, 34-35) prepared a conceptual framework for food security which emphasizes: availability; culture; decision-making power and management; health and wellness; stability, and accessibility. Compared to other U.S. states, Alaska faces unique food security challenges because of its remoteness, limited agricultural production, and high reliance on both locally harvested wild foods and imported foods; therefore, subsistence plays a greater role in supporting food security in the state (Fall, 2018; ICC, 2015).

Food security, specifically through the lens of subsistence harvests, can be affected by myriad factors. Work in the Bering Strait region by Ahmasuk, Trigg, Magdanz, and Robbins (2008) found food security was affected by the time households were able to spend harvesting, a lack of harvest effort, resources being less available to harvest, and changes in household composition. Wolfe & Scott’s (2012) research in Yukon River communities found five factors to be significantly related to household salmon production: the cost of fuel; whether the household had the necessary gear; number of harvesters; number of households eating salmon; and the number of people eating salmon.

The nutritional profile of chum salmon makes it an invaluable food source, particularly in Alaska’s harsh and remote environments. Chum salmon is a complete protein, offering 20 grams of protein per 100 grams of fish, as well as the B vitamins, potassium, phosphorus, selenium, and omega-3 fatty acids (Chief Andrew Isaac Health Center, 2024). The availability and nutrient-density make salmon a dietary staple for many, as it can be harvested, preserved (through smoking, drying, or freezing), and stored for extended periods—crucial during months when fresh food is limited. A diet rich in chum salmon and other traditional foods supports the health of Indigenous Alaskans, who face elevated rates of lifestyle-related conditions like heart disease, diabetes, and stroke (ANTHC, 2021a,b). The essential nutrients in salmon play a key role in mitigating these risks. Additionally, chum salmon’s high protein-to-energy ratio, low

energy density, and low insulinogenic load make it key to a healthy, sustainable diet (Chief Andrew Isaac Health Center, 2024).

Chum salmon play a unique dietary role across the Yukon and Kuskokwim regions and are consistently named as a primary food source in Alaska Native communities (ANHB, 2004). They are considered “like medicine” to many Elders (Fienup-Riordan et al., 2020:76) because they are less oily and fatty than other species (e.g., Chinook salmon) and thus can feed Elders, people with open wounds or who cannot digest oil-rich salmon, and those who prefer their taste (KRITFC, 2021; Moncrieff, Brown & Sill, 2009). In addition, the low oil content makes chum salmon an easier resource for processing and drying (Raymond-Yakoubian and Raymond-Yakoubian 2015), which is vital for long-term storage through the winter, as well as for preparing traditional delicacies such as eggamarrluk (half-dried, half-smoked salmon) (KRITFC, 2021).

In addition, the acts of fishing (e.g., pulling nets, walking along riverbanks) and harvesting (e.g., cutting and hanging fish, maintaining fires) are energy intensive, providing exercise which can minimize the consequences of chronic diet related diseases. The benefits extend beyond physical health as well—both the strenuous activity and the cultural connection cultivated by subsistence practices have been found to reduce depression, substance abuse, and other mental health diseases that are increasingly prevalent in Indigenous communities in Alaska (ANTHC, 2021b). Chum salmon thus supports mental and emotional health in Indigenous communities of the Yukon and Kuskokwim rivers. As stated by TCC to the Senate Committee on Indian Affairs:

“The act of going to fish camp, preparing camp, fishing, and processing fish is hard, physical activity. From dusk to dawn, families are working. [This] helps families stay busy and maintain focus in the present moment, which is ideal for mental health” (U.S. Senate 2023:18).

Over the last 10 years, the salmon crisis has contributed to the number of diabetic and pre-diabetic patients due to increased food insecurity and lifestyle changes. Since 2019, TCC has found that the number of diabetic and prediabetic patients in its region has increased by 24.6% and 70%, respectively. This can be directly linked with declines in salmon abundance, harvesting, and consumption (Chief Andrew Isaac Health Center, 2024).

4.4.3.2.2.2 Culture, Identity, and Family

Through fostering physical, emotional, and mental health, salmon and salmon fishing ground Indigenous peoples across Western and Interior Alaska in their unique identities, cultures, and places (see Raymond-Yakoubian 2019, for example). The fundamental importance of social relationships built around subsistence have been shared within and across generations by Indigenous residents of the Yukon River, Kuskokwim River, and their tributaries.

The relationship between Alaskan Natives and chum salmon has deep historical and cultural roots. The early Paleoindians in Alaska, traditionally thought of as big-game hunters, likely relied heavily on chum salmon as part of a diverse subsistence strategy that included fishing, hunting, and gathering. Evidence from the Upward Sun River site in the Yukon region of Alaska reveals that Alaskan Natives have been harvesting and consuming chum salmon as far back as 11,500 years ago (Halffman et al., 2015). Chum salmon were particularly important because of their predictable seasonal abundance and their suitability for preservation due to their lower oil content than other salmon species, supporting survival during long winter months. Additionally, the historical importance of chum salmon for Alaskan Natives underscores the rich biodiversity of the Beringia region and suggests that riverine resources were crucial to the economy and diet of these early inhabitants, even during the challenging post-Ice Age environment.

Fishing for salmon as a primary food is a means of practicing cultural values and a source for building and maintaining relationships, which shape and form identity (Raymond-Yakoubian, 2019). In this way, salmon may be considered as a “cultural keystone species”: a “culturally salient species that shape in a major way the cultural identity of a people, as reflected in the fundamental roles these species have in

diet, materials, medicine and/or spiritual practices” (Garibaldi & Turner, 2004). Moreover, salmon are considered kin to the Indigenous Peoples of the Yukon and Kuskokwim regions, meaning both salmon and humans have a responsibility to support the well-being of the other.

Many Indigenous peoples across the Yukon and Kuskokwim regions believe that humans and salmon share a mutual awareness. Salmon “are considered sentient creatures possessing intelligence and memory. Like all animals, they are aware of what people think and say about them” (Fienup-Riordan, 2020: 11). Therefore, there are protocols for proper behavior and treatment of fish, and salmon are only caught when they willingly gift themselves to fishermen (Fienup-Riordan et al., 2020; Voinot-Baron, 2020). In the Yupiaq worldview, if this reciprocal relationship is not respected, the salmon will not return, meaning that sharing and avoiding waste is crucial (Fienup-Riordan, 2020:25). Maintaining cultural connections amongst humans, and between humans and salmon, depends on humans maintaining these reciprocal relationships.

Avoiding waste is perhaps the pinnacle teaching and example of proper behavior and respect toward salmon. Checking set nets and fish wheels often, not catching more fish than can be processed in a timely manner (*i.e.*, before spoilage), avoiding cutting during the hottest parts of the day, fishing during ideal weather, and proper cutting to use all parts of the salmon are all ways to avoid waste (Fienup-Riordan 2020; Ikuta et al., 2013; Moncrieff, 2017; Raymond-Yakoubian and Raymond-Yakoubian 2015). Additionally, parts of the salmon that are not eaten, like bones and fins, must be properly disposed of, often through burial, burning, or return to the river, depending on the culture and family; and harvest gear and fish-cutting spaces must be kept clean (Fienup-Riordan et al., 2020). Failure to abide by these teachings, and thus disrespecting salmon, contributes to salmon declines (Fienup-Riordan et al., 2020: 78, 107).

Sharing resources is another hallmark teaching of proper behavior toward fish, and it is widely understood that sharing salmon leads to an increase in its abundance (Fienup-Riordan et al., 2020); builds strong connections between households within and across communities (Ikuta et al., 2016); and provides many benefits to individuals, households, and communities across the state including increased well-being, food security, food diversity, heritage, and cultural identity (Carothers et al., 2021). Sharing is vital to social responsibility as well, as salmon are given to Elders and those who do not have access to fish, which further reinforces social and communal ties. Finally, sharing extends beyond simply exchanging resources to include cooperation in harvesting, processing, and sharing of equipment and knowledge.

It is at fish camp that these teachings, values, and kinship relationships with salmon are passed down to Alaska Native youth of the Yukon and Kuskokwim regions. Summer fish camps have long been a primary place for Indigenous families to gather, heal, learn from Elders, and foment traditional ways of life, and many families have maintained the same fish camp sites for generations (KRITFC, 2024). Each person is given age-appropriate chores at fish camp (*e.g.*, young children haul water, older adults supervise smokehouses), and the shared work both fosters responsibility and purpose as well as family unity, continuity, and belonging.

Chum salmon hold a special role at Yukon and Kuskokwim fish camps. They are often the first salmon on which young women will practice heading, gutting, and cutting fish. As shared by an Elder from the Kuskokwim:

“When they started bringing in chum salmon, I would try cleaning and cutting... When she handed me a fish to work on, I’d be very happy... That was how we girls learned about caring for fish, and each girl did the same” (Nastasia Larson, quoted in Fienup-Riordan et al., 2020:69).

Young men, on the other hand, are taught purpose in becoming providers for their families through fishing. Contemporary salmon declines and fishing restrictions are preventing youth from fulfilling a core part of who they are, and Alaska Native youth who are disconnected from cultural practices have reported

suffering suicidality and identity and mental health crises (Skewes et al., 2020; Voinot-Baron, 2022). Cultural well-being is thus vital to mental and emotional health of regional Indigenous peoples.

Fish camp traditions are changing with declines in salmon abundance and related restrictions on fishing opportunities, increasing fuel prices, a greater dependence on store-bought food, and ties to full-time, year-round work, and many families are moving their fish camp sites and activities to their villages, closer to home (KRITFC, 2024). In general, fewer families are migrating to fish camps for any extended period, let alone for an entire summer fishing season. As said by one Kuskokwim Elder:

“I’m one of the fish campers...but I don’t go to fish camp because of the fish closures. There’s only maybe 5 in Tunt [who use their] fish camp right now. No, that’s not that many.” — Adolph Lupie, Tuntutuliak, as quoted in KRITFC (2021:7)

Whereas in days of abundance, parents and grandparents could spend the summer teaching youth our ways of life, contemporary restrictions mean Indigenous youth “are having to learn core components of our way of life and how to be Real People in 12-hour [fishing] windows” (J. Samuelson, personal communication, September 25, 2024). Many families admit not permitting young children to practice cutting salmon because the few fish harvested are too precious to allow for mistakes.

While it is important to note that the practice of traditional cultures on the Yukon and Kuskokwim are alive and strong today, Alaska Native practitioners are being forced to adapt these traditions, particularly due to declines in traditional foods, ecosystem change, and ongoing legacies of colonization. Drastic changes to, or a loss of fish camps, as well as heightened anxiety to meet subsistence salmon needs in short windows, impact families’ abilities to gather, reconcile grievances, and instruct children (KRITFC, 2024; Voinot-Baron, 2022). Decreases in salmon have also affected families’ abilities to share salmon without worry for winter food stores (Brown and Godduhn, 2015; Ikuta et al., 2016). The absence of salmon and resulting effects to Indigenous families’ abilities to embody millennia-old values and traditions is a leading contributor to social crises in WIAK families and communities. These effects also likely contribute to out-migration of families and population loss in rural regions as families pursue new forms of food security and identity in urban areas (Wolfe & Scott, 2010).

The loss of access to salmon and the criminalization of traditional practices have contributed to social issues within Indigenous communities, such as depression, anxiety, and the breakdown of cultural knowledge transmission. Younger generations have faced barriers in continuing the fishing traditions of their ancestors, disconnecting them from their heritage and cultural identity. To address these deep social and cultural losses, Indigenous leaders continue to advocate for the recognition of their rights and the restoration of their traditional stewardship roles (Carothers et al., 2021).

4.4.3.2.2.3 Economies and Livelihoods

Contemporary subsistence uses in rural Alaska occur within a mixed economy, which includes both a subsistence fishing and hunting component and a cash component. Commercial fishing has long played an important role in mixed economies for rural and Alaska Native communities across Alaska (Wolfe, 1982; Reedy, 2009). Wolfe & Spaeder (2009: 350) describe the connections between subsistence and commercial fishing across Western Alaska (Norton Sound, Kuskokwim, and Yukon areas), emphasizing that commercial fishing uses the same skills and equipment as subsistence fishing and serves to reinforce subsistence practices through providing an additional source of income that can help purchase subsistence gear (e.g., nets, motors, fuel). Fishermen also often retain some salmon from their commercial harvests for subsistence purposes (Brown et al., 2023). With no commercial opportunities for Chinook in the Yukon since 2008, recent commercial opportunities have centered on summer and fall chum salmon, though those too have ceased since 2020.

The combination of money from paid employment and subsistence food production characterizes the mixed subsistence economies in many areas of rural Alaska (Fall, 2018). Subsistence food production is directed toward meeting the needs of families and communities, not market sale as in commercial

production. In this way, families (or households and communities) will engage economic strategies that use household income (*e.g.*, from commercial fisheries, fur trapping, wage employment, seasonal jobs, and dividends) to support subsistence activities and invest in efficient harvest technologies for subsistence use.

In many Indigenous Yukon and Kuskokwim communities, sled dogs have played an important role in mixed economies and culture as a means of transportation, hauling goods, subsistence hunting, fishing, and trapping, and racing (Andersen, 1992). Chum salmon has long been a primary food source for dogs, and fishing for a dog team was a large portion of the annual subsistence harvest for many communities (Duffy et al., 2013; Native Village of Georgetown, 2021). As a primary means of transportation and work, it was critical that dog teams were fed good “fuel,” primarily chum salmon. Though the number of sled dogs in rural Alaska communities has declined since the arrival of snow machines in the late 1960s and early 1970s (Ikuta et al., 2013), sled dogs, the caretaking that they require, and mushing are activities that continue to the present and provide a means for intergenerational relationships to form and for knowledge about one’s culture and environment to be shared (LaVine, 2010). The decline in salmon, and particularly chum salmon, on the Yukon and Kuskokwim has been a significant shock to many sled dog kennels, whose owners now must find other food sources for their dogs, ranging from Northern pike to expensive manufactured dog food.

During recent chum salmon declines, TCC has facilitated the distribution of fish to Tribal communities along the Yukon River that are unable to engage in subsistence fishing. This is a significant effort that extends well beyond the cost and includes cultural, legal, and logistical complexities as well. On average, the cost to distribute fish, both donated and purchased, to replace forgone subsistence harvests in the TCC region has totaled approximately \$1,968,506.82 annually since 2020: TCC has spent an average of \$713,866.44 per year to purchase salmon for its Tribal Citizens, and collectively, the Tribes in the TCC region have spent an additional \$1,254,640.38 annually on fish distribution.¹⁴⁹ In 2024, for the second summer in a row, all TCC communities have received fish by the end of the season.¹⁵⁰

In addition, Tribal citizens have incurred higher expenses in recent years from the maintenance of fish camps, especially when unused and facing increased environmental exposure. Without regular in-season maintenance, repair costs have escalated due to the need for significant rebuilding, including high expenses for materials, labor, and transportation to remote locations. Economically, the cost of restoring these camps after long periods of disuse is substantial, ranging from \$20,000 to \$50,000, depending on their condition and size. This cost includes replacing damaged structures like drying racks, cabins, and access roads. Logistical costs for transporting materials to remote Yukon River areas can add 10-30% to the total expense. Additionally, with fewer locals skilled in traditional construction, communities often need to hire external labor at rates of \$35 to \$70 per hour, further increasing restoration costs.

Fish camps along the Yukon River face increasing rehabilitation costs as they go unused, with the potential for rebuilding expenses to far exceed initial estimates. However, as discussed above, the cultural and social costs of restricted subsistence harvests go well beyond monetary concerns. The loss of TK and reduced engagement in subsistence activities weaken Alaska Native communities’ economic resilience and increase reliance on external food sources. The decline in subsistence fishing has led to unattended camps, making them vulnerable to trespassing, vandalism, and environmental damage. Repairing this damage adds to already high maintenance costs, while the cultural significance of these camps makes their loss emotionally impactful for the communities. Proactive investment is needed to restore the camps and revive subsistence practices.

¹⁴⁹ These figures do not include additional costs for specific TCC programs, such as the Elder Nutrition program, and costs of staff labor and benefits to distribute fish. Additionally, many Tribes’ distribution program costs have been partially offset by grants, and they face the risk of no longer being able to supplement fish supplies beyond what TCC can provide once this funding ends.

¹⁵⁰ The process of ordering fish begins in late March or early April, with the goal of having fish available by May and completing distribution by August. TCC staff spend 2-4 months per year preparing for the distribution, and when it comes time to distribute the fish, it requires 4-6 staff members working 25-40 hours per week to coordinate all the logistics.

4.4.3.2.3 Ecosystems and Biodiversity

Alaska Native people across Western and Interior Alaska are deeply interconnected with regional ecosystems and cannot be separated from them. In the Yukon and Kuskokwim regions, Tribal Nations and people are deeply interconnected with regional ecosystems and cannot be separated from them; the health of the people is reflected in that of the ecosystem, and vice versa (Samuelson, 2023). As salmon declines are deeply felt in families, cultural exchanges, and economies in the Yukon and Kuskokwim regions, so too are they felt across the ecosystem.

Chum salmon are a nutrient vector between marine and freshwater environments. When salmon return to spawn and die, their carcasses provide a critical influx of marine-derived nutrients to river ecosystems, supporting a wide array of species—from aquatic insects to large predators (Cederholm et al., 1999; Walsh et al., 2020). The recent and dramatic declines in chum salmon populations have likely disrupted this nutrient cycle, leading to nutrient-poor conditions in rivers and streams, which can affect the entire aquatic food web and reduce biodiversity at multiple trophic levels.

For instance, lower chum salmon returns have a direct effect on predators in the Yukon and Kuskokwim regions that rely on salmon as a food source, like bears, eagles, and wolves. Predators face food shortages, particularly as they head into winter, which can result in lower survival rates, diminished population sizes, and their movement into areas with higher food density, including human villages and towns. As stated by one Kuskokwim TK holder:

“When the chum returns were good, it was just stink, and fish were everywhere. I don’t think people realize the importance they have to the ecosystem. The river’s health, the plants. I think of all the bears, and if they have no fish, they’re eating berries; but that’s not going to hold them off, so they have to eat more baby moose; and then we get back to where we are still: trying to conserve moose up here.” (Whitworth et al. 2023, in Siddon, 2023:133).

Salmon also contribute to the structure of the rivers and streams themselves by digging redds (nests) for their eggs. This process of digging and reshaping gravel beds creates habitat for many other species, such as aquatic insects, other fish species, and amphibians. Lower chum salmon returns reduce the frequency of this natural process, leading to more stable and compacted riverbeds, which may reduce habitat diversity.

Juvenile chum salmon feed on aquatic insects and small forage fish in the river. Chum salmon population declines could lead to an overabundance of certain prey species, which disrupts the balance of predator-prey relationships in the river. The absence of salmon also alters the ecosystem dynamics for other fish species that either depend on the same food sources or depend on chum salmon as prey, leading to imbalances in the river ecosystem and affecting the long-term sustainability of populations which are vital to the diet of other species. For instance, at the Henshaw Creek weir project in the Yukon drainage, the 2021 summer chum salmon escapement of 3,729 fish represented only 2.5% of the annual average escapement from 2000 to 2019. Over this same period, changes in longnose sucker and Northern pike abundance were also noted, highlighted the interdependence of salmon and other species (McKenna, 2022).

Across Alaska, the average chum salmon body after 2010 were 2.4% smaller than the average body size observed prior to 1990 (Oke et al., 2020). Smaller chum salmon today provide roughly 1.11 fewer meals per fish in the Kuskokwim region (10% decline), 1.3 fewer meals per fish in Nenana (11.2% decline), and 1.4 fewer meals per fish in Emmonak (12.5% decline) (Oke et al., 2020).¹⁵¹ Decreased numbers of fish harvested compounds the loss of meals from shrinking body sizes, and declines in salmon body sizes could decrease fecundity and nutrient transport to and across ecosystems, with additional, consequential adverse effects for human communities.

¹⁵¹ Personal communication among KRITFC staff and K. Oke.

Over time, as chum salmon return smaller at age, and particularly at times of low abundance, communities are needing to find alternative food sources. Species substitutions may lead to cumulative overharvesting and further reductions in biodiversity. One Kuskokwim TK holder has observed similar trends:

"There just weren't any [chum salmon in 2021]. I was having to harvest a lot more reds than I normally would for all of that other stuff...I think a lot more people were just getting a lot more reds. So, then that makes me concerned about the red numbers. If we have to keep doing this and hitting them hard, then maybe, is that going to negatively impact what's spawning, what comes back...? And that was the talk, too, a couple of years ago. I remember as we were having to harvest more chum, people were like, 'Well, you guys are going to have to start watching the chum numbers.' Same with whitefish, people were bringing that up. If we're having to harvest more whitefish, we're going to have to start thinking about watching those species. I guess it all has a ripple effect." (Megan Leary, quoted in KRITFC 2021:7).

This has been a challenge for many families, as chum salmon especially have been one of the most reliable, abundant salmon species for annual food stores during recent declines of other traditional food sources, like Chinook salmon, caribou, moose, and waterfowl (Godduhn et al., 2020; KRITFC, 2021).

4.4.4 State Management of Commercial Chum Salmon Fisheries

Commercial fishing is defined by the State of Alaska as the taking, fishing for, or possession of fish with the intent of disposing of them for profit, or by sale, barter, trade, or in commercial channels (AS 16.05.940 (5)). Commercial fisheries in Alaska fall under a mix of state and Federal management jurisdictions. In general, the state has management authority for all salmon, herring, and shellfish fisheries, and for groundfish fisheries within three nautical miles of shore.

Management of the commercial salmon fisheries is the responsibility of the ADF&G Division of Commercial Fisheries, under the direction of the BOF. The salmon fisheries are administered through the use of management areas throughout the state and managed under a limited entry system; participants must hold a limited entry permit for a fishery to fish and the number of permits for each fishery is limited. The state originally issued permits to persons with histories of participation in the various salmon fisheries. Permits can be bought and sold.

4.4.4.1 Commercial Harvests of Chum Salmon in Western and Interior Alaska

This section provides information on the commercial chum salmon fisheries in the western Alaska river systems and bay areas, presented by ADF&G management area. This includes commercial chum salmon fisheries that have historically occurred in Kotzebue, Norton Sound,¹⁵² the Yukon River, Kuskokwim River and Bay, and Bristol Bay management areas (Figure 4-25). In alignment with the subsistence fisheries highlighted in Section 4.4.3, commercial fisheries are the focus of this section because the Council's Purpose and Need statement is specific to Western and Interior Alaska, and these regions broadly align with Coastal WAK and Upper/Middle Yukon genetic reporting groups.

The SIA prepared for the April 2024 Council meeting contains substantial, additional information on commercial harvests of salmon including a longer time series of harvest data and discussion of fishery status broken down by management area and is incorporated by reference here.

¹⁵² The ADF&G management area includes Norton Sound up through Port Clarence; however, the commercial fishery in the Port Clarence District has been closed since 2009 and is therefore not included here.

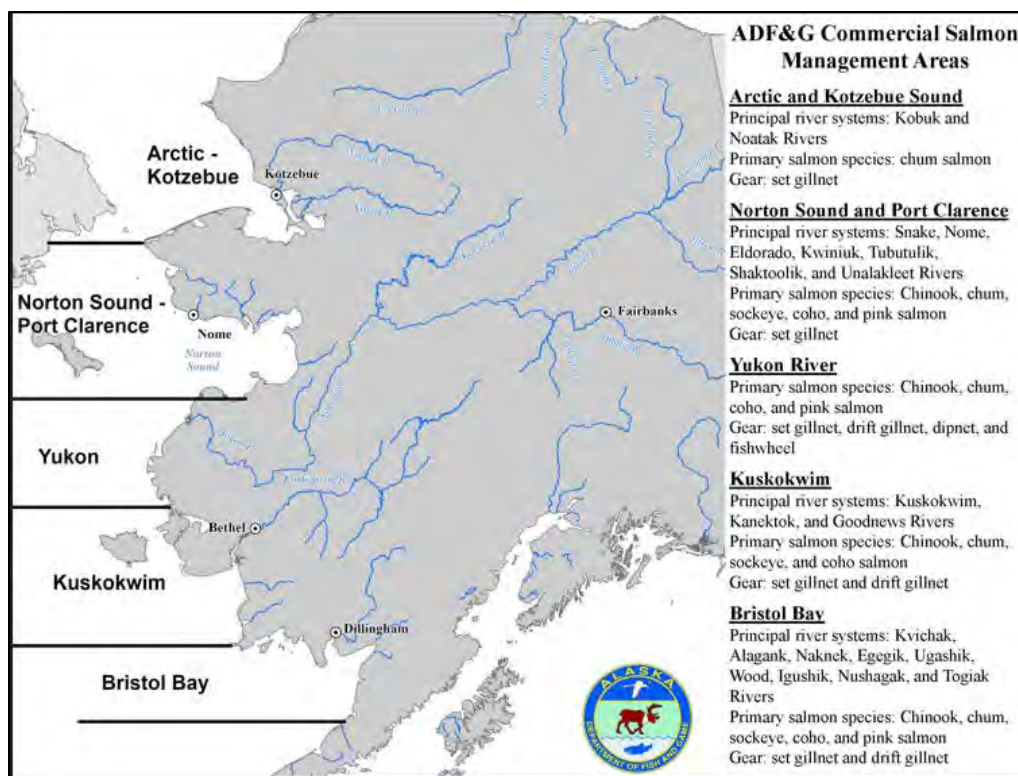


Figure 4-25 ADF&G commercial salmon management areas in Western Alaska

Source: ADF&G personal communication, 1.25.24.

Summary of Commercial Chum Salmon Fishing Trends

All commercial salmon fisheries within the Western and Interior Alaska management areas have experienced either closures or declining commercial chum salmon harvest trends in recent years.

Table 4-41 provides a snapshot of trends in the commercial chum fisheries associated with each ADF&G management region and Figure 4-26 provides a visual representation of more recent (2011-2023) commercial catch.¹⁵³ Table 4-41 also demonstrates chum salmon revenue dependence through the percent of total salmon value that is attributable to chum salmon relative to other salmon species in the most recent year the commercial fishery was open (since 2023). The eight Commercial Fisheries Entry Commission (CFEC) permits that cover commercial fishing in these regions do not prescribe the type of salmon species that can be harvested. However, this is influenced by the species composition within each region and the regulatory salmon management plans adopted by the Board of Fisheries, as well as additional management measures ADF&G may put in place to protect species of concern.

The vast majority of commercial salmon harvested in the **Kotzebue** area is chum salmon, due to the relative abundance of this species. For Kotzebue, large declines in commercial harvest have occurred since 2018, when nearly 700,000 chum salmon were caught (Table 4-41 and Figure 4-26). Although harvest in the 2022 season was above the 1962-2023 average harvest of 231,196 chum salmon (at 475,624 chum salmon), this year appears to be an anomaly among lower years of harvest. Total chum harvested in 2023 dropped back below average, although processor logistics and capacity likely limited harvest in this year. In 2024, harvest levels continued to drop dramatically (not represented in the tables or figures), with

¹⁵³ Data in this section extends to the 2023 commercial seasons; however, the text has been updated to include consideration of commercial harvest patterns from 2024.

5,392 total commercial chum salmon harvested which was the poorest harvest since the state started managing the Kotzebue District in 1962, largely driven by poor chum salmon abundance.¹⁵⁴

Although the **Norton Sound** commercial chum salmon fishery has remained opened in this recent period, along with the commercial harvesters in the Yukon and the Kuskokwim, participants in these fisheries have been experiencing multi-species fishery disasters (as declared by the Secretary of Commerce).¹⁵⁵ Prior to the 2000s, commercial salmon fishing in the area was sporadic due to lack of commercial fish buyers in all subdistricts. Since 2008, markets have been generally stable with a single processor, Norton Sound Seafood Products, operating buying stations in villages across Norton Sound. As demonstrated in Table 4-41, Norton Sound commercial fisheries derived more than 50% of their value from chum salmon in 2023. However, commercial species dependency also includes coho and pink salmon, with the relative proportions shifting over time. Since 2018, harvest of all species in the Norton Sound Area has declined. In 2023, commercial salmon fisheries harvested 15,693 chum salmon (Table 4-41) which further dropped in 2024 to 4,297 chum salmon. This is well below the record high in 1983 of 319,437 chum salmon. The Northern Norton Sound subdistricts generally met their escapement objectives for chum salmon in 2023, but the Southern Norton Sound subdistricts did not and Subdistricts 4, 5, and 6 did not open for commercial fisheries directed at chum salmon.

There are two distinct runs of chum salmon on the **Yukon River**, the summer and fall chum runs. Chum salmon management in the lower river transitions from summer chum salmon management to fall chum salmon management on July 16. Commercial chum salmon closures have been in place for Yukon River summer chum since 2021 and for the fall run since 2022. Chinook salmon timing overlaps with summer run chum salmon and poor Chinook salmon abundance for over a decade has led to reduced commercial fishing opportunities for summer chum salmon to avoid Chinook salmon. The lack of commercial harvest in recent years is a stark contrast to commercial harvests of 576,700 summer chum salmon in 2018 and 489,702 fall chum salmon in 2017.

Large scale commercial salmon fisheries in the **Kuskokwim Management Area** have not occurred since 2016. Since that time there has been limited commercial opportunity in the Kuskokwim River, with participants needing to secure their own market for their catch prior to fishing, due to the absence of a processor. The opportunities were provided later in the season and directed at coho salmon, after most subsistence salmon fishing was completed. On the other hand, in Kuskokwim Bay, a single processor operated in 2020 and 2021 and a small number of chum salmon were caught during the commercial sockeye salmon directed fishery. Poor chum salmon abundance was observed in 2021-2023 in Kuskokwim River and 2021 and 2022 in Kuskokwim Bay and would not have allowed for a commercial chum salmon fishery in those years.¹⁵⁶

Commercial salmon fisheries in **Bristol Bay** primarily target sockeye salmon and accounts for the largest sockeye salmon fishery in the world. In 2023, 41 million sockeye salmon were harvested in the commercial fishery. By contrast, in 2023, about 343,000 chum salmon were harvested in the Bristol Bay commercial salmon fishery. In 2024 the sockeye harvest dropped to 31 million and chum harvest dropped to about 250,000 salmon. The chum salmon catch also comprises a small (<1%) proportion of the total

¹⁵⁴ ADF&G 2024 Kotzebue Sound Salmon Season Summary

¹⁵⁵ Disaster determinations were approved by the Secretary of Commerce for the 2019 through 2021 Norton Sound red king crab fisheries, 2020 and 2021 Norton Sound chum and coho salmon fisheries, the 2020 through 2022 Yukon River salmon fisheries, and the 2020 through 2022 Kuskokwim River Chinook, chum and coho salmon fisheries. Positive determinations make these fisheries eligible for disaster assistance from NOAA if funds are appropriated by Congress. A declared fishery disaster must meet specific requirements under the Magnuson-Stevens Fishery Conservation and Management Act.

¹⁵⁶ In 2024 (and some other recent years), some limited commercial salmon fishing periods were opened, despite the low chum salmon returns. These fishing periods are focused during times when coho are known to be running and therefore effort was not "directed" at chum salmon. Additionally in 2024, limited opportunities were made available because no large-scale processors operated, and thus minimal effort expected. If there had been a large-scale processor present, commercial opportunity may not have been provided.

value of the fishery. Similar to other management areas, the harvest has dropped considerably relative to the 2018 harvest of 1.6 million chum salmon and it is below the 20-year average of 1.1 million fish.

Table 4-41 Comparison of commercial chum salmon harvest and value with historic medians (most recent year included is 2023)

Fisheries Management Area	Most recent year with directed commercial chum fishery (since 2023)	Chum catch in most recent year opened (# of fish)	Chum ex-vessel value in most recent year opened	% of total salmon value chum represents in most recent year opened	Median catch from most recent 10-years opened (# of fish)	Median ex vessel value from most recent 10-years opened	Historic high catch (# of fish)
Kotzebue	2023	141,781	\$733,061	100%	432,083	\$1,341,254	695,153 (2018)
Norton Sound-Port Clarence ^a	2023	15,693	\$62,606	54%	79,461	\$314,784	319,437 (1983)
Yukon River Summer Run	2020	13,968	\$51,067	99%	422,222	\$1,530,505	1,616,682 (1988)
Yukon River Fall Run	2019	268,360	\$1,073,146	76%	254,495	\$1,296,926	489,702 (2017)
Kuskokwim River	2020 ^b	*	*	*	48,194	\$74,029	1,318,647 (1988)
Remainder of Kuskokwim Area ^c	2021	5,845	\$6,453	1%	7,707	\$9,074	133,524 (2010)
Bristol Bay	2023	342,905	\$574,777	0%	726,005	\$1,451,000	2,243,569 (2006)

Source: ADF&G Annual Management Reports and Season Summaries.

* represents confidential data due to less than three individuals making landings.

a = Norton Sound ex-vessel values calculated as the product of total chum salmon lb harvested and the average ex-vessel price.

b = There have been no commercial processors operating on the Kuskokwim River since 2015 and no commercial catcher/sellers targeting chum since 2020. The commercial fishery on the river was closed for chum salmon fishing 2021-2023 due to low abundance. The small amount of commercial harvest between 2016-2020 is catcher/seller only and confidential due to limited participation. Thus, the 10-yr Kuskokwim River average is calculated from 2006-2015.

c = There were no commercial chum salmon fisheries in the Kuskokwim Bay area from 2016-2019 due to a lack of processors. There were no commercial fisheries in 2022-2023 due to low abundance of chum salmon. The 10-yr average is calculated from 2012-2021.

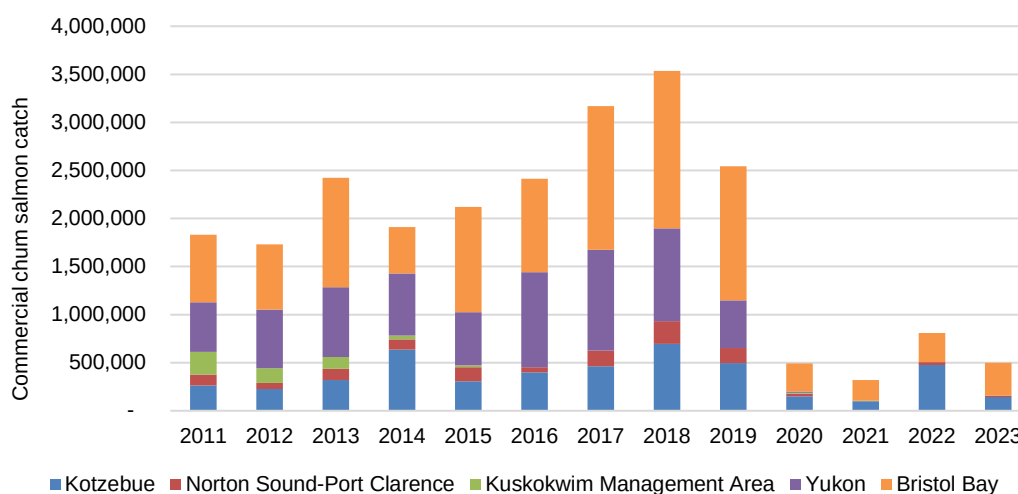


Figure 4-26 Trends in commercial chum harvest, 2011–2023

Source: ADF&G Annual Management Reports and Season Summaries.

Regional Economics of Commercial Chum Salmon Fishing

Commercial salmon fishing opportunities can play an important and integrated role in the vitality and well-being of communities throughout the ADF&G Management Areas analyzed here. Communities associated with these management areas are considered remote and rural communities by almost all standards and opportunities to generate income are extremely limited. As described in Section 4.4.3.2.2.3 for communities such as these that are engaged in mixed economies, commercial fishing can provide household income for investment into resources that allow for subsistence harvests. Additionally, commercial salmon fishing equipment (*e.g.*, boats, fishwheels, nets, four-wheels) may be used for other subsistence activities well, or depending on the area management, subsistence fishing may occur simultaneously with commercial fishing. **Therefore, the economic impacts from declines in salmon fishing opportunities fit into a larger regional economic and social framework that can have broad and long-term implications for permit holders, households, and communities within the regions.**

Participation in commercial fisheries has been one factor associated with higher subsistence harvest rates, which means that those with access to commercial boats and equipment may also be supporting others in the community as a “super household” (*i.e.*, where a small number of harvesters are responsible for the majority of subsistence harvests). It was noted by residents in the Norton Sound/ Bering Strait region, that jobs can represent a unique challenge in that they provide income that can aid subsistence harvests, but that time required for these jobs can keep people from participating in subsistence (Raymond-Yakoubian & Raymond-Yakoubian, 2015). As a seasonal employment opportunity, commercial fishing can provide valuable flexibility for following a year-round subsistence calendar (or the “seasonal round” within a community).

Revenue earned in commercial salmon fishing can also provide for basic necessities that require income. The cost of living is high in rural Western and Interior Alaska. In particular, goods or services that require transportation are expensive or in some cases unavailable. Poverty rates are high in Western and Interior Alaskan communities, many of which overlap with the local permit holder residences for commercial chum salmon fisheries throughout Norton Sound, the Yukon Area, Kuskokwim Management Area, and Bristol Bay). Therefore, joint restrictions for commercial and subsistence salmon harvesting can represent a “double-blow” to a household’s access to food with both reductions in a primary source of protein, through subsistence salmon harvests, in addition to disposable income to purchase food at a store. Moreover, if or when a super household is doubly impacted by commercial and subsistence fishing closures, this may have important ripple effects throughout communities in terms of sharing networks, food security, and cultural practices (Wolfe et al., 1982).

Historically, the economic importance of chum salmon commercial fisheries varies by the region of Western and Interior Alaska due to the salmon species available for commercial harvest in addition to the other non-fishing economic opportunities in the permit-holders’ community of residence. Employment opportunities are extremely limited in most of these fishing communities within Western and Interior Alaska, although the CDQ groups have invested into their regions and communities by providing seasonal, full-time, and internship employment opportunities for some residents (see Section 4.2.2.4 for more examples).

The April 2024 SIA for the Initial Review demonstrates fishing diversification for several time scales and in the context of both overall harvest levels and value of revenue from chum salmon versus other fisheries revenue. Both a longer and shorter-time series for Kotzebue and Bristol Bay demonstrates consistent patterns in chum dependency for commercial fishing. The Kotzebue commercial gillnet fishery continues to show near total dependence on chum salmon. While the magnitude of chum caught in the Bristol Bay commercial fishery can be high (*e.g.*, ~2.2 million fish in 2006; Table 4-55 in the April 2024 SIA), the relative harvest of chum in this fishery is dwarfed by the magnitude of the commercial sockeye salmon fishery. However, for some commercial fisheries (*i.e.*, Norton Sound, Yukon, Kuskokwim), chum salmon has become relatively more important to total ex-vessel revenue as Chinook salmon is less available. The

Yukon River commercial gillnet fisheries have historically focused on both Chinook and chum salmon, while Norton Sound and the Kuskokwim area have historically been more diversified across several species.

The April 2024 SIA also demonstrates the degree to which these commercial fisheries are primarily prosecuted by local permit holders (Tables 4-57 through Table 4-71 of April 2024 SIA).¹⁵⁷ Kotzebue, Norton Sound, the Yukon River, and the Kuskokwim area commercial fisheries are prosecuted by primarily local harvesters, with over 95% of the permit holders residing in local communities for each of these fishery management areas. In contrast, 75.4% of CFEC gillnet permit holders for Bristol Bay are held by non-local residents.

The presence of fish buyers or commercial fishing processors are another important component for commercial fishing opportunities. As described in the April 2024 SIA, processors have not always been available to support commercial operations, including the Kotzebue region in the early 2000s, Norton Sound prior to the 2000s, and in the Kuskokwim region since 2016, and this can greatly limit the scope of commercial fishing operations. Declines in salmon can also contribute to declining processor interest, as it may not be economically feasible to maintain a plant without the necessary economies of scale. Some CDQ groups currently and have historically contributed to available processing capacity. Processing plants can also generate employment opportunities for the residents of associated communities.

Typically, regional economic impact analyses consider the sectors that support an industry of focus and the indirect effects associated with a change in expenditures within that industry resulting from the proposed action or change. Some support services like this exist, particularly in CDQ communities, through the groups' community-based ventures. For example, CVRF has developed Mechanic/Welding shops in 18 of their communities, where residents can employ the services of certified mechanics. However, given the highly local nature of the commercial WAK salmon fisheries (with the exception of the Bristol Bay commercial fisheries), the limited number of businesses in many of these rural communities, and importantly the cultural practice of sharing which may include one's labor (Raymond-Yakoubian, 2019), "support sectors" can look different in many of the rural Western and Interior communities. For instance, rather than disposable income exchanged for assistance in preparing fishing gear, in some instances there may be an expectation of a younger family member assisting an older family member.¹⁵⁸ In this way, skills and knowledge may be passed down as well. With limited businesses available to provide for-profit services, developing the skills and knowledge for commercial fishing, boat maintenance, equipment repair, etc. can be another type of value generated without necessarily involving monetary exchange.

Inter-generational commercial operations within fishing families in Western and Interior Alaska can be seen through CFEC permit transfers (CFEC, 2022a; CFEC, 2022b). For six of the eight permits associated with the Arctic, Yukon, and Kuskokwim management areas, more than 50% of the transfers between 1980 – 2021 for each permit type, were transferred to an immediate family member. The Kuskokwim salmon gillnet permit (S04W) had the greatest percent of total transfers to immediate family members at 72.4%, compared to the statewide level for all fishery permits of 33.6%. Additionally, these Arctic, Yukon, and Kuskokwim salmon permits are sometimes gifted rather than sold at rates ranging from 39.2% of transfers (Upper Yukon Fishwheel; S08P) to 61.2% of transfers (Kuskokwim salmon gillnet permit; S04W) for all transfers between 1980- 2021. This is relative to 32.5% of all commercial fishery permit transfers statewide that were gifted during the same time period. Bristol Bay permits are transferred at a much higher rate, given the magnitude of the fishery, with 38.7% of all Bristol Bay salmon permits gifted and 35.4% going to immediate family members, during this same time period.

¹⁵⁷ Available at the archived meeting agenda for the April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

¹⁵⁸ Personal communication, J. Raymond-Yakoubian.

4.4.4.2 South Alaska Peninsula Management Area (Area M)

This section briefly discusses the South Alaska Peninsula Management Area (Area M) commercial salmon fisheries because WAK chum salmon are incidentally caught in this fishery (and other State waters fisheries), and it is proximate to the affected environment and other commercial chum salmon fisheries discussed in Section 4.4.4.1.

Chum, sockeye, pink, coho, and Chinook salmon are harvested within Area M which includes waters from Kupreanof Point west to Scotch Cap on Unimak Island and includes the Unimak District, Bechevin Bay Section of the Northwestern District, Southwestern District, South Central District, and Southeastern District. The 2023 commercial salmon harvest in the South Alaska Peninsula totaled 20,167,684 salmon. The majority of salmon harvested were pink salmon at 85% (17,097,391 fish), followed by sockeye at roughly 9% (1,740,707 fish) and chum salmon at 5% (1,120,863 fish) of the total harvest. Major fish processing operations have historically been located at Sand Point, King Cove, Dutch Harbor, and Akutan.

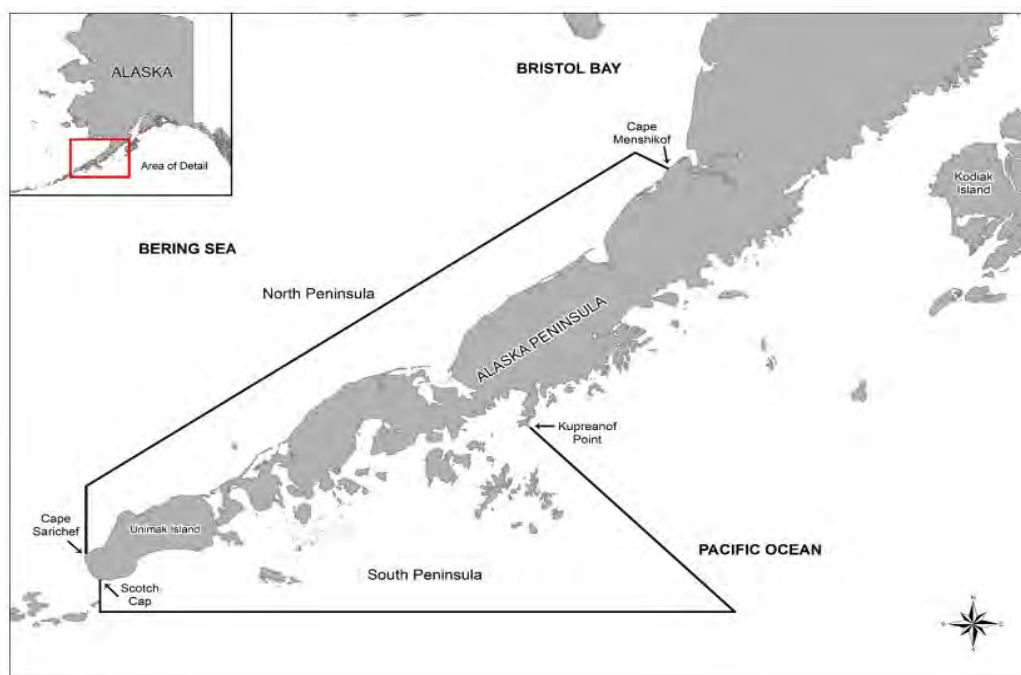


Figure 4-27 Map of Area M with the North and South Peninsula Defined

Source: ADF&G.

Overview of Area M Chum Salmon Harvests

The South Alaska Peninsula fisheries vary by time and space for gear types and are prosecuted in two fishing seasons, a June commercial fishery in the South Unimak and Shumagin Islands and a post-June fishery that covers all waters of Area M (except the Southeastern District Mainland) from July 1 through October 31. Legal fishing gear types in South Peninsula waters include purse seine, drift gillnet and set gillnet.

Table 4-42 provides the number of chum salmon harvested in the June commercial fishery in the South Unimak and Shumagin Islands compared to the annual harvest of chum salmon in the South Alaska Peninsula from 2006 to 2022. As shown, commercial harvests of chum salmon in the June fishery comprise a significant proportion of the annual chum harvest, ranging from 25% in 2006 to 77% in 2014. The numbers of chum salmon harvested ranged from a low 429,703 fish in 2016 to a high of 2,256,363 fish in 2021.

Table 4-42 Number of chum salmon harvested in the South Unimak and Shumigan Islands June fishery compared with annual chum salmon harvests in the South Alaska Peninsula fisheries from 2006 to 2022

Year	June Chum Salmon Harvest	Annual Total Chum Salmon Harvest	June Harvest as Proportion of Annual Total
2006	299,827	1,185,661	25%
2007	297,539	681,087	44%
2008	410,932	814,123	50%
2009	696,775	1,684,944	41%
2010	271,700	792,369	34%
2011	423,335	979,187	43%
2012	395,060	623,967	63%
2013	399,058	952,160	42%
2014	390,139	505,197	77%
2015	178,715	680,167	26%
2016	270,614	429,703	63%
2017	640,891	1,960,576	33%
2018	537,466	998,585	54%
2019	549,072	1,168,952	47%
2020	490,128	915,147	54%
2021	1,168,601	2,256,363	52%
2022	544,097	822,314	66%

Source: ADF&G, Dann et al., (2023) and Fox et al., (2022).

Stock of Origin for Chum Salmon Caught in Area M Commercial Fisheries

The origin of chum salmon stocks harvested in the South Unimak and Shumagin Islands June fishery has long been of interest to fishermen and stakeholders. Various studies have been conducted to identify the origins of chum salmon harvested in the Area M fishery, most notably the Western Alaska Salmon Stock Identification Project (WASSIP) completed in 2012. A new study has been designed to estimate stock, age, and length compositions and stock-specific harvests in South Alaska Peninsula fisheries from 2022–2026.

WASSIP was initiated in 2006 and comprehensively sampled commercial and subsistence fisheries for chum and sockeye salmon from Chignik to Kotzebue over a four-year period (Eggers et al., 2011). Chum salmon sampled in 2007–2009 were subsequently analyzed and a genetic baseline reported stock compositions to 9 reporting groups that were defined by a combination of stakeholder interest, population genetic structure, adequate representation of individuals and populations within reporting groups in the baseline, and expected contributions of reporting groups to catch samples: Asia, Kotzebue Sound, CWAK, Upper Yukon, Northern District, Northwestern District, South Peninsula, Chignik/Kodiak, and East of Kodiak. Stock compositions and stock-specific harvests and harvest rates were reported in Dann et al. (2012a), Habicht et al. (2012a), Munro et al. (2012), and Templin et al. (2012).

From 2007–2009, approximately 29% to 33% of the chum salmon harvested in Area M fisheries were of CWAK origin (Munro et al., 2012). More recently, a preliminary study estimated the harvest rates for Western Alaska and Alaska Peninsula stocks for the 2022 Area M fisheries and found the relative proportion of CWAK stocks was substantially lower than WASSIP years at 12.8% and 103,798 CWAK chum salmon harvested (Table 27 in Dann et al., 2023), though stock proportion is known to vary by time and gear type. Greater numbers of CWAK chum salmon were harvested in the June fishery compared to the post-June fishery, and the stock proportion was higher in gillnets compared to other gear types, like seines.

From 2007–2009, annual harvests of Upper Yukon origin chum salmon in Area M fisheries ranged from 1,410 (2009) to 6,988 (2008) fish (Appendix D10–D12 of Munro et al., 2012). More recently, a

preliminary study estimated that 1,522 Upper Yukon chum salmon were harvested in the Area M fisheries in 2022 (Table 27 in Dann et al., 2023).

4.5 Effects of the Alternatives on Western Alaska Chum Salmon Fisheries

This portion of the analysis is a direct extension of the results presented in Section 3.3.4 that contains the potential impacts on chum and WAK chum salmon as a result of the proposed alternatives, as well as Section 3.4.1 which contains the analysis of potential impacts on Chinook salmon PSC. Here, the primary focus is on the potential impacts to individuals, rural and Indigenous communities, and Tribes across Western and Interior Alaska that depend on these species and the in-river ecosystems they support. To the extent the proposed management measures reduce WAK chum salmon bycatch and contribute to increased WAK chum salmon returns, these entities may experience indirect positive effects (typically referred to as “benefits” throughout the DEIS).

This section first provides specific context for the magnitude and likelihood of potential benefits under each alternative. Following this discussion, a qualitative description of the broader benefits is provided which are relevant to all proposed action alternatives.

The analysis of potential benefits uses a similar approach to the evaluation of potential costs of the proposed alternatives to the Bering Sea pollock industry; however, the uncertainties are different and there are important nuances that must be considered. For instance, the potential impacts of an overall chum salmon PSC limit (Alternative 2 and 3) are evaluated using retrospective data from 2011–2023 to identify when each sector would have hypothetically met the PSC limit and apportionment. Since this type of analysis does not account for any changes in fishing behavior, the estimates on potentially forgone revenue are an upper bound for the expected direct impacts to the industry in the future. As discussed in Sections 3.1.4.2 and 3.3.4.4.2, the retrospective estimates for potential reductions in the AEQ bycatch of WAK origin fish are neither an upper nor lower bound of expected future savings. Moreover, it is not possible to connect the potential AEQ bycatch reductions to individual river systems and tributaries throughout Western and Interior Alaska. This means the analysis cannot identify whether the entities listed previously would receive indirect benefits from the proposed alternatives, and there is even greater uncertainty when determining *which* entities may benefit.

While there is considerable uncertainty surrounding the potential costs of the proposed alternatives to the Bering Sea pollock industry, this fleet will be directly regulated by any new measures. The uncertainty around benefits is arguably greater given the breadth of external factors which may influence the intended outcome (Figure 4-28). However, both analyses of costs and benefits emphasize the importance of considering the broader (and unquantifiable) impacts from the alternatives.

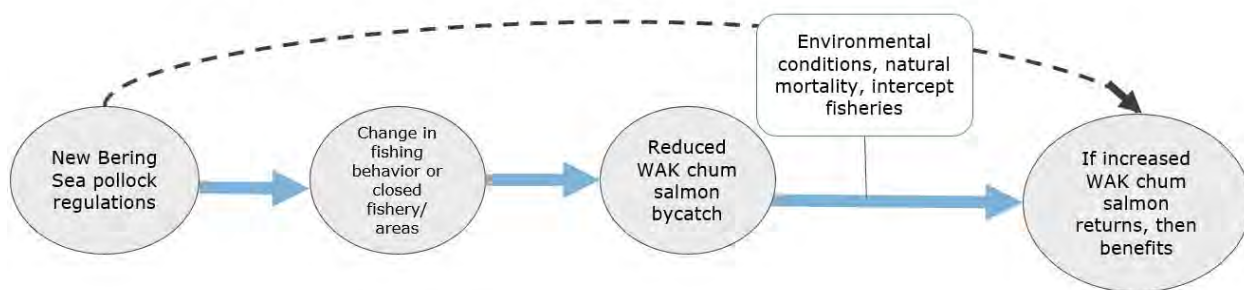


Figure 4-28 Pathway for potential benefits from proposed management measures

This portion of the analysis directly addresses EO 12866, which requires a thorough consideration of the potential net benefits of the proposed action. This evaluation involves a detailed assessment of both the expected costs and benefits at a national level, to include both quantifiable and qualitative considerations. Additionally, EO 12866, as well as National Standards require consideration of distributional economic

and social impacts at a finer scale. As such, this section of the analysis describes benefits at a disaggregated level that allows for an understanding of potential distributional impacts and includes a broader discussion of other impact categories which may not be included in a net benefits calculation but are important for achieving National Standards and consideration in decision-making.

4.5.1 Alternative 1

Alternative 1 would retain the existing regulations for chum salmon bycatch in the Bering Sea pollock fishery. Under the status quo:

- the annual average level of CWAK bycatch was 38,489 chum salmon (14.8% of the total bycatch) and the average level of Upper/Middle Yukon bycatch was 8,528 chum salmon (Table 3-28);
- the AEQ for the CWAK group ranged between 11,539 chum salmon in 2012 and 69,403 chum salmon in 2017 with an annual average of 38,060 fish, which represents 1.75% of the total average CWAK harvest across State and Federal fisheries (total average harvest of 2,170,396 — not including Area M fisheries) (Table 3-32 and Table 3-33);
- The AEQ for the Upper/Middle Yukon group ranged between 2,175 in 2020 and 16,451 in 2017 and averaged 6,095 fish (Table 3-32); and
- across the time series, the pollock fishery's impact on the Yukon fall chum salmon run (Upper/Middle Yukon reporting group) averaged 1.0% of the run size (Figure 3-20).

Selection of Alternative 1 is expected to maintain the current level of impact and would not provide a greater benefit beyond status quo. However, apart from any of the regulatory changes being considered in this action, abundance could change in the future with consequences (either positive or negative) to Western and Interior Alaska chum salmon users and ecosystems.

4.5.1.1 Subsistence Chum Salmon Users

This section was primarily co-written by KRITFC and TCC with some contributions from analytical staff.

IK and TK are holistic *systems* and thus the discussion of the potential impacts of Alternative 1 does not separate communities of people from non-human beings in a particular ecosystem or environment. Alternative 1 retains the existing regulations for chum salmon bycatch management and would not change any regulations for chum salmon fisheries in Western and Interior Alaska. This management framework for salmon fisheries includes a priority for management to first and foremost meet spawning escapement goals in order to sustain salmon resources for future generations. After conservation (escapement), the highest priority use in Alaska is for subsistence under both state and Federal law. Salmon surplus above escapement needs and subsistence uses are made available for other consumptive uses of the stock, such as commercial and sport fishing.

Under Alternative 1, it is expected that the pollock fleet would continue its operations as it has in recent years. While fishing behavior and chum salmon avoidance strategies could change in the future, Alternative 1 represents no regulatory change and therefore does not have inherent benefits to Western and Interior chum salmon users beyond the status quo. In other words, any effect that current operations of the Bering Sea pollock fishery have on current and future years' run returns, the marine ecosystem, and salmon-dependent communities would be expected to continue in the future. Any impacts from these fisheries may be felt in-river along with other impacts on chum salmon, such as those from ecosystem change, other sources of removals, changes in prey availability, and potential impacts from hatchery fish.

Removals of chum salmon due to bycatch in the pollock fishery has coincided with recent years of low abundance, the related restrictions on subsistence harvests of chum salmon, as well as the consequent

negative social, cultural, and economic conditions described in Section 4.4.3.2. While chum salmon returns are cyclical, new climate regimes, and the compounding effect of various sources of removals create a foreseeable scenario in which low chum salmon abundance compared with historical levels could persist. TK holders have also noted that chum salmon abundance cycles are decreasing in span; whereas a significant collapse in chum salmon abundance used to occur every 30 years, it now occurs every 20 years.¹⁵⁹

The sustained conditions of low chum salmon abundance observed under status quo across regions of Western and Interior Alaska may pose a threat to the sustainability of certain regional chum salmon populations with potential effects on genetic diversity and the food security of Indigenous communities. Chum salmon declines have imbalanced regional freshwater ecosystems, causing people (and non-human harvesters, such as bears) to seek other sources of nutrition to fill gaps in food security (see Section 4.4.3.2.3). With the potential for continued low chum salmon abundance under status quo, increased harvest of non-chum salmon species—both by human and non-human harvesters—is likely to continue, with compounding effects felt throughout Western and Interior Alaska’s freshwater ecosystems.

Additionally, within the Yukon-Kuskokwim region, continued low chum salmon returns would likely lead to low subsistence harvests with resounding implications for Alaska Native and rural communities’ ways of life and wellbeing in the region (see also Appendix 8, Appendix 9a, and 9b independently-authored by KRITFC and TCC). For Indigenous communities, the loss of chum salmon threatens food security and food sovereignty—the ability to access traditional, culturally significant foods in a sustainable and self-determined way. Continued declines in chum salmon abundance reduces the availability of a key food source, forcing communities to turn to less culturally significant and less nutritious store-bought foods, which are often more expensive and less accessible in remote areas. These dietary changes pose physical health threats for these communities (these health impacts are further characterized in Appendix 9), and these changes erode their cultural connections to the land and water, where salmon fishing has long been a central practice.

Indigenous food security, particularly for salmon species, is tightly linked to biodiversity (Nesbitt & Moore, 2016). A decline in a species’ diversity in terms of their unique life history traits, including chum salmon, can reduce the stability and temporal access to harvest cycles. Nesbitt and Moore’s (2016) study of Canadian origin salmon showed communities with access to a wider diversity of salmon species (and unique subpopulations within a species) tend to experience more stable catches and longer seasons. While the concepts and findings from their study can be applied in understanding biodiversity within the Western Alaska chum salmon populations, it is important to note that Nesbitt & Moore were not directly addressing these stocks. The broader implications on biodiversity and ecosystem-based management that they present can serve as a relevant framework but should not be interpreted as focused on the specific case of Western Alaska chum salmon. Because ecosystems and subsistence Indigenous communities are innately interconnected, ecosystem impacts filter to community level, affecting their health and well-being:

“It is key to understand that the health and well-being of our Alaska Native communities on the Kuskokwim is intrinsically linked to the health of our salmon, ecosystems, and economies. When our salmon are healthy, our people, our land, our river, and our non-human relatives are healthy. These health benefits mutually reinforce one another; they are interconnected.”
(Samuelson, 2023: 2)

Conversely, when salmon are unhealthy—in low abundance, riddled with diseases, subject to harvest restrictions—so too are Yukon and Kuskokwim region Indigenous communities and the wider ecosystem upon which these communities depend. With the potential for continued low chum salmon abundance

¹⁵⁹ Personal communication, E. Burk.

under status quo operations, this reciprocal ecosystem-community wellbeing will likely continue to be disrupted.

4.5.1.2 Commercial Chum Salmon Users

Alternative 1 would not change any regulations for commercial chum salmon fisheries in Western and Interior Alaska. Salmon surplus above escapement needs and subsistence uses are made available for other consumptive uses of the stock, such as commercial and sport fishing.

Under Alternative 1, it is expected that the pollock fleet would continue its operations as it has in recent years. While fishing behavior and chum salmon avoidance strategies could change in the future, Alternative 1 represents no regulatory change and therefore does not have inherent benefits to commercial salmon fisheries in Western and Interior beyond the status quo. Section 4.4.4.1 describes these status quo conditions including the reliance Western and Interior Alaska commercial fisheries have had on chum salmon in recent and historical years, and the restriction resulting from the current stock status. This section demonstrates that commercial salmon fisheries within the Western and Interior Alaska management areas have experienced either closures or declining commercial chum salmon harvest trends in recent years.

These chum salmon declines under status quo have further exacerbated the economic impacts of Chinook and coho salmon declines that historically have been caught in regional commercial fisheries. These low commercial catch rates and fishery closures have widespread adverse economic implications for the permit holders and communities they are associated with, including adverse impacts to subsistence activities (*e.g.*, financing nets, boats, gas, and other gear used for subsistence) because of the dynamics of mixed cash-subsistence economies in this region. As demonstrated through residency addresses associated with CFEC commercial fishing permits, these fisheries are highly local fisheries (with Bristol Bay being the exception), and they operate within rural communities that have extremely limited alternative opportunities for generating income.

4.5.2 Alternative 2 or 3

Alternative 2 or 3 would include an overall chum salmon PSC limit set at an amount between 100,000 and 550,000 chum salmon, although the lower bound of the range is extended to 75,000 chum under Alternative 3, Option 1. Under both alternatives, the PSC limit would only apply in the pollock B season and be apportioned among the sectors. Alternative 3 would conditionally apply the overall chum salmon PSC limit, such that it would only be in effect the year after chum salmon returns were below their thresholds (see Section 2.4.1.1).

Retrospective catch and bycatch data is used as a frame of reference for if and when each sector would have met its apportionment of a PSC limit and the hypothetical PSC reductions after this point. In this section, the analysis attempts to connect the potential benefits in terms of the estimates of AEQ reductions to in-river users. It is also acknowledged that an AEQ analysis may not fully capture the importance of a relatively small number of chum salmon returning to their natal streams, as discussed in Appendix 8, independently-authored by KRITFC. Following this is a discussion of the potential impacts of increased avoidance behavior on WAK chum salmon and Chinook salmon in response to an overall chum PSC limit.

4.5.2.1 Approach to Scaling the Potential Impacts of Alternative 2 or 3

To scale the potential impact of Alternative 2 or 3 for WAK chum salmon users, the mean AEQ reductions for the CWAK and Upper/Middle Yukon reporting groups from the stochastic model are compared to the Yukon summer and fall chum salmon run reconstructions and management plan thresholds (respectively). This portion of the analysis is a direct extension of Section 3.3.4.2.2.

Table 4-43 summarizes the Yukon River summer and fall chum salmon escapement goals and management plans for ease of the reader. Note that the CWAK reporting group does not fully align with the Yukon summer chum salmon run, and the exact proportions of the populations encompassed within the reporting group and represented in the bycatch are unknown (as discussed in Section 3.3.4.2.2). The analysis accounts for this uncertainty by adjusting the savings estimates of AEQ CWAK chum salmon from 100% of the reported value to 75%, 50%, and 25%, as recommended by ADF&G staff. **This is a conceptual tool developed to assist decision-makers and is intended to indicate a spectrum of different scenarios.** As an example, if 50% of the AEQ fish estimated to be saved were Yukon summer chum salmon, then 50% would return to other river systems from Kotzebue Sound to Bristol Bay in unknown proportions.

Table 4-43 Summaries of the Yukon River summer and fall chum salmon escapement goals and management plan thresholds for directed fisheries opportunities

Management Plan	Escapement Goal	Subsistence	All Other Directed Uses
Summer Chum Salmon	500,000–1,200,000 fish	Subsistence opportunities may be provided if run size > 500,000 fish	Opportunities for all other directed uses may be provided if run size > 650,000 fish
Fall Chum Salmon	300,000–600,000 fish	Subsistence opportunities may be provided if run size > 300,000 fish	Opportunities for all other directed uses may be provided if run size > 550,000 fish

Source: ADF&G see 5 AAC 05.362 for Yukon summer chum salmon and 5 AAC 01.249 for Yukon fall chum salmon.

4.5.2.1.1 Potential Indirect and Positive Impacts of Alternative 2 or 3

Had the analyzed overall chum salmon PSC limits and apportionments been in effect from 2011–2022 and no changes in fishing behavior occurred, the greatest impact on AEQ bycatch reductions would have occurred in 2017 under a PSC limit of 100,000 chum salmon using apportionment Option 1 (3-year average) at 47,931 CWAK fish and 11,593 Upper/Middle Yukon fish. The 2017 run sizes were at the highest levels during the analyzed period at 3,615,100 summer chum salmon and 2,315,583 fall chum salmon, both of which exceeded the upper bound for the drainage-wide escapement goals. Despite strong run sizes in 2017, directed fishing opportunities were limited due to conservation measures aimed at protecting co-migrating Chinook salmon and commercial fishing activity was constrained by limited processor (buyer) capacity. As this suggests, salmon fishery managers consider multiple factors when determining inseason harvest strategies, including preseason forecasts, prior escapement data, feedback from LK and TK holders, and conservation needs when providing harvest opportunities.

In contrast, the 2021 run sizes were the lowest during the analyzed period at 156,130 fish (summer chum salmon) and 95,249 fish (fall chum salmon). The greatest impact on AEQ bycatch reductions in 2021 would have occurred under either a 100,000 or 75,000 chum salmon PSC limit using apportionment Option 4 (AFA) and apportionment Option 1 (3-year average) respectively. Even if it was assumed that 100% of the AEQ reductions for the CWAK reporting group returned as Yukon summer chum salmon, and no other at sea mortalities had occurred, either PSC limit and apportionment combination would have improved abundance but would not have made a difference in meeting the lower bound of the escapement goal nor provided directed fishing opportunities.

If either Alternative 2 or 3 were selected, the magnitude of the potential conservation benefits (measured as returning AEQ chum salmon) would depend on the PSC limit and apportionment selected, the fleet's ability to avoid WAK chum salmon in a given year, whether the fish avoided by the pollock fishery are caught at sea by other fisheries, the environmental conditions, among others. The potential reductions in the AEQ bycatch for the CWAK group would also be widely diffused across river systems from Kotzebue Sound in the north down through Bristol Bay and there is no way for the analysts to predict the proportion of saved fish that would return to any given system/area. Based solely on historical catch and bycatch trends described in the analysis, it is expected that the potential benefits would largely manifest as marginal improvements of abundance, rather than increased subsistence or commercial fishing opportunities. However, the analysis cannot quantify the impact of expected changes in fishing behavior

in an effort to remain under the PSC limit, which could result in additional WAK chum salmon savings, as well as a risk in increased WAK chum salmon PSC as previously discussed. If an overall chum salmon PSC limit results in a relatively small number of returning fish, KRITFC states that there could be much broader benefits to communities and ecosystems alike (see Appendix 8, independently-authored by KRITFC), although the analysis cannot identify which communities across the region would be most likely to benefit.

Table 4-44 Comparison of the mean AEQ reductions for the CWAK reporting group at 100%, 75%, 50%, and 25% of the reported value as if an overall chum salmon PSC limit of 100,000 fish and sector apportionments were in place each year from 2011–2022, compared to the Yukon summer chum salmon run reconstruction (run size) and summaries of directed fishing opportunities. A stochastic model was used for AEQ estimation.

AEQ and Adjustment	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Apportionment Option 1: 3-Year Average												
100%	8,600	3,925	6,022	14,718	14,472	30,564	47,931	36,284	33,467	16,324	21,189	24,727
75%	6,450	2,944	4,517	11,038	10,854	22,923	35,948	27,213	25,100	12,243	15,892	18,545
50%	4,300	1,962	3,011	7,359	7,236	15,282	23,965	18,142	16,733	8,162	10,595	12,364
25%	2,150	981	1,506	3,679	3,618	7,641	11,983	9,071	8,367	4,081	5,297	6,182
Apportionment Option 2: 5-Year Average												
100%	9,830	4,483	7,887	15,625	14,091	29,227	46,819	35,897	33,429	16,322	21,097	24,641
75%	7,372	3,362	5,915	11,719	10,568	21,920	35,114	26,922	25,072	12,241	15,822	18,481
50%	4,915	2,241	3,943	7,812	7,045	14,613	23,409	17,948	16,714	8,161	10,548	12,320
25%	2,457	1,121	1,972	3,906	3,523	7,307	11,705	8,974	8,357	4,080	5,274	6,160
Apportionment Option 3: Pro Rata												
100%	9,877	4,521	7,904	15,665	14,217	29,282	47,296	36,187	32,977	16,044	21,119	24,731
75%	7,408	3,391	5,928	11,749	10,663	21,962	35,472	27,141	24,733	12,033	15,840	18,548
50%	4,939	2,261	3,952	7,833	7,109	14,641	23,648	18,094	16,489	8,022	10,560	12,366
25%	2,469	1,130	1,976	3,916	3,554	7,321	11,824	9,047	8,244	4,011	5,280	6,183
Apportionment Option 4: AFA												
100%	9,903	4,535	9,557	14,953	12,834	30,406	42,193	31,446	32,322	16,104	21,538	29,843
75%	7,427	3,401	7,168	11,215	9,626	22,805	31,645	23,585	24,242	12,078	16,153	22,383
50%	4,951	2,268	4,779	7,476	6,417	15,203	21,097	15,723	16,161	8,052	10,769	14,922
25%	2,476	1,134	2,389	3,738	3,209	7,602	10,548	7,862	8,081	4,026	5,384	7,461
Run size	2,406,000	2,479,900	3,349,600	2,467,600	1,978,400	2,581,500	3,635,100	2,074,700	1,689,400	763,200	156,130	478,690
Subsistence	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	No	No
ANS Met	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Commercial	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	No	No

Source: NMFS Alaska Region CAS, data compiled by ABL. ADF&G provided run size information and summaries of directed fishing opportunities.

Table 4-45 Comparison of mean AEQ reductions for the CWAK reporting group at 100%, 75%, 50%, and 25% of reported value as if an overall chum salmon PSC limit of 325,000 fish and sector apportionments were in place each year from 2011–2022, compared to Yukon summer chum salmon run reconstruction (run size) and summaries of directed fishing opportunities. A stochastic model was used for AEQ estimation.

AEQ and Adjustment	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Apportionment Option 1: 3-Year Average												
100%						7,197	19,945	12,248	5,822	1,986	5,629	4,536
75%						5,398	14,959	9,186	4,366	1,490	4,221	3,402
50%						3,599	9,973	6,124	2,911	993	2,814	2,268
25%						1,799	4,986	3,062	1,455	497	1,407	1,134
Apportionment Option 2: 5-Year Average												
100%						6,398	19,302	10,859	4,924	2,218	5,863	4,486
75%						4,799	14,476	8,144	3,693	1,664	4,397	3,365
50%						3,199	9,651	5,429	2,462	1,109	2,931	2,243
25%						1,600	4,825	2,715	1,231	555	1,466	1,122
Apportionment Option 3: Pro Rata												
100%						6,430	19,396	10,968	5,055	2,195	5,810	4,497
75%						4,823	14,547	8,226	3,791	1,646	4,357	3,372
50%						3,215	9,698	5,484	2,528	1,097	2,905	2,248
25%						1,608	4,849	2,742	1,264	549	1,452	1,124
Apportionment Option 4: AFA												
100%					1,472	2,650	12,453	6,709	3,140	2,216	6,707	4,747
75%					1,104	1,988	9,340	5,032	2,355	1,662	5,030	3,560
50%					736	1,325	6,226	3,354	1,570	1,108	3,353	2,373
25%					368	663	3,113	1,677	785	554	1,677	1,187
Run size	2,406,000	2,479,900	3,349,600	2,467,600	1,978,400	2,581,500	3,635,100	2,074,700	1,689,400	763,200	156,130	478,690
Subsistence	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	No	No
ANS Met	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Commercial	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	No	No

Source: NMFS Alaska Region CAS, data compiled by ABL. ADF&G provided run size information and summaries of directed fishing opportunities.

Table 4-46 Comparison of the mean AEQ reductions for the CWAK reporting group at 100%, 75%, 50%, and 25% of the reported value as if an overall chum salmon PSC limit of 550,000 fish and sector apportionments were in place each year from 2011–2022, compared to the Yukon summer chum salmon run reconstruction (run size) and summaries of directed fishing opportunities. A stochastic model was used for AEQ estimation.

AEQ and Adjustment	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Apportionment 3-Year Average												
100%						635	11,369	6,413	1,317	51	295	313
75%						476	8,527	4,810	988	38	221	235
50%						318	5,685	3,207	659	26	148	157
25%						159	2,842	1,603	329	13	74	78
Apportionment Option 2: 5-Year Average												
100%							7,470	4,386	865	63	650	627
75%							5,602	3,289	649	47	487	470
50%							3,735	2,193	432	31	325	314
25%							1,867	1,096	216	16	162	157
Apportionment Option 3: Pro Rata												
100%							7,495	4,264	774	0	705	607
75%							5,621	3,198	580	0	529	455
50%							3,748	2,132	387	0	353	303
25%							1,874	1,066	193	0	176	152
Apportionment Option 4: AFA												
100%							1,596	860	185	33	444	383
75%							1,197	645	139	25	333	287
50%							798	430	92	16	222	191
25%							399	215	46	8	111	96
Run size	2,406,000	2,479,900	3,349,600	2,467,600	1,978,400	2,581,500	3,635,100	2,074,700	1,689,400	763,200	156,130	478,690
Subsistence	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	No	No
ANS Met	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Commercial	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	No	No

Source: NMFS Alaska Region CAS, data compiled by ABL. ADF&G provided run size information and summaries of directed fishing opportunities.

Table 4-47 Comparison of the mean AEQ reductions for the CWAK reporting group at 100%, 75%, 50%, and 25% of the reported value as if an overall chum salmon PSC limit and sector apportionments were in place in 2021 and 2022 under Alternative 3, Option 1, compared to the Yukon summer chum salmon run reconstruction (run size) and summaries of directed fishing opportunities. A stochastic model was used for AEQ estimation.

AEQ and Adjustment	2021	2022
Apportionment Option 1: 3-year Average		
100%	24,081	35,173
75%	18,061	26,380
50%	12,041	17,587
25%	6,020	8,793
Apportionment Option 2: 5-year Average		
100%	24,005	31,659
75%	18,004	23,745
50%	12,003	15,830
25%	6,001	7,915
Apportionment Option 3: Pro Rata		
100%	24,004	31,638
75%	18,003	23,729
50%	12,002	15,819
25%	6,001	7,910
Apportionment Option 4: AFA		
100%	23,227	31,923
75%	17,420	23,942
50%	11,613	15,962
25%	5,807	7,981
Run size	156,130	478,690
Subsistence	No	No
ANS Met	No	No
Commercial	No	No

Source: NMFS Alaska Region CAS, data compiled by ABL. ADF&G provided run size information and summaries of directed fishing opportunities.

Table 4-48 Comparison of the mean AEQ reductions for the Upper/Middle Yukon reporting group under as if the overall chum salmon PSC limits and sector apportionments for Alternatives 2 and 3 were in place from 2011–2022, compared to the Yukon fall chum salmon run reconstruction (run size) and summaries of directed fishing opportunities. A stochastic model was used for AEQ estimation.

Apportionment	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
75,000-Chum Salmon PSC Limit												
Option 1: 3-Year Avg.											3,681	1,832
Option 2: 5-Year Avg.											3,670	1,692
Option 3: Pro Rata											3,669	1,679
Option 4: AFA											3,556	1,666
100,000-Chum Salmon PSC Limit												
Option 1: 3-Year Avg.	4,249	955	704	1,310	2,284	7,121	11,539	5,057	1,465	1,418	3,242	1,350
Option 2: 5-Year Avg.	4,927	1,111	936	1,469	2,198	6,814	11,305	5,023	1,462	1,410	3,233	1,359
Option 3: Pro Rata	4,930	1,116	924	1,445	2,204	6,826	11,435	5,053	1,465	1,395	3,245	1,344
Option 4: AFA	4,938	1,116	1,124	1,443	2,042	7,152	9,927	4,422	1,346	1,321	3,298	1,569
325,000-Chum Salmon PSC Limit												
Option 1: 3-Year Avg.						1,833	4,915	1,547	303	110	878	262
Option 2: 5-Year Avg.						1,654	4,887	1,363	190	231	962	283
Option 3: Pro Rata						1,724	4,937	1,342	211	251	933	289
Option 4: AFA					400	684	3,090	822	102	421	1,011	288
550,000-Chum Salmon PSC Limit												
Option 1: 3-Year Avg.						212	3,134	852	63	0	22	0
Option 2: 5-Year Avg.							2,065	541	47	0	116	26
Option 3: Pro Rata							2,031	562	43	0	132	53
Option 4: AFA							459	47	0	1	51	17
Run size	1,244,141	1,089,200	1,215,809	956,669	828,453	1,390,329	2,315,883	1,114,684	802,964	184,233	95,249	242,465
Subsistence	Yes	Yes	Yes	Yes	Limited	Limited	Limited	Limited	Limited	Limited	No	No
ANS Met	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Commercial	Yes	Yes	Limited	Limited	Yes	Yes	Yes	Yes	Limited	No	No	No

Source: NMFS Alaska Region CAS, data compiled by ABL. ADF&G provided run size information and summaries of directed fishing opportunities.

4.5.2.1.2 Implications of Pollock Fishery Avoidance Behavior

The retrospective estimates on AEQ chum salmon bycatch reductions under Alternative 2 or 3 do not account for potential future changes in fishing behavior to avoid reaching the overall PSC limit. These estimates represent the number of chum salmon that, had they not been taken as bycatch, may have returned to their natal river systems to spawn or be taken in directed fisheries (see Section 4.5.5). It is expected that greater total chum salmon savings could be realized compared to status quo as the pollock fleet works to stay below the hard cap. At a lower (*i.e.*, 100,000) chum salmon PSC limit, this may also be the case for WAK chum salmon, but at higher PSC limits the analysis cannot inherently predict the same outcome for WAK chum salmon given the variation in WAK chum salmon rates relative to total chum salmon (see Section 3.3.4.4.2). In the future, the magnitude of the AEQ bycatch reductions would be influenced by many factors. These include the overall PSC limit amount, apportionment, the actual bycatch in that year, the WAK component in the total bycatch, among other others.

In addition, Chinook salmon are also of critical importance to Western and Interior Alaska communities. Section 3.4.1.2 and Table 3-65 describe the potential Chinook salmon savings under a chum salmon PSC limit that could end the B season early for one or more sectors, based on retrospective data. This section also highlights that if the sectors are able to prevent a closure with increased avoidance strategies, these Chinook salmon savings may not manifest as estimated by these retrospective data. Moreover, if chum salmon avoidance strategies decrease operational efficiency to the extent that it extends the season, this could have adverse impacts for Chinook salmon PSC. As described in Section 3.4.1.2, Chinook salmon bycatch rates tend to increase in September and October. While overall Chinook salmon PSC limits would constrain the amount of PSC, there would still be a risk that Chinook salmon PSC could increase relative to what it otherwise may have been.

4.5.2.2 Implications of CDQ Reserve Pool

As described in Section 3.3.4.4.1 and Section 3.3.4.6.9, the use of the CDQ Reserve Pool under Alternatives 2, 3 or 5 could result in greater chum salmon PSC and theoretically WAK chum salmon PSC, relative to not adopting this suboption. Table 2-12 and Table 2-27 provide the maximum amount of additional chum salmon PSC that may be apportioned to all CDQ group if they all received an inshore adjustment to their chum salmon PSC apportionment and theoretically caught. However, these sections highlight several reasons why all CDQ groups are not expected to access the reserve pool each year, if the provision is used at all. CDQ groups would likely prefer to continue harvesting with the CP sector and its use would require planning and commitment to harvesting all of a group's B season pollock quota with the inshore or mothership sector. Thus, it would most likely be accessed in a situation where there were capacity issues or operational decisions would render a CP platform unavailable for CDQ pollock to be harvested on.

It is also unclear how many additional WAK chum salmon may be caught if a higher PSC limit was apportioned to one or more groups from this reserve pool. Under status quo regulations, CDQ groups may harvest their CDQ pollock with the inshore or mothership sectors and overall chum salmon PSC may be different relative to recent CDQ trends. Access to the CDQ Reserve Pool would allow some additional amount over the limit, and this would most likely be 'used' at lower overall (Alternative 2 or 3) or corridor (Alternative) PSC limits, rather than under the higher limits considered where less frequent closures were observed across sectors using retrospective data.

4.5.3 Alternative 4

Alternative 4 would modify the current regulations for the salmon bycatch IPAs and would not change any management regulations for chum salmon fisheries in Western and Interior Alaska. The analysis cannot precisely quantify the potential PSC reductions that have been achieved in recent years under the IPA measures. Compared to the 2021 level of bycatch of 545,901 chum salmon, the 2022 B season

bycatch was a 55% reduction, the 2023 B season an 80% reduction, and the 2024 B season was a 94% reduction. These reductions may not be solely attributable to the recent IPA changes, but without modifying the existing regulations to require these measures continue to be used in the future, it would be possible for the contracts to be modified and less stringent avoidance efforts could be used in the future.

4.5.4 Alternative 5

The subsequent discussion of potential impacts under Alternative 5 to Western and Interior Alaska chum salmon users is a direct extension of the analysis presented in Section 3.3.4.6 on the impacts to total and WAK chum salmon. People, communities, and Tribes may benefit from Alternative 5 to the extent it would reduce WAK chum salmon bycatch, potentially leading to a subsequent increase WAK chum salmon returns. Chinook salmon are also critically important to Western and Interior Alaska communities and so the overall benefits from Alternative 5 are also weighed against the likelihood that an inseason corridor option would extend the B season and increase the risk of greater Chinook salmon PSC (see Section 3.4.1.4).

As described in Section 3.3.4.6, all of the inseason corridor options (Option 1, Suboption 1 and Option 2) under Alternative 5 are generally expected to have either a neutral or reduced impact on chum salmon and WAK chum salmon PSC relative to no action. Chum and WAK chum salmon PSC rates were typically higher inside the inseason corridor than in outside areas during the closure window (June 10 – August 31), and vessels are expected to respond to any corridor option adopted in regulation. **Under Alternative 5, WAK chum salmon bycatch could be reduced relative to the status quo in two primary ways: vessels may adjust their behavior to avoid reaching the corridor PSC limit, and/or they may be displaced from some or all of the corridor area through the end of August.**

The three inseason corridor options under consideration would account for chum salmon PSC in the corridor in the same way and thus present the same risk for attaining the PSC limit. Whether a closure actually occurs in the future would depend on the PSC limit and apportionment selected and a sector's ability to constrain its PSC while fishing inside the corridor, among other factors. The three inseason corridor options differ from one another based on the number and location of stat areas inside the corridor that would close if the corridor chum salmon PSC limit is met; Option 1 would close the entire corridor (40 of 40 stat areas), Suboption 1 would close 29 of 40 stat areas, and Option 2 would close between 19 and 29 of the 40 stat areas.

Relative to Suboption 1 or Option 2, Option 1 appears to hold the greatest potential to reduce WAK chum salmon PSC *prior* to a corridor closure, as it holds a comparatively greater consequence, especially for the inshore CVs (all other factors being equal). This consequence may incentivize inshore CVs (and other sectors) to constrain their PSC against the corridor PSC limit while fishing inside the corridor or fishing outside the corridor where bycatch rates have often been lower, to the extent practicable. These behavior changes could reduce WAK chum PSC. The magnitude of future savings is expected to partially be driven by the corridor PSC limit, however, a sector's performance against the corridor PSC limit will be assessed based on the number of total chum salmon it catches inside the corridor. Thus, there is still uncertainty in the magnitude of reduction in WAK chum salmon bycatch specifically.

Option 1 also holds potential to substantially reduce WAK chum salmon bycatch after a corridor closure so long as the chum salmon bycatch rates in areas that vessels move to are not substantially greater. However, Option 1 was shown to displace more pollock catch compared to either of the other corridor options. Although it was uncommon for the chum salmon bycatch rates to be greater outside the corridor compared to within it, there were some years where this did occur (2019 and 2020). Since Option 1 could displace greater amounts of pollock catch from inside the corridor after it is closed, and so it has a greater risk of creating unintended negative consequences, if the PSC rates in areas outside the corridor are higher than what was observed inside the area.

Relatedly, Option 1 has greater potential to temporally displace pollock catch, if the amount displaced cannot be recovered at the same rate or if, regardless of the closure actually occurring, the strategies vessels use to avoid chum salmon slow the pace of the fishery. While Chinook salmon PSC would continue to be constrained by the hard cap, any scenario that diverts pollock catch to later weeks in the B season would increase the likelihood that Chinook salmon bycatch is greater (compared to no action, see Section 3.4.1.4). Should Chinook salmon PSC increase due to the changes in fishing behavior in response to the corridor, there could be subsequent negative and indirect consequences for people and communities across Western and Interior Alaska.

Suboption 1 and Option 2 would also be expected to motivate preemptive chum salmon avoidance strategies in the corridor to the extent that these closures are perceived as a risk and consequence by the cooperative. If a closure occurs, these options would allow directed fishing for pollock to continue in a select number of exempted stat areas for vessels that met the corridor PSC limit. However, the analysis expects the impact of bycatch would be reduced due to the historical trends of significantly greater chum/WAK chum salmon bycatch and bycatch rates inside the corridor. In particular, the Fleet Movement Model shows this for Suboption 1 (see Section 3.3.4.6.4). Consistent with the overall reduction in chum salmon bycatch, the estimated net change in WAK chum salmon PSC was projected to be negative under Suboption 1.

Option 2 would allow the IPAs to select the number and location of stat areas (between 19 and 29) to close based on criteria set in Federal regulations. A corridor closure under Option 2 is expected to result in the least amount of displaced pollock catch, either because a greater number of stat areas are exempted from closure and/or the IPAs carefully balance their selections of areas to close by considering historical CPUE. Compared to Option 1 or Suboption 1, this dynamic for Option 2 could reduce the risk that fishing effort is displaced to areas with higher chum/WAK chum salmon PSC rates. However, the magnitude of WAK chum salmon bycatch reductions in the future would depend on the stat areas selected by the IPAs as well as inseason performance.

Section 3.3.4.6.7 describes that the potential impacts of Alternative 5, Option 3 on WAK chum salmon users are generally the same as what has previously been described under Option 1, Suboption 1, and Option 2. However, Option 3 would suspend the inseason corridor and closure provisions in the B season following high Yukon summer and fall chum salmon returns. Thus, there may be years in which additional WAK salmon savings are not achieved under Option 3. Additionally, Section 3.3.4.6.8 describes that given the limited scope in changes to the fishing flexibility under Alternative 5, Option 4 relative to recent practices, this option is not expected to result in adverse impacts on WAK chum salmon or those dependent on WAK chum salmon returns.

Depending on many external factors, reduced WAK chum salmon PSC from preemptive or required action to move outside of the corridor area defined under the options of Alternative 5 could lead to greater WAK chum salmon returns than may have been achieved under no action. The analysis is not able to quantify the magnitude of increased AEQ WAK chum salmon nor which communities in the Western and Interior Alaska may be most likely to benefit. As for any proposed action that has the potential to contribute to increased WAK chum salmon returns Section 4.5.5 below contextualizes the types of broader benefits that may result.

4.5.5 Broader Implications of WAK Chum Salmon Savings

To the extent that any proposed alternative reduces WAK chum salmon bycatch from current levels, the management change could increase the likelihood that WAK chum salmon return to their regions of origin with positive impacts towards conservation. Over time, higher abundance could provide more harvest opportunities, a higher likelihood of attaining harvest goals, support for Tribal food sovereignty and security, restoring human-salmon-ecosystem relationships for many across Western and Interior Alaska. The subsequent sections describe a diverse range of potential social, cultural, and economic

effects that could be realized, should WAK chum salmon savings be realized under the proposed action alternatives.

4.5.5.1 Passive Use Benefits

Passive use benefits, also referred to as non-use, or existence value, may occur when there is real and measurable utility (*i.e.*, benefit) from the knowledge that relatively unique natural assets, even if utilized sustainably, will continue to exist in perpetuity. Fundamentally, passive use value reflects the utility an individual derives from knowing that the resource of interest (*e.g.*, chum salmon) exists in a given state of being, even when no use is ever expected to be made of it by the holder of the value. Therefore, if the management measures adopted through the alternatives result in reduced WAK chum salmon bycatch and increased WAK chum salmon returns, the magnitude of returns are not the critical factor in whether this type of benefit can manifest. Unlike subsistence and commercial fisheries, which require a certain threshold to be met before the benefits of increased chum returns can be experienced, passive use benefits may be derived from an action alternative that reduces WAK chum salmon bycatch regardless of the magnitude of that reduction.

The concept of passive-use value is well established in economic theory, supported by a growing body of empirical literature, increasingly employed in both public and private valuation analyses, and accepted by most as a legitimate, appropriate, and necessary aspect of natural resource policy and management decision-making. It should be noted that this economic terminology and lens may not be in alignment with indigenous world views; however, there may be overlap in the concepts involved.

In the current context, WAK chum salmon clearly demonstrate non-use value because they contribute not only to the existence and productivity of many living assets for which both market and non-market values exist (*e.g.*, commercial salmon fisheries, Steller sea lions, sea birds, and toothed whales of various species), but also the social fabric, identity, and culture of Native and non-native peoples throughout Alaska, the Pacific Northwest, and Canada. Although described through a different lens (*i.e.*, not through economic theory but through expression of values and principles), this concept has been communicated through considerable expressions of public interest and concern during this and previous Council actions on salmon bycatch.

To the best of the analysts' knowledge, there has been no study published to date concerning the passive-use value of changes in chum salmon run sizes. The analysts have not included any suggestion of the potential magnitude of non-use impacts, choosing instead only to identify their likely existence. This is fully consistent with requirements contained in EO 12866 and NOAA Fisheries Guidance for Preparation of Economic Impact Analyses.

4.5.5.2 Directed Use Opportunities for Chum Salmon Fisheries

Should the proposed action alternatives reduce WAK chum salmon bycatch in the pollock fishery, abundance may improve. If abundance improves to levels where escapement needs are met, managers could provide less restricted or unrestricted directed fishing opportunities, there could be positive and indirect effects for subsistence users in the form of longer fishing periods or fewer restrictions on eligible gear types. Should harvest opportunities become less restricted, the costs associated with subsistence fishing trips could be reduced compared to what they are now. Not all households can afford to take multiple small trips to accommodate restricted fishing schedules.

Additional flexibility in the timing and duration of subsistence harvesting opportunities could support traditional practices of fishing for chum salmon when they present themselves (see Section 4.4.3.2.1). This may also be more aligned with when fish are in better condition (Godduhn et al., 2020: 57). The weather across WAK turns wet and rainy as the summer months go on, which can spoil fish drying on racks and flies are more present (Ikuta et al., 2013). These are complicated dynamics, however. Inseason

managers aim to provide balanced opportunities across the timing of a run, and restrictions on target opportunities for chum salmon in June and July may be an effort to conserve Chinook salmon.

Although improvements in WAK chum salmon abundance beyond escapement would first and foremost be prioritized for subsistence uses, the magnitude of the returning run size allows the State of Alaska to determine whether there is expected surplus above escapement and subsistence needs to allow for directed commercial fisheries opportunities. To the extent that the proposed measures result in savings of WAK chum to a level where abundance improves beyond the amounts required to meet escapement and subsistence harvest needs, there could be positive and indirect effects on commercial fishers within some of these management areas.

Section 4.4.4.1 emphasizes how cash income is often earned in the commercial harvesting portion of the salmon fishery and used to support subsistence activities. In some cases, especially with the high cost of fuel, subsistence activities may be reduced if commercial harvesting income is lacking. Even a few hundred fish that are made available to commercial harvesters in-river due to “chum salmon savings” under the alternatives in question may provide a family or multiple families with just enough cash income to afford more time at fish camp to meet their subsistence needs for the coming winter. Though it is not possible to quantify exactly what effect the chum salmon savings estimated under the alternatives would have on commercial harvesters in any particular river system it is important to recognize that even a few hundred fish, and a few hundred dollars from those fish, may be critically important in many villages throughout Western and Interior Alaska.

4.5.5.3 Western and Interior Alaskan Communities Engaged in or Dependent on Chum Salmon

If the proposed measures result in savings of WAK chum salmon to a level where additional directed harvest is available, there could be positive and indirect effects for communities that rely on chum salmon (Section 4.5.5.3 and 4.5.5.3.3). However, **the analysis cannot determine with any precision which community may receive some indirect benefits from potential bycatch reductions, in terms of improved harvest opportunities and broader economic, social, and cultural benefits.** Given the potential intervening variables, and particularly the unknown distribution of CWAK chum salmon bycatch from coastal Western Alaska river systems, it is not possible to identify these salmon to their rivers of origin in order to understand which communities may benefit. Even for communities that rely on the Yukon River fall chum stock, which directly aligns with the genetic reporting group for Upper/Middle Yukon, analysts cannot further disaggregate where these returning chum salmon may be caught in salmon fisheries in marine or inland waters.

Chum salmon are the most widely harvested species of salmon by residents in the Kotzebue Area and play a meaningful role in the total subsistence salmon harvests in the Norton Sound region. In the Yukon Area, summer and fall chum salmon contribute in larger proportion to the subsistence economies of communities in the Upper and Middle Regions. Fall chum salmon play an increasingly important role in the Upper region communities of Central, Circle, Eagle, Eagle Village, Fort Yukon, Stevens Village, Venetie, and Beaver because summer chum and coho salmon do not migrate the full length of the river. (Table 4-38).

In the Kuskokwim Region, chum salmon plays a larger role in terms of the proportion of total subsistence salmon harvests for communities in the lower region. However, while chum salmon may not contribute the majority of subsistence salmon harvests for communities in the upper region, sockeye salmon do not migrate to the headwaters of the Kuskokwim River, increasing that region’s dependence on other salmon species, particularly chum, Chinook, and coho salmon. Chum salmon accounted for the largest proportion of all resources harvested for subsistence in the middle region at 14%. These communities include Aniak, Chuathluk, Crooked Creek, Lower Kalskag, Red Devil, Sleetmute, Stony River, and Upper Kalskag.

Section 4.4.4.1 describes regional trends in commercial chum harvests and the April 2024 SIA includes a suite of tables that demonstrate patterns of community and regional (*i.e.*, local versus non-local)

engagement and dependence on commercial chum salmon fisheries in Western and Interior Alaska.¹⁶⁰ This includes trends in the number of active permits holders and value for each of the eight commercial permit types and for each community where permit holders reside, from 2011-2022. As shown in these tables, Kotzebue, Norton Sound, the Yukon River, and the Kuskokwim area commercial fisheries are prosecuted by primarily local harvesters, with over 95% of the permit holders residing in local communities for each of these fishery management areas. In contrast, 75.4% of CFEC gillnet permit holders for Bristol Bay are held by non-local residents. Some communities with the greatest number of CFEC permits include: Kotzebue, Unalakleet, Shaktoolik, Elim, Emmonak, Kotlik, St Mary's, Mountain Village, Alakanuk, Pilot Station, Marshall, Quinhagak, Bethel, Akiachak, Tuntutuliak, Dillingham, Togiak, and Naknek. However, especially given the small population in some Western and Interior communities, for communities with a lower overall count of commercial fishing permits, those few permits may still represent an important opportunity for income.

4.5.5.3.1 Mixed Economies and Cultural Identity

This section addresses the positive and indirect benefits that could be realized within and across the mixed economies and sharing networks of rural Alaska communities, as well as the traditional practices which foster cultural identity for many Indigenous communities across Western and Interior Alaska. These benefits could be realized if abundance improves, and harvest goals are able to be met as a result of the proposed alternatives.

Many rural communities are connected to one another through extensive (broad and deep) sharing networks (Trainor et al., 2021). Sharing chum salmon and other subsistence resources supports meeting households' food security needs and provides a means for expressing culturally held values. As an example, in the Tanana region "...salmon is given to individual elders, Elders' residences and people who do not have access or ability to fish. Almost all the fishermen interviewed stated that the first salmon caught were given away to share the taste of the first fish and bring luck to the fishermen" (Moncrieff, 2007).

Section 4.4.3.2 describes the central role that fish camps play in teaching values and sharing kinship relationships with salmon are passed down to Alaska Native youth in the Yukon and Kuskokwim regions, although similar experiences are likely relevant to other areas of Western and Interior Alaska as well. When people are working together to harvest, cut, and process fish, they are connected at that moment to each other and their ancestors (Trainor et al., 2021). Each person has an age-appropriate chore that fosters responsibility, purpose, unity, and belonging. Equally important are the physical health benefits provided by the hard work of catching, cutting, and preserving fish.

4.5.5.3.2 Ecosystem

As noted elsewhere in this DEIS, KRITFC and TCC have shared their perspective that an AEQ analysis may not fully capture the potential indirect and positive effects that a relatively small number of chum salmon returning to their regions of origin may have on population viability as well as ecosystem and community wellbeing. (see Appendix 8 and 9, independently-authored by KRITFC and TCC respectively). it is possible Western and Interior Alaska chum salmon populations have unique spatial and or/temporal separation resulting in genetically distinct populations. These are referred to as "discrete spawning populations."

Western and Interior Alaska salmon populations, including those on the Yukon and Kuskokwim Rivers, vary in their productivity, carrying capacity, and life history characteristics. These factors may contribute to their sustainability and resilience to ecosystem change. Recent work on the variation and life history characteristics among eight geographically and genetically distinct Chinook salmon populations within the Canadian portion of the Yukon River found population diversity supports species' viability and

¹⁶⁰ Available at the archived meeting agenda for the April 2024 Council meeting (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

fishery stability (Connors et al., 2022). In particular, genetic divergence was correlated with run timing and spatial distributions of these Chinook salmon populations (Connors et al., 2022). Similar information is not available for WAK chum salmon, making the applicability of Connors et al. 2022 to chum salmon unclear.

However, if it is assumed that similar characteristics could apply to WAK chum salmon, potential reductions in WAK chum salmon bycatch could have a much broader scope of indirect benefits. Additional input from Tribal entities also describes the importance of potentially returning chum salmon, such that very small numbers of returning fish may be of importance for Tribal food sovereignty and security (see Appendices 8 and 9, independently authored by KRITFC and TCC). More broadly, and not inherently related to the concept of discrete spawning populations, there could be positive and indirect benefits for Western and Interior Alaska ecosystems that are related to human communities.

These points are raised so they can be considered in the full scope of potential benefits resulting from the proposed action. The analysis must also note, however, that subpopulations of WAK chum salmon with unique life history characteristics (*e.g.*, size and productivity) cannot currently be identified in the pollock fishery's bycatch.¹⁶¹

4.5.5.3.3 Potential Benefits of the Proposed Action to Yukon and Kuskokwim Indigenous Ways of Life

This section was primarily co-written by KRITFC and TCC with minor contributions from analytical staff.

A meaningful reduction in WAK chum salmon bycatch compared to status quo levels as a result of one or more of the action alternatives could increase WAK chum salmon abundance.

There could be broader potential benefits that even a very few number of chum salmon returning to the Yukon and Kuskokwim Rivers as well as their tributaries offer regional communities and ecosystems. Female chum salmon typically lay 2,400 to 3,100 eggs, with some carrying as many as 4,000 eggs (Buklis, 2024). One successful spawning event may procreate thousands of future spawners, thus contributing to the sustainability of these stocks, including discrete spawning populations (see Appendix 8, independently-authored by KRITFC).

Over time, along with other factors, this could allow for increased harvest opportunities, a higher likelihood of attaining harvest goals, support for Tribal food sovereignty and security, and a restoration of the human-salmon-ecosystem relationships on the Yukon and Kuskokwim rivers (see Section 4.4.3.2) as well as elsewhere in the WAK region. These effects could in turn contribute to the viability of future chum salmon fisheries, as well as to the integrity of Yukon and Kuskokwim Indigenous communities and ecosystems as a whole, because each salmon that returns and successfully spawns may help rebuild populations and imbue climate resilience into the genetics of future chum salmon.

Indigenous communities in the Yukon and Kuskokwim regions would be positively affected in a profound way should chum salmon abundance recover to historical or near historical levels. Abundant chum salmon populations would increase both the opportunities for harvest and the amount of chum salmon harvested, restoring communities' unique relationships with salmon and their holistic well-being that is so dependent upon salmon and salmon fishing (see Section 4.4.3.2.4). Though other factors affect traditional ways of life in the region (*e.g.* increased use of technology, ecosystem change, legacies of colonization), and contemporary subsistence communities will always represent a synthesis between traditional and modern ways of life, subsistence fishing restrictions have inarguably affected Indigenous

¹⁶¹Beyond the CWAK and Upper/Middle Yukon genetic reporting groups, little genetic divergence exists among chum salmon spawning collections, with the currently available genetic marker sets, within Western and Interior Alaska river systems. This may be due to the species colonization from a single glacial refugia into dynamic watershed that were transiently interconnected over the last ~1200 generations. Among the large river systems (lower Yukon and Kuskokwim) chum salmon likely formed large metapopulations less affected by the diversifying effect of genetic drift.

people's ability to embrace and share traditional practices. Increased abundance leading to increased harvest opportunities would provide the option for younger generations to learn these practices and would encourage families to continue fish camps that foster important intergenerational exchanges and learning.

In addition, subsistence harvest of salmon is vital to health in the region—from nutritional value to the exercise fishing and processing provides to the mental and spiritual well-being engendered by learning these traditional practices from Elders in the community (KRITFC 2024; see Section 4.4.3.2.2.1). Chum salmon also support regional ecosystem health and provide for resilient populations of other traditional foods, directly linking salmon abundance with ecosystem health and community well-being (see Section 4.4.3.2.3). Therefore, an action alternative that meaningfully reduces chum salmon bycatch would engender a variety of substantive benefits for Salmon People and ecosystems.

4.5.6 Effects from Combined Alternatives

This section highlights the potential combined effects on those dependent on WAK chum salmon if a combination of alternatives are adopted together. Chapter 2 describes that Alternatives 2 and 3 are mutually exclusive from one another, as is Alternative 3 and Alternative 5, Option 3. However, all other options and components of the proposed action alternatives may be selected in combination. In some cases the potential combined effects from the adoption of a combination of alternatives are expected to be different than the effects described above, if the alternative was adopted alone. This section flows directly from Section 3.3.4.7, which describes the combined effects of the alternatives on chum and WAK chum salmon.

Alternative 2 or 3 + Alternative 5

Section 3.3.4.7 describes that the result of a combination of an overall chum salmon PSC limit (Alternative 2 and 3) along with the adoption of a corridor cap is highly dependent on many factors, in particular the cap levels selected.

With a low overall chum salmon PSC limit and corridor cap fewer WAK chum salmon are expected to be caught while pollock vessels respond to the incentives generated by the management measures and/or experience closures of the corridor or overall for the B season. Because the inseason corridor area and closure window (June 10-August 31) spatially and temporally overlaps the majority of the WAK chum salmon bycatch since 2011, whether closures occur or not this combination of alternatives is expected to reduce WAK chum salmon PSC. Although the impact of this combination of alternatives is unquantified in the analysis, it would be expected to lead to some additional adult WAK chum salmon returns to rivers of origin providing the types of broader benefits described in Section 4.5.5. If this amount, combined with other factors, is able to aid in meeting escapement goals and providing subsistence fishing opportunities, benefits for Western and Interior Alaska Tribes, communities, mixed-economies, and broader ecosystem functions may be realized.

An overall and inseason corridor chum salmon PSC limit set at higher amount in their respective ranges may provide a weaker incentive for behavior changes compared to a combination of caps set at lower or middle values. Granted, if an overall or corridor PSC limit is apportioned to the vessel-level, PSC limits at that higher range may still be perceived as a risk by some vessels and motivate more avoidance. However, in general, a combination of these limits may generate more limited changes from status quo for WAK chum salmon users.

Alternative 2 or 3 + Alternative 4 and/or Alternative 5

In general, the provisions identified to be included in Federal regulations for IPA management (Alternative 4) may be effective tools to remain under the overall or inseason corridor chum salmon PSC limits and/or to provide additional focus for the reduction of WAK chum salmon specifically as described in Section 3.3.4.7. This may result in additional benefits in terms of WAK chum salmon savings from their joint adoption.

4.5.7 Combined Effects for Chum Salmon Users

Past and present human actions have had combined and wide-ranging effects on the health, cultures, and economies of communities, Tribes and individuals engaged in or dependent on chum salmon fisheries in Western and Interior Alaska (see Section 4.4.3, Section 4.4.4.1, and fisheries and Section 4.4). Additional information is also available in Appendix 8, independently-authored by KRITFC, as well as their other reports (KRITFC, 2021, 2022, 2023) and Appendix 9a, independently-authored by TCC. In Appendix 8, KRITFC emphasizes its perspective that all factors related to WAK chum salmon declines, including the pollock fishery's bycatch and the exclusion of TK from decision-making processes, are experienced by chum salmon dependent communities in a cumulative way.

Actions that may have a combined impact with the proposed actions include authorization and prosecution of the Bering Sea pollock fishery and ecosystem change, described at the beginning of Chapter 3. In addition, chum salmon dependent communities may be affected by:

South Alaska Peninsula Management Area (Area M)

As described in Section 4.4.4.2, some amount of Western Alaska chum salmon has been caught in the Area M commercial salmon fisheries since at least 1980. The Area M fishery is proximate to the action area, and while specific aspects of overall State of Alaska salmon fishery management continue to be modified, it is reasonably foreseeable that this fishery will continue in the future. As noted elsewhere in this document, WAK chum removals from the Area M fishery have exceeded WAK chum removals from bycatch in the Bering Sea pollock fishery.

Hatchery Releases of Chum Salmon

Hatchery production of salmon is an RFA that may affect WAK chum salmon through competition for food and habitat (see Section 3.3.2.1 and Ruggerone, et al., 2021). Hatchery releases of chum salmon have increased over time, particularly since the mid-1980s, reaching a peak in 2023 at 3.44 billion chum salmon released from all countries around the North Pacific Rim (NPAFC, 2024).

Improved WAK Chum Salmon Genetic Analyses and Modeling

As described in Appendix 8, independently authored by KRITFC, and acknowledged in Section 3.3.2, research is currently being conducted to provide better information on the spatial distribution and stock composition of the bycatch (see Appendix 8, Attachment 2 and 3 as well as Head et al., 2024). This work is intended to improve the information available on WAK chum salmon and impacts of bycatch. Depending on the outcome of the research, this additional information may aid the pollock fishery in its efforts to avoid WAK chum salmon inseason. Other ongoing work may also improve the resolution of stock structure, which could eventually allow managers to estimate the stock-specific impacts of harvest at a much finer scale and provide broader potential benefits to communities (see Appendix 8, Attachment 1).

Subsistence and Commercial Chum Salmon Fisheries Management

ADF&G manages commercial, subsistence, sport, and personal use salmon fisheries (see Section 3.3.3). Additionally, within Federal waters of the Kuskokwim and during periods of conservation concern, USFWS and KRITFC are responsible for co-managing rural subsistence salmon fisheries (see Appendix 8.3.C). This management system is a broad ongoing action. The chum salmon run declines in recent years have resulted in some management areas not meeting some or all escapement goals as well as restrictive management actions on commercial, sport, and subsistence harvests of chum salmon as described in Section 3.3.3. Subsistence fishing has been limited or closed on the Kuskokwim River since 2021 and limited or closed for the Yukon summer and fall run since 2020 (Section 4.4.3). It is likely that state, federal, and Tribal managers will continue to issue in-river chum salmon fishing restrictions until populations rebuild, and that fishers may additionally voluntarily restrict their harvests to support conservation efforts.

Effects of the Proposed Actions

The management structure for Western and Interior Alaska chum salmon fisheries will not be affected by the proposed action (*i.e.*, a priority for management to meet spawning escapement goals; that the highest priority for use is subsistence under state and Federal law; and that salmon surplus above escapement needs and subsistence uses are made available for other consumptive uses of the stock). The effects of Alternatives 2 through 5 are intended to *reduce* chum PSC and WAK chum PSC in the pollock fishery to the extent practicable. To the extent these alternatives can achieve this objective, as evaluated in detail in Section 3.3.4, the proposed alternatives being considered in this Federal action under NMFS's authority are not anticipated to have adverse combined effects on chum and WAK chum salmon or those communities and Tribes that depend on these resources. However, action alternatives that result in minimal or perverse outcomes for WAK chum salmon would not aid in supporting the restoration of salmon stocks or communities' well-being when considered cumulatively with other factors.

4.6 Summary of Potential Costs and Benefits, Consideration of Net National Benefits

Consideration of the net benefits of the proposed action to the Nation is required by EO 12866. This approach employs the concepts of a BCA, as described at the beginning of Section 4.1. This is a specific type of economic analysis that compares the expected benefits and costs of an action, typically in monetary terms. The intent is to 1) demonstrate whether the benefits of an action are likely to justify the costs, and 2) discover which of the various possible outcomes would be the most cost-effective. Where all benefits and costs can be quantified and expressed in monetary units, BCA provides decision makers with a clear indication of the most efficient alternative, that is, the alternative that generates the largest net benefit to the U.S. It is not always possible to express the important benefits and costs in monetary terms, as is the case for actions considered in this analysis. In this case, the guidance from *Circular A-4* (2003) directs the analysis to rely on a qualitative assessment of the costs and benefits.

While the full RIR is meant to provide broader context for the nuances and uncertainty around the expected effects, as well broader context for the distributional impacts that may result from the proposed action, the net benefits analysis is focused on a particular scope (the U.S.) with a particular methodology (BCA). It is important to understand what is not included in this type of analysis. For instance, changes in employment and most tax revenues are not economic benefits within a BCA. The former is an example of an economic impact, and the latter is a transfer payment within the economy. However, both of these issues are important to policy makers and the public and are considered as part of the broader RIR analysis. Conducting a BCA is often useful and informative even if the resulting summary measure is only one of many factors considered (USD HHS, 2016). Benefits and costs are measured from the perspective of the Nation, rather than from that of private firms, individuals, or communities. Benefits enjoyed by other nations, foreign owners or foreign consumers are not included, although tax payments by foreign owners, and export revenues are benefits to the Nation.

A statement of effects on Net National Benefit will be prepared once the Council has identified a preferred alternative or taken action to recommend an alternative. This section provides an overall summary of benefits and costs that will be considered when making a determination of the effect of the action on net national benefits.

For consistency of accounting in this section, impacts categorized as potential **costs** are related to the investment or inputs needed to achieve the goals of action. This means impacts could represent either cost savings (- cost) or additional costs (+ costs). The potential **benefits** are related to the intended outcome of the proposed regulations. Alternatives may provide benefits (+ benefits) or work against intended goals (- benefits). It should also be noted, that while the purpose and need statement (Section 1.1) defines a purpose of “*develop[ing] actions to minimize bycatch of Western Alaska origin chum salmon in the Eastern Bering Sea pollock fishery,*” this RIR highlights the broader potential benefits of this goal. This

includes environmental, social, cultural and economic dimensions associated with increased WAK chum salmon returns.

Summary of Marginal Costs from Proposed Alternatives

Table 4-49 categorizes the costs described in the RIR, including expected changes in consumer costs, producer costs, and any expected cost savings to the Bering Sea pollock fishery and consumers.

The alternatives are expected to have either neutral or negative effects on **U.S. pollock producers**, which include U.S. businesses throughout the production process. This includes AFA harvesters, shoreside processors, CDQ groups and subsidiaries, and businesses that provide support services to operations. As mentioned, this calculation does not include changes in employment or community tax revenue. The degree of costs (or decreased revenue) incurred is expected to vary widely in magnitude depending on the alternative(s) selected.

At a high level, implementation of an overall or corridor PSC limit (Alternative 2, 3 or 5) could decrease production due to unharvested B season pollock. This could adversely affect revenues for harvesters, processors, CDQ groups, and other associated U.S. shoreside businesses that support this fishery. The magnitude of these effects is expected to be greatest under low overall PSC limits (Alternative 2 or 3), a corridor cap with a low limit and full corridor closure (Alternative 5, Option 1), or an outcome that includes these alternatives. The impacts of these alternatives can be qualitatively anchored using potentially forgone revenue and revenue at risk as demonstrated in Section 4.3. These values represent an upper bound on direct gross revenue impacts given the understanding that if implemented, harvesters are expected to adjust fishing practices as much as able, to remain under their apportionment of the limit and under Alternative 5, some amount of harvest may also be recovered outside of the closure area.

One of the most likely impacts under any alternative that requires or motivates operational changes and increased chum salmon avoidance practices is an increase in operational costs. As described in Section 4.3.2.2.1 and Section 4.3.2.3.1, this could include increased fuel costs, observer costs for offshore vessels, the opportunity costs associated with increased transit time (in which a vessel may have otherwise been fishing) and potentially moving to areas with lower pollock CPUE. If the fishing season is extended this could increase variable costs associated with production. In addition, increased avoidance could possibly lead to decreased product value if the size of the fish caught is less than the minimum needed to make a certain product or quality of the product worsens due to the additional transit time. Analysts do not have access to operational cost data other than fuel costs (see NPFMC, 2024) and cannot predict the degree of additional movement each alternative may motivate. Thus, the empirical data to adequately quantify this impact is not available. Generally, it is expected that the greater the consequence of the management measure, the greater operational costs the vessel would be willing to incur.

Other alternative combinations may present more limited changes in costs and production. For instance, Alternative 4 would largely codify operational strategies and any additional operational cost that have occurred in recent years under IPA changes. The chum salmon PSC limit (Alternative 2 or 3) and inseason corridor caps (Alternative 5) at the highest limits considered may only motivate operational changes earlier in the B season or if cooperatives build in additional vessel-level incentives such as vessel-level apportionments.

Impacts to **U.S. consumers of pollock** would be indirect but felt cumulatively with global factors. For a net National benefit calculation, non-resident consumers outside the U.S. are not included. As described in Section 4.2.1.2, approximately 21% of Alaska pollock supply goes directly to the domestic market (McKinley Research Group, 2023) and pollock producers have been seeking increased domestic market opportunities. However, U.S. pollock has historically had substitutes in domestic markets, therefore a decrease in available product may result in consumers shifting demand towards other products rather than being willing to pay higher prices. However, recent EOs and global trade conditions may make substitute imported products less available and/or more expensive. There are many changes likely occurring in price and supply under baseline conditions, therefore the full impacts under baseline conditions on consumers

are still unclear. Additionally, if repeated or erratic B season closures have a more widespread multi-species effect on seafood harvesters and processors, paired with U.S. ban of Russian seafood imports, this could impact consumer access to pollock, as well as other Alaskan species. Due to these many exogenous factors and uncertainties, costs to consumers are not able to be quantified; however, action alternatives would be most likely to affect U.S. consumers if they resulted in unharvested B season pollock (reduced pollock supply), all else being equal.

Cost savings are generally not expected from the proposed action. With a focus on minimizing WAK chum salmon bycatch, the proposed management measures are all intended to either incentivize or require different fishing behavior from the Bering Sea pollock fleet. Some of the proposed actions may have no effect on fishing behavior overall or in a given year, other measures considered may require vessels to move more often or to sub-optimal fishing locations and/ or they may end the B season early.

Table 4-49 Summary of types of costs associated with the proposed actions and factors that affect the likelihood these costs will be realized

	Type of Cost	Likelihood of Impacts Depend on
Increased Costs to U.S. Producers	If action results in unharvested B season pollock If action aids in increasing operational costs or reducing revenues due to lower quality/ size of pollock	- Fleet's ability to adapt fishing practices to minimize chum salmon bycatch while continuing to fish under the management measures adopted - Environmental conditions in that year
Increased Costs to U.S. Consumers	If action aids in increasing price or decreasing quality or quantity of pollock products available for U.S consumers	- Elasticity of demand (substitutability of other products) - Recent EOs and global trade conditions - Stability of processors and their ability to continue to process other species
Cost Savings	If action aids in a reduction of costs for producers or consumers	No cost savings expected relative to no action

Summary of Marginal Benefits from Proposed Alternatives

Table 4-50 summarizes the possible types of benefits that may occur from the alternatives, which are described in greater detail in Section 3.3.4 for WAK chum salmon and Section 4.5 which is a direct extension of the potential benefits to people and ecosystems connected to WAK chum salmon. In Table 4-50, benefits are either categorized as short/medium term benefits, longer term benefits or negative benefits (representing any possible unintended outcomes for WAK chum or Chinook salmon from the proposed alternatives). Additionally, as represented in the third column in Table 4-50, to the extent the action alternatives are successful in reducing WAK chum salmon bycatch and aiding additional salmon to return to WAK river systems, there could be much broader benefits to people and ecosystems.

The benefits that would be accounted for within this scope have not been fully quantified or monetized. Some quantitative context has been provided that emphasizes the impacts of the chum and Chinook salmon declines. For instance, Section 4.1.1 of Appendix 9 TCC cites the costs associated with their efforts to distribute salmon to villages in 2021, as well as ADF&G estimates for the loss in subsistence salmon value provided for Federal disaster assessments. However, the estimates provided represent a portion of the full value of chum salmon as expressed by TCC in Appendix 9, KRITFC in Appendix 8, and in this DEIS. Section 4.5.5 and Section 4.4.3.2 describe the cultural significance of chum salmon for many Western and Interior Alaskan Tribes. Harvests and consumption primarily occur in mixed economies for which there is no dollar value exchanged. Additionally, these sections describe the many ways in which chum salmon support traditional lifestyles, holistic wellbeing, and are a healthy food source providing food security and food sovereignty, particularly in light of changing ecosystems and declines in Chinook salmon. Although unquantified and unmonetized, if the bycatch reductions occur alongside positive cumulative factors (*e.g.*, favorable environmental conditions for chum salmon), the positive impacts could be substantial, as expressed in the independently-authored submissions provided

by KRITFC and TCC (see Appendix 8 and 9) and extensive public testimony received by the Council in April 2024 and February 2025. Positive cumulative factors could aid in broader implications such as improved food sovereignty and food security, enhanced community cohesion, and facilitating intergenerational knowledge transfer potentially restoring human-salmon-ecosystem relationships.

There is uncertainty around whether and to what degree benefits may manifest from the proposed alternatives for people and ecosystems (see Section 3.3.4 and Section 4.5). The primary conservation benefit of the proposed management measures was quantified as AEQ WAK chum salmon bycatch reductions. If either Alternative 2 or 3 were selected, the retrospective analysis shows the PSC limits and apportionment options under consideration may improve WAK chum salmon abundance. The magnitude of the potential conservation benefits (measured as returning AEQ fish) would depend on many factors including the combination of PSC limit and apportionment, the fleet's ability to avoid WAK chum salmon in a given year, whether the fish avoided by the pollock fishery are caught at sea by other fisheries, and environmental conditions, among others. Section 4.5.2.1 describes that comparing the predicted AEQ bycatch reductions to the Yukon summer and fall chum salmon runs do not appear to result in measurable, indirect benefits towards meeting escapement in years of very low abundance. The potential benefits of reductions in the AEQ bycatch for the CWAK group would be widely diffused across river systems from Kotzebue Sound in the north down through Bristol Bay and there is no way for the analysts to predict the proportion of saved fish that would return to any given system/area. However, as described in Appendix 8, independently authored by KRITFC, even a small number of additional returning chum salmon due to the proposed management changes could increase abundance with broader conservation and ecosystem benefits. Again, these are difficult values to measure and likely dependent on the performance of cumulative factors.

Future behavioral responses from the pollock fishery could also influence whether the alternatives result in positive, neutral, or negative effects for WAK chum salmon users and in river ecosystems. The "actual" AEQ bycatch reduction in the future may be more or less than the estimates reported in the document. For instance, if a PSC limit implemented under Alternatives 2, 3, and/or 5 are perceived as having a high risk and consequence by vessel operators, it is likely they will take proactive measures to increase avoidance and prevent a closure, to the extent they are able. The further vessels remain below the overall PSC limit, the greater the resulting chum salmon savings would be, exceeding the reported values in this analysis. This may also result in greater WAK chum salmon savings. The reason the expected outcomes are different is because the WAK component in the overall bycatch varies each year but does not account for the majority of the bycatch. Therefore conversely, vessels focused on an overall chum salmon PSC limit may prioritize fishing in areas with the lowest known PSC rates and inadvertently catch more WAK chum salmon than they may otherwise have (see Section 3.3.4.4.2). This would be a negative benefit from a management measure creating perverse effects.

There are no quantitative estimates available for potential changes in WAK chum salmon for Alternatives 4 or Alternative 5, Option 1, 2, 3, or 4; however, in general, these proposed measures are not expected to have negative impacts on WAK chum salmon stocks.

Table 4-50 Summary of types of benefits associated with the proposed actions and factors that affect the likelihood these benefits will be realized

	Type of Benefit	Extended Benefits for Human Dimensions	Likelihood of Impacts Depend on
Positive Short/Medium-Term Benefits for WAK \Chum Salmon	If action aids in positive impact on WAK chum salmon returns that does not tip the scale for fishing opportunities	Passive use value Broader benefits to human-ecosystem networks	The ability for the proposed alternatives to generate positive impacts on WAK chum salmon returns depends on 1) the incentives generated for the pollock fleet and their ability to avoid more WAK chum and/or 2) whether the B season ends early for a pollock sector
	If action aids in positive impact on WAK chum salmon returns that does tip the scale for fishing opportunities	Passive use value Broader benefits to human-ecosystem networks Subsistence fishing opportunities Cultural practices Health benefits Food security Food sovereignty Community cohesion Knowledge transfer Commercial fishing opportunities (in some areas)	
Positive Longer-Term Benefits for WAK Chum Salmon	If action aids in increases in WAK chum salmon populations		Cumulative factors, including: • Environmental conditions • Catch in salmon fisheries • Hatchery releases throughout the North Pacific • Initiatives under other authorities (e.g., Chinook moratorium, Gravel to Gravel Initiative)
Negative Benefits	If action aids in an increase in WAK chum or Chinook salmon PSC relative to no action	Negative impacts for human dimensions and in river ecosystems	The incentives under the alternative selected may influence the pollock fleet's fishing behavior and whether there would be perverse outcomes for WAK salmon

Overall, it is not possible to quantify net benefits to the Nation given the high degree of uncertainty around the magnitude of the marginal costs and benefits. However, the analysis provides some BCA context with which to consider the alternatives.

- Where historical, quantifiable estimates are possible for an overall PSC limit (Alternative 2 or 3), the analysis often demonstrates a stark tradeoff between the potential costs (unharvested pollock) and benefits (chum and WAK chum salmon saved). This is due to the fact that the methods used are only able to quantify the impacts in prior years when the overall PSC limits (Alternative 2 or 3) or corridor cap (Alternative 5, Suboption 1) would have been met (see Section 3.1.4.1). However, this method cannot quantify future chum salmon savings, or the avoidance costs incurred from behavioral changes to avoid meeting the overall PSC limit, based on incentives produced by the risk and consequence of closures.
- If the measures are able to motivate fishing that yields the desired benefits (*i.e.*, reductions in WAK chum salmon bycatch) without closing the B season pollock fishery, the proposed action is more likely to result in greater net benefits to the Nation (or less negative net benefits to the Nation).
- Based solely on the estimates provided from retrospective data, Alternatives 2 and 3 demonstrate WAK chum salmon savings; however, based on these estimates no alternative alone would have an impact on AEQ WAK chum salmon returns such that it allows for increased harvest opportunities. However, there is a high degree of uncertainty in the potential combined effect of WAK chum salmon PSC reductions and whether and to what extent these actions would aid in

the long-term building of WAK chum salmon stocks. If this outcome did transpire, although unquantified, benefits could be substantial and widespread.

- Finally, to the extent that the proposed actions induce changes in fishing behavior to reduce chum salmon PSC, there could also be impacts to Chinook salmon. Many people, communities, and Tribes across Western and Interior Alaska also rely on Chinook salmon as a food source but also a key component to cultural practices and identity. If the induced behavior changes result in marginally greater catches of Chinook salmon as bycatch, the benefit to WAK chum salmon users and therefore the net benefits to the Nation may also be somewhat diminished.

4.7 Affected Small Entities (Regulatory Flexibility Act Considerations)

Section 603 of the Regulatory Flexibility Act (RFA) requires that an initial regulatory flexibility analysis (IRFA) be prepared to identify whether a proposed action will result in a disproportionate and/or significant adverse economic impact on directly regulated small entities, and to consider any alternatives that would lessen it. NMFS prepares the IRFA in the classification section of the proposed rule for an action. Therefore, the preparation of a separate IRFA is not necessary for the Council to recommend a preferred alternative. This section provides information about the directly regulated small entities that NMFS would use to prepare the IRFA in the proposed rule should the Council recommend regulatory amendments.

This section also identifies the general nature of the potential economic impacts on directly regulated small entities, specifically addressing whether the impacts may be adverse or beneficial. This section only highlights any costs and benefits of the alternatives that would differ between small and large entities.

Identification of Directly Regulated Entities

The proposed actions would directly regulate those entities that participate in the Bering Sea pollock fishery's B Season. These entities include the AFA affiliated pollock fleet – CPs, CVs that deliver to inshore processors, CVs that deliver to motherships – and the six western Alaska CDQ Program groups that receive allocations of Bering Sea pollock. Alternatives that result in reduced pollock harvest may affect businesses that own inshore processing facilities or motherships, but no alternatives would modify regulations that directly govern these businesses on their own.

The CDQ Program was designed to improve the social and economic conditions in western Alaska communities by facilitating their economic participation in the BS fisheries. In aggregate, CDQ groups share a 10 percent allocation of the BSAI pollock TAC. Through this ownership and their partial ownership in many of the vessels in the BS pollock fishery, CDQ groups are directly regulated entities.

Count of Directly Regulated Entities That Are Small Entities

The RFA recognizes and defines three kinds of small entities: 1) small businesses, 2) small non-profit organizations, and 3) small government jurisdictions. No government jurisdictions are regulated by this action, so this analysis focuses solely on the directly regulated businesses and non-profits.

Businesses classified as primarily engaged in commercial fishing are considered small entities if they have combined annual gross receipts not in excess of \$11.0 million for all affiliated operations worldwide or in excess of 750 employees for processors and Motherships (50 CFR § 200.2).¹⁶² Motherships are indirectly regulated by most of the alternatives; however, changes to incentive plan agreements may directly affect Motherships. Thus, the two operating motherships may be directly regulated small entities. If business entities have a known affiliation, then the \$11.0 million threshold is applied to the group of affiliated entities rather than individually. NMFS considers members of fishing cooperatives to be

¹⁶² Businesses classified as primarily engaged in fish processing are considered small entities if they employ 750 or fewer persons on a full-time, part-time, temporary, or other basis, at all affiliated operations worldwide. No processors are directly regulated and so this test is not applicable for this analysis.

affiliated, applying the Small Business Administration's (SBA) “principles of affiliation”, specifically, its description of “[A]ffiliation based on identity of interest” (13 CFR § 121.103(f)):

[A]ffiliation may arise among two or more persons with an identity of interest. Individuals or firms that have identical or substantially identical business or economic interests (such as family members, individuals or firms with common investments, or firms that are economically dependent through contractual or other relationships) may be treated as one party with such interests aggregated.

From 2019 to 2024, 99 vessels participated in the AFA fishery, and of those, 89 were active in 2023.¹⁶³ In 2023, all active vessels were either in cooperatives whose combined revenue exceeded the \$11.0 million threshold or, when combined with known affiliated vessels, total gross revenue exceeded the \$11.0 million threshold. Thus, based on 2023 revenue, none of the active Bering Sea pollock vessels were identified as small entities.

The only small entities that are directly regulated by this action are the six CDQ groups. CDQ groups are non-profit entities that are also directly regulated under the proposed alternatives. Under the RFA, a non-profit entity is considered a ‘small organization’, and thus a small entity. Each of the directly regulated CDQ groups is an independently owned and operated small entity and not dominant in the pollock industry and is, therefore, a small organization. CDQ groups’ affiliations, including their for-profit subsidiaries, with other large entities do not qualify them as large entities.

Most CDQ groups have made direct investments in fishing vessels through wholly- or partially- owned for-profit fishing companies, several of which are directly regulated by this action (see Section 4.2.2.2). Due to either cooperative affiliation or company affiliation, these for-profit entities are all considered large entities for RFA purposes.

Impacts to Small Entities (CDQ Groups)

As described in Section 4.2.2, the six CDQ groups are:

- Aleutian Pribilof Island Community Development Association (APICDA)
- Bristol Bay Economic Development Corporation (BBEDC)
- Central Bering Sea Fishermen’s Association (CBSFA)
- Coastal Villages Region Fund (CVRF)
- Norton Sound Economic Development Corporation (NSEDC)
- Yukon Delta Fisheries Development Association (YDFDA)

As described in Section 3.2.1, the pollock fishery harvests approximately 1.3 million tons of pollock each year (some years substantially more, some somewhat less) and provides millions of dollars in revenue to western Alaska CDQ communities through various channels, including through direct catch and sale or leasing of quota to various harvesting partners. The vessels harvesting CDQ pollock are the same vessels conducting AFA non-CDQ pollock harvesting. Revenue derived from groundfish allocations and investments in BSAI fisheries may enable these non-profit corporations to better comply with the burdens of this action.

The range of potential impacts on CDQ groups is described in Section 4.3. Based on the best available scientific data, Alternatives 1 and 4, and Alternative 5, Suboption 1 and Option 2, and the less constraining PSC limits under Alternatives 2, 3 and 5, Option 1 would have the potential to minimize any significant adverse economic impact on small entities, as they are least likely to result in decreased pollock harvest. This action is not expected to have more than a *de minimus* effect on the recordkeeping

¹⁶³ Of the 89 vessels that participated in the 2023 AFA fishery (A and B season), 13 acted as CPs and 76 were CVs Table 4-1).

and reporting requirements of CDQ groups, particularly as any additional costs would likely be spread across the entirety of each sector.

None of the alternatives under consideration are expected to have a disproportionate impact on small entities relative to large entities. While some of the alternatives or combinations of alternatives may generate adverse impacts for the CDQ groups, including more operational costs and opportunity cost associated with harvesting Bering Sea pollock, they may be similar to impacts on AFA companies defined as large entities. One difference may be that options for apportionment (Alternative 2, Options 1, 2, and 3) that are based on historic chum salmon bycatch of each sector may have implications for the CDQ groups ability to lease CDQ pollock. During the analytical period of 2011-2023, the CDQ groups have leased CDQ pollock only to CPs. Should they desire to lease to inshore or mothership CVs in the future, as highlighted in the analysis (Section 2.4.1.1), these apportionment approaches may restrict the ability of CDQ groups to do so. The suboption to consider a 'CDQ Reserve Pool' under Alternative 2 or 3 (Section 2.4.1.1) or Alternative 5 (Section 2.7.4.1) is an option to minimize this adverse impact. However, it would be implemented with the tradeoff of potentially increased chum salmon PSC from these groups.

Additionally, the analysis highlights potentially disproportionate impacts from the corridor caps, in particular Alternative 5, Option 1, on inshore CVs, some of which are wholly or jointly owned by CDQ groups. As described in this section, these subsidiaries do not meet the definition of small entities under RFA due to their cooperative affiliation.

5 Management Considerations

Generally, the proposed alternatives do not require significant modifications to the status quo NMFS approach to monitoring, management, and enforcement of salmon bycatch in the Bering Sea pollock fishery. NMFS would be able to use the existing approach for both Chinook and chum salmon. Unless otherwise noted, the existing regulations in 50 CFR 679.21(f) remain in place.

5.1 Alternative-Specific Considerations

5.1.1 Alternative 1

To support the Council's salmon bycatch management goals, NMFS has implemented a comprehensive monitoring program to collect data on salmon bycatch in the Bering Sea pollock fishery. This program, which allows for accurate and precise estimation of all salmon bycatch including chum salmon, was first implemented in 2011 under amendment 91 to the BSAI Groundfish FMP, refined in 2016 under amendment 110, and further refined in 2024 under amendment 126 with the adoption of an electronic monitoring (EM) program that includes the Bering Sea pollock fishery.

NMFS collects a broad range of salmon bycatch data from the Bering Sea pollock fishery, including a count and species identification of all salmon bycatch. For Chinook and chum salmon, tissue samples are taken from a subsample to determine the relative stock composition of the bycatch (*i.e.*, proportion of non-Chinook PSC from each identifiable genetic group). Salmon must be sorted so that all are counted and to enable biological sampling. Every vessel must retain all salmon bycatch; at-sea discard of salmon is prohibited before the number of salmon has been determined by an observer and the collection of scientific data or biological samples from the salmon has been completed (see [50 CFR 679.7\(k\)\(8\)](#)). CVs must retain and deliver all salmon species for counting by observers at the dock.

Bycatch monitoring is accomplished through the following requirements for observer coverage or participation in electronic monitoring for all vessels and shoreside processors (Table 5-1 and the following sections).

Table 5-1 Summary of salmon bycatch monitoring in the BSAI pollock fishery

Fishery	Observer Monitoring	Salmon Discard Prohibition	Salmon Accounting	Salmon Biologicals
Catcher Processor (CPs)¹	✓ Two At-sea observers on every fishing trip (200%)	✓ All salmon discards are prohibited	✓ All salmon are counted and identified to species	✓ Biological information, including genetic samples, on Chinook and chum salmon
Motherships¹	✓ Two At-sea observers on every fishing trip (200%)			
Catcher vessels² delivering to shoreside processors (non-EM)	✓ At-sea and shoreside observers (100%) and shoreside observers monitoring all offloads			
Catcher vessels² delivering to shoreside processors (EM)	✓ At-sea video recording of all fishing activity and shoreside observers monitoring all offloads			

¹ CPs and Motherships have two observers onboard. This is sometimes referred to as “200% observer coverage”.

² For all vessels delivering to a shoreside processor, salmon accounting and biological data are collected by shoreside observers.

Catch Monitoring and Control Plans (CMCPs) annually approved by NMFS staff outline how each shoreside processor must allow fishery observers to collect monitoring data (see [50 CFR 679.28\(g\)](#)).

The following two sections provide more detail on the monitoring of CPs, motherships, and CVs. These monitoring requirements apply for all salmon PSC (*i.e.*, Chinook and chum). For more information on the use of observer coverage, electronic technologies, and CMCPs to support salmon accounting, please see:

- Fully Counted: How Salmon Bycatch is Monitored in the Bering Sea Pollock Fishery at <https://www.fisheries.noaa.gov/s3/2023-08/Salmon-Bycatch-Flyer.pdf>
- Catch Weighing and Monitoring in Alaska at www.fisheries.noaa.gov/alaska/sustainable-fisheries/catch-weighing-and-monitoring-alaska
- Electronic Monitoring in Alaska at www.fisheries.noaa.gov/alaska/resources-fishing/electronic-monitoring-alaska

Monitoring on Catcher/Processors and Motherships

CPs and motherships have two fishery observers onboard each vessel to enable every haul to be monitored, 24 hours a day, every day. Once onboard, each haul is immediately deposited into one of several fish holds. When the vessel is ready to begin processing, fish are released from bins to flow over a series of conveyor belts through the factory.

Multiple regulatory requirements help ensure that the observers on a CP or mothership vessel can account for all salmon bycatch during fishing operations. Sorting of catch, including salmon, occurs after total catch is weighed on the flow scale. Crew on the sorting line must immediately put all salmon into the designated salmon storage container and keep it there until the observer has the opportunity to collect all necessary information from the salmon ([50 CFR 679.21\(f\)\(15\)\(ii\)](#)).

NMFS approved video monitoring systems in the vessel factories ensure that sorters place all salmon into the designated salmon storage container and do not remove them ([50 CFR 679.7\(k\)\(8\)](#)). A digital display

of real-time footage depicting catch sorting and salmon handling is available to observers during all fishing operations ([50 CFR 679.28\(e\)\(1\)\(viii\)](#)).

CVs delivering to motherships are not required to have observers onboard because the codend is never brought onboard the vessel while the CV is traveling to the mothership. They then transfer the codend directly to the mothership, where observers sort and count the salmon, as described above.

Monitoring on CVs Delivering to Shoreside Processors

CVs delivering to shoreside processors must either utilize at-sea observers or voluntarily participate in the EM program. CVs with at-sea observers must carry one observer on every trip (*i.e.*, 100% observer coverage). CVs in the EM program must carry EM systems to ensure compliance with fishery regulations, including prohibitions on discarding salmon, during fishing activity while CVs are at sea ([50 CFR 679.51\(g\)](#)). EM systems must be active for the duration of the fishing trip. After the delivery, an EM service provider reviews the video to ensure that the CV delivered all unsorted catch to the shoreside processor.

Regardless of whether a shoreside CV carries an observer or uses EM, all salmon bycatch is required to be delivered to a shoreside processor to ensure full accounting of salmon for every pollock offload. Observers at the shoreside processor monitor every offload. Any salmon encountered on the sorting line must be immediately put into a salmon bycatch storage bin and kept there until the observer can identify, count, weigh all salmon, and collect the required biological information.

5.1.2 Alternative 2

Alternative 2 would require no change to the status quo NMFS comprehensive approach to collecting salmon bycatch data. NMFS would modify [50 CFR 679.21](#) to incorporate an overall non-Chinook PSC limit. As it does for Chinook salmon PSC, NMFS would apportion the non-Chinook PSC limit among the sectors, and then among CDQ groups, inshore cooperatives and, where applicable, the inshore open access fishery.

Only those salmon caught during the B season fishery and accounted for in the non-Chinook catch accounting category would accrue to the PSC limit. While the non-Chinook catch accounting category includes sockeye, pink, coho, and chum salmon, over 99% of the salmon bycatch in this category are chum salmon. Although, using the updated catch accounting system, it would be possible to separate chum salmon from the other three species in the non-Chinook category, doing so would likely require regulatory changes and a system redesign. As such, **NMFS recommends** that the non-Chinook catch accounting category be unchanged under Alternative 2 and the rest of the action alternatives.

Table 5-2 Annual number of salmon, by species, caught as bycatch in the non-Chinook catch accounting category in the BSAI pollock fishery, 2011–2023

Year	Sockeye	Coho	Pink	Chum	Total	% Chum
2011	27	32	202	191,174	191,435	99.86%
2012	16	9	42	22,116	22,183	99.70%
2013	9	39	94	125,174	125,316	99.89%
2014	22	24	50	219,346	219,442	99.96%
2015	89	37	988	236,638	237,752	99.53%
2016	34	34	144	342,789	343,001	99.86%
2017	150	53	926	466,549	467,678	99.76%
2018	87	9	125	294,841	295,062	99.86%
2019	185	169	1,600	345,928	347,882	99.86%
2020	228	125	385	342,887	343,625	99.79%
2021	48	60	385	545,549	546,042	99.91%
2022	16	34	47	242,278	242,375	99.96%
2023	32	136	108	112,027	112,303	99.75%

Source: NMFS Alaska Region CAS.

NMFS would manage a non-Chinook PSC limit similar to the manner in which it manages the regulations that prohibit entities from exceeding their Chinook salmon PSC limit. Vessel operators, IPA managers, AFA cooperative managers, and NMFS track their Chinook salmon PSC, and cooperatives (including the C/P and mothership sectors) are prohibited from exceeding their Chinook salmon PSC limit and must stop fishing prior to exceeding their limit. NMFS reports any cooperative or CDQ group that exceeds its apportioned PSC to NOAA's Office of Law Enforcement (OLE). This approach provides for more timely enforcement than NMFS-managed closures. By issuing an apportionment to a cooperative or CDQ group along with a prohibition to exceed that apportionment, the cooperative or CDQ group can track their bycatch in near real-time and incorporate real time salmon avoidance measures to ensure the PSC limit is not reached, and cease pollock fishing immediately if the limit is reached. Regardless of which Alternative 2 option or suboption is selected, this approach to management of the non-Chinook PSC limit would not change.

CDQ Non-Chinook PSC Reserve Pool

The CDQ Reserve Pool suboption under Alternative 2 would create some new NMFS management responsibilities. The purpose of this reserve pool would be to allow an additional apportionment of PSC from the pool to a CDQ group that timely communicates its commitment to have its CDQ pollock quota harvested by either the inshore or mothership sector. This is because CDQ groups have historically harvested their CDQ pollock quota in association with the CP sector, and the PSC apportionment may not be sufficient to otherwise allow harvest with another sector if required.

As provided in the Council's motion, the CDQ group would not be able to split its pollock quota between sectors or switch its association midseason. After a CDQ group notifies NMFS that it is not harvesting in association with the CP sector, the selected sector - either inshore or mothership - must harvest all of the CDQ group's pollock quota for that year. Because PSC apportionments cannot be modified inseason, the reserve pool would not be able to be used for inseason contingency or emergency situations.

NMFS recommends that the notification deadline for a CDQ group to notify NMFS of its intent be **October 15** in order to be incorporated in the proposed BSAI annual harvest specifications. The Council's motion provides that any CDQ group that intends to associate its pollock quota with the inshore or mothership sector must notify NMFS by November 15. At the December Council meeting, and contemporaneously with final harvest specifications, NMFS notifies the public and Council of salmon PSC apportionments. Receiving notice from a CDQ group so close to the start of the December Council meeting on November 15 may create unnecessary urgency for NMFS to complete PSC allocation tasks and would not allow for incorporation in the proposed harvest specifications.

Although it would not include the additional apportionment of PSC contemplated in the suboption, the concept of the CDQ Reserve Pool under an overall chum salmon PSC or a corridor chum salmon PSC limit could be internalized among CDQ groups with contractual agreements. Similar to the buffers that are internally generated for the Chinook PSC limit under the IPAs, a portion of the limit could be dedicated for this particular purpose. CDQ groups could develop a contractual framework agreement outside of regulation that stipulates the conditions under which this buffer pool may be accessed by a group and CDQ groups would not be required to inform NMFS the previous year for the BSAI harvest specification process. To take this private party contractual agreement approach would not require the selection of the CDQ reserve pools suboption currently in the motion. It would not set the terms in Federal regulation or be managed by NMFS. It would have the advantage of providing greater inseason flexibility in providing access in emergency or unforeseen situations based upon a framework preestablished by CDQ groups. For instance, the reserve pool could be accessed if CDQ pollock is transferred to an inshore or mothership vessel mid-season. This variation on the CDQ Reserve Pool would fit within the analyzed set of alternatives as long as the total chum salmon PSC limit (including this buffer) is within the ranges analyzed in under Alternative 2, 3, and 5.

5.1.3 Alternative 3

Alternative 3 would also require no change to the status quo NMFS comprehensive approach to collecting salmon bycatch data or managing the Bering Sea pollock fishery. However, as it does with the abundance-based Chinook salmon PSC limit, NMFS would rely on ADF&G to annually provide abundance indices that NMFS can use to determine if the thresholds for “low WAK chum salmon abundance” are met. The information ADF&G would use to estimate abundance would depend on the area index suboption. An overall non-Chinook PSC limit would be in effect during the B season fishery based on indices of the prior year’s chum salmon abundance. All non-Chinook salmon taken as bycatch during the B season would accrue to the PSC limit (which would be within the range of 75,000 to 550,000 chum salmon).

By October 1 of each year, ADF&G would inform NMFS and the Council of the estimated chum salmon abundance indices and the supporting methods, data, and analysis used to generate the indices, which would allow NMFS to determine if the thresholds have been reached and which, if any, of the chum salmon bycatch limits should be imposed the following year. This timing would accommodate the Council’s annual October meeting where proposed groundfish harvest specifications (including PSC limits) are recommended. This timing would also provide the opportunity for review by the Council, its Scientific and Statistical Committee, and the public. This transparent public process is necessary for ensuring that each abundance index represents the best available scientific information and ensuring that the data and methods used in the index continue to provide a reliable indicator of chum salmon abundance necessary to set the PSC limit.

If a chum salmon bycatch limit is triggered, NMFS would publish the limit with the proposed rule for the proposed BSAI groundfish harvest specifications following Council action in October. It would then apportion the PSC limit, and any PSC from the CDQ reserve pool, in the final harvest specifications.

If the Council recommends Option 1 (three-river index), **there is a decision point for the Council** about what should happen if the source of the data for any of the three indices stops being maintained. For example, should one of the data sources for the Norton Sound summed escapement in the Snake, Nome, Eldorado, Kwiniuk, and North Rivers become unavailable. One option would be the approach taken under amendment 110 to the BSAI Groundfish Fishery Management Plan. There, should ADF&G identify a need to modify its methodology for estimating inriver abundance given the available information, it must explain the need and basis for the modification in its annual letter to NMFS. This approach allows for methodology improvements over time and the flexibility to address unique circumstances in any given year. In sum, while the index would not change, the methodology for estimating abundance may, so long as an explanation is provided to NMFS, the Council, potentially the SSC, and the public.

5.1.4 Alternative 4

Alternative 4 would require no change to the status quo NMFS comprehensive approach to collecting salmon bycatch data or managing the Bering Sea pollock fishery.

It would require modifications to any effective IPA, which are legal contracts that create incentives for salmon bycatch avoidance. The IPAs were implemented under amendment 91 alongside the Chinook salmon PSC limit that requires the pollock fishery to cease fishing when reached. The IPAs establish vessel-level incentives for members to avoid Chinook and chum salmon bycatch. As of the 2024 fishing season, all participants in the Bering Sea pollock fishery are members of the IPAs.¹⁶⁴ Under Alternative 4, industry must add up to six new industry-proposed elements to the IPAs, each of which are intended to further avoid chum salmon bycatch in areas and times of highest proportion of Western Alaska chum salmon stocks and analyze chum salmon avoided and operational tradeoffs.

¹⁶⁴ The IPAs and amendments can be accessed at NMFS website--<https://www.fisheries.noaa.gov/alaska/bycatch/chinook-salmon-bycatch-management-alaska>.

NMFS must review and approve all IPAs and IPA amendments ([50 CFR 679.21\(f\)\(12\)](#)). If there are deficiencies, NMFS initially requests that a submitter correct the identified issues. If corrections are not made, NMFS may disapprove a proposed IPA or amendment to an IPA for the reasons outlined in [50 CFR 679.21\(f\)\(12\)\(v\)\(D\)](#), including if the IPA fails to contain a description of the required IPA elements. The rules outline how the IPA representative can address a NMFS disapproval of an IPA, such as through revising it or initiating an administrative appeal ([50 CFR 679.21\(f\)\(12\)\(v\)\(D\)](#)). IPA representatives must provide a publicly available annual report of IPA performance to the Council ([50 CFR 679.21\(f\)\(13\)](#)).¹⁶⁵

Regardless of whether any of the six proposed IPA elements are added to the list of required elements under [50 CFR 679.21\(f\)\(12\)\(iii\)\(E\)](#), NMFS management of the IPAs would not change. The IPA managers would be required to ensure that the IPAs address the new elements, modifying IPA provisions where necessary. They would be required to submit all changes incorporated into the IPAs to NMFS, which would then perform its review under [50 CFR 679.21\(f\)\(12\)\(v\)](#) and approve or disapprove. All vessels that are members of the IPAs would then be required to comply with the amended IPA provisions. The IPAs would continue to provide annual reports to the Council on IPA performance.

5.1.5 Alternative 5

For Alternative 5, the Council's motion provides three different options for the size and shape of the closure inside the inseason corridor: Option 1, NMFS would close for the applicable sector(s) all 40 stat areas that compose genetic clusters 1 and 2; Suboption 1, NMFS would close 29 stat areas for the applicable sector(s) that compose genetic clusters 1 and 2; Option 2, IPAs would close between 19 and 29 stat areas inside genetic clusters 1 and 2. All three options involve a PSC limit that can be monitored and managed similarly to the Chinook salmon PSC limit. Both Option 1 and Suboption 1 create a corridor defined by regulation and that would be managed the same way every season.

Only Option 2 would require a significant modification of the existing IPA processes for the Bering Sea pollock fishery. Because the specific stat areas that make up the closed area may change each B season, a process would need to be developed, including the collection of additional information from the fleet, for NMFS to review and approve the stat areas selected by the IPAs.

General Monitoring and Management Considerations

No Alternative 5 option would require a change to the comprehensive approach NMFS uses under the status quo to collect salmon bycatch data. NMFS would continue to monitor all salmon bycatch. Under all three options, a non-Chinook PSC limit would be applied to the combined statistical areas within genetic clusters 1 and 2. All non-Chinook salmon caught within genetic clusters 1 and 2 from June 10 through August 31 would count towards the limit. This date range reflects the period when the majority of chum salmon bycatch has been encountered on the pollock fishing grounds and when Western Alaska chum salmon are typically encountered in higher proportions. The area-specific PSC limits would be apportioned among the pollock fishing sectors using the same options and suboptions as Alternative 2. Further apportionments to cooperative and CDQ groups would also be as provided in Alternative 2.

Under Alternative 5, Option 1, NMFS would manage a time/area non-Chinook PSC limit similar to the fashion it manages the Chinook salmon PSC limit. That is, cooperatives and CDQ groups will monitor their non-Chinook PSC (as does NMFS) caught within genetic clusters 1 and 2 between June 10 and August 31 and must ensure that their vessels stop fishing prior to exceeding their non-Chinook PSC limit within that period.

When the apportioned non-Chinook PSC limit for any sector is reached, that sector must cease pollock fishing within the designated corridor until September 1. NMFS reports any overages to NOAA OLE.

¹⁶⁵ The most recent IPA reports (March 2025) can be accessed on the Council's website--<https://www.npfmc.org/cooperative-reporting/>.

The apportionment of PSC limits to cooperatives and CDQ groups accompanied by a regulatory prohibition against exceeding such limits allows for more timely management than NMFS-managed closures by publication of notices in the Federal Register. The cooperative or CDQ group can monitor its bycatch in near real-time and require its vessels to cease fishing immediately.

Under Option 1, any sector that exceeds its apportioned non-Chinook PSC limit must stop fishing within 100% of the inseason corridor. Under Suboption 1, 29 statistical areas, or 75% of the inseason corridor would be closed. Under both Option 1 and Suboption 1, the stat areas closed to fishing would be constant from year to year and the same for all sectors.

Option 2 Considerations

Under Option 2, the IPAs can change the stat areas that may be closed to fishing from year to year for each sector. Each IPA must designate prior to the start of the B season the 19–29 stat areas that (between ~50% and ~75% of the inseason corridor), upon meeting the non-Chinook PSC limit, would be closed. NMFS expects that the process for its review and approval of each IPA’s selected stat areas would be as follows.

To provide the opportunity to review, each IPA would have to identify the stat areas to NMFS **prior to the start of the B season**. IPAs would be required to submit all closure area proposals in an IPA amendment each year before the B season starts and may not change these areas once the B season commences. After year one, if an IPA does not submit a timely IPA amendment, or NMFS does not approve of the IPA amendment, then the closure area for the prior year would remain in place.

In year one, all IPAs must describe its selected closure stat areas in an IPA amendment prior to the start of the B season. Failure to submit an IPA amendment that includes the proposed closure prior to the start of the B season would result in a prohibition against member vessels fishing within the corridor in that year’s B season, if also recommended by the Council.¹⁶⁶

CDQ groups shall be subject to the closure area of the IPA to which they are a party at the beginning of the B season. Historically, all CDQ groups have joined the Catcher Processor IPA. Under Option 2, should they continue to be subject to the CP IPA, they would also be subject to the same closure area as all CPs, as designated in the CP IPA approved by NMFS prior to the start of the B season. Similarly, if a CDQ group were to join the Inshore IPA, it would be subject to the same closure area as all inshore CVs. In effect, once a CDQ group’s apportioned PSC is exceeded, no vessel could fish that CDQ’s quota for the remainder of the closure period within the closure area designated in the IPA to which the CDQ is a party.

In the IPA amendment designating the proposed closure area, the IPA must provide sufficient information for NMFS to review the basis for the selected stat areas. The stat areas must be selected based on chum catch, pollock CPUE, and relevant genetic data. It will be important for the IPAs to include a description of its methods, supporting data, and analysis. Failure to timely provide sufficient information for the evaluation would impair the timely approval of the IPA amendment. NMFS will issue a letter to the IPA either approving or denying the IPA amendment or requesting additional information. IPAs could appeal the denial of an IPA amendment in the same manner as for all IPA amendments under [50 CFR 679.21\(f\)\(12\)\(v\)\(D\)](#).

NMFS recommends that the Council consider clarifying its intent with respect to how the IPAs should use chum catch, pollock CPUE, and relevant genetic data to select stat areas. Issues that could be clarified include what constitutes “relevant” genetic data. Are all data regarding the genetic composition of bycatch relevant, or only a subset? Should IPAs put greater weight on certain data, such as genetic information? While it may be prudent to leave some discretion to the IPAs, if the Council wants to

¹⁶⁶ Currently, all catcher processor vessels and CDQ groups are members of the CP IPA (last amended on May 26, 2022), all CVs that deliver to motherships are members of the MSSIP (last amended on January 5, 2016), and all CVs that deliver to shore-based processors are members of the Inshore SSIP (last amended on May 31, 2024).

provide more guidance, it could facilitate NMFS' review of the selected stat areas during the approval process.

As under Option 1 and Suboption 1 of Alternative 5, under Option 2, cooperative managers and CDQ groups would be responsible for monitoring their vessels' compliance with all IPA provisions. IPAs would also be responsible for the provision and application of penalties for vessels that do not comply with IPA provisions, including any fishing within a closure area during a closure window.¹⁶⁷

Finally, if the Council recommends the adoption of Alternative 5, Option 2, NMFS suggests that it consider a provision that addresses situations in which vessels choose not to join an IPA. Under 50 CFR 679.21(f)(12)(ii)(A), no vessel owner or CDQ group is required to join an IPA. For example, the Council could add a provision to prohibit vessels that are not a member of an IPA from fishing in the inseason corridor in the B season, or during the timeframe the corridor is in effect (June 10 through August 31). The Council could consider any type of opt-out provision from the range of options and suboptions in the suite of alternatives. Without this provision, a vessel could avoid the Option 2 prohibition on fishing within a designated corridor area by choosing not to join an IPA and would thus not be bound to an IPA-specific corridor closure. Note that any vessel not in an IPA would also be subject to the PSC opt-out limit for Chinook salmon under 50 CFR 679.21(f)(5).

Currently, becoming a member of an IPA is voluntary ([50 CFR 679.21\(f\)\(12\)\(ii\)\(A\)](#)). It is noted that IPAs were created by the Council as a tool for members of the fleet to voluntarily take measures to reduce Chinook and chum PSC that NMFS would not require or otherwise enforce in practice. To encourage participation by sectors and individual members, the Council created several regulatory provisions, including lower Chinook bycatch limits that are imposed on sectors without a NMFS-approved IPA. An incentive for vessels to voluntarily join IPAs was created by imposing more significant limits on Chinook PSC and other measures that vessels could avoid. However, since the adoption of Chinook salmon PSC limits under amendment 91 and the attendant need for sectors to monitor their bycatch under IPAs, every vessel and CDQ group has been a member of an IPA.

A vessel could avoid the Option 2 prohibition on fishing within a designated corridor area by choosing not to join an IPA. As it is not an IPA member, it would not be bound to an IPA-specific corridor area. Therefore, if participation in an IPA is not required, it would be necessary to develop regulations that implement Option 2 for those vessels not in an IPA. The Council would need to decide what would be the Option 2 corridor area. For example, it could decide that those vessels would be prohibited during the closure period from fishing in all 40 stat areas (as opposed to only 19 to 29 stat areas). Another option would be to prohibit them from fishing in certain set statistical areas, as in Suboption 1. OLE would enforce time and area closures as is done currently.

Option 3: Abundance-based Threshold

Similar to how ADF&G and NMFS implement the Chinook salmon abundance index, ADF&G would annually notify NMFS of the estimated Yukon River summer and fall abundance. NMFS would determine if the abundance exceeded the selected abundance index values (either 75th or 90th percentile). The ADF&G notice would be provided by October 1 each year. If they are both exceeded, then the corridor cap and closure provisions do not apply for that B Season. Similar to Alternative 3, NMFS would notify the fleet whether there would be a corridor cap in place for the upcoming B season in its proposed

¹⁶⁷ Under Option 1 and Suboption 1, OLE would be able to review any instances of vessels fishing in closed areas and take all appropriate and authorized enforcement actions.

harvest specifications. There are no other management, monitoring, or enforcement considerations associated with this option.

Option 4: Winter Herring Savings Area

NMFS monitoring and management of the Winter HSA is described in Section 3.5.1.1. Shifting the start date for the pollock fishery from September 1 to September 30 would not require any changes to the status quo monitoring, management, and enforcement of herring PSC and the Winter HSA.

5.2 Transfer Provisions

The Council's rationale for incorporating transfer provisions is that they can provide vessels, cooperatives, and fishing sectors with more flexibility to utilize their B season pollock allocation. Absent a transfer, once a PSC limit is reached, the vessel must stop fishing. If the vessel obtains a post-delivery transfer, the vessel may complete the trip. Non-Chinook PSC under Alternatives 2, 3, and 5 would be transferable in the same fashion as for Chinook salmon PSC ([50 CFR 679.21\(f\)\(8\)\(i\)](#)). Transfer provisions for non-Chinook PSC would apply under any combination of options or suboptions under Alternatives 2, 3 and 5.

Regulations at 50 CFR 679.21 would allow non-Chinook PSC to be transferred among sectors, among inshore cooperatives and among CDQ groups. Intra-cooperative transfers of non-Chinook PSC would be completed by cooperative managers. However, inter-cooperative, inter-CDQ group, and inter-sector transfers of non-Chinook PSC would require NMFS approval of the transfer. Requests for approvals would be filed by the entity receiving the transfer (for example, see Chinook transfer approvals under [50 CFR 679.21\(f\)\(8\)\(ii\)](#)).

Regulations would also allow for post-delivery transfers of non-Chinook PSC. If the amount of chum salmon caught as bycatch in the B season pollock fishery exceeds an entity's apportionment, to cover the overage, the entity (*e.g.*, a cooperative or a CDQ group) would be eligible to receive a transfer of non-Chinook PSC from an entity with surplus PSC. The entity may not receive by transfer non-Chinook PSC greater than that required to balance the account to zero.

5.3 Inshore Open Access Fishery

For AFA vessels not in a cooperative (*i.e.*, inshore open access fishery), the status quo NMFS approach to collecting salmon bycatch data would remain unchanged. In historically rare occasions, inshore AFA CVs do not join a cooperative (see Section 2.4). In this event, by rule, they are part of a NMFS-managed inshore open access fishery. NMFS continues to monitor all salmon bycatch in the inshore open access fishery.

For Alternatives 2, 3, and 5, NMFS would apportion non-Chinook salmon PSC to the inshore open access fishery in the same manner as it does for Chinook salmon PSC ([50 CFR 679.21\(f\)\(10\)](#)). NMFS would apportion the amount of non-Chinook PSC to any vessels in the inshore open access fishery, but any such PSC would not be transferable. NMFS would monitor the non-Chinook PSC in the inshore open access fishery and close the fishery prior to the apportioned PSC being reached.

While the majority of AFA vessels are both in a cooperative and an IPA, participation in a cooperative is different from participation in an IPA. In all years in which one or more AFA vessels are in the inshore open access fishery (as opposed to a cooperative), every eligible vessel has still participated in an IPA. This means that even when AFA vessels have not been in a cooperative, they have chosen to be subject to the salmon avoidance requirements within IPAs.

5.4 Enforcement

Under all alternatives, no changes to the existing enforcement tools are necessary. Under alternatives 2, 3, and 5, each cooperative and CDQ group, along with NMFS, would monitor its apportionment of the overall non-Chinook salmon PSC limit. If a cooperative or CDQ group reaches or exceeds its apportionment, NMFS would notify OLE. Enforcement officers use Vessel Monitoring Systems (VMS), which are required to be used on all vessels participating in the Bering Sea pollock fishery, to monitor vessel activity and identify fishing that may be occurring where prohibited. Enforcement officers would use these same VMS systems to determine if a vessel fishing for a cooperative or CDQ group that has exceeded its PSC apportionment continues to fish in a closed area, under Alternative 5 or otherwise. However, VMS data only provides spatial data of where a vessel operates; it does not collect data on the target or reveal in which fishery a vessel is operating. Therefore, VMS data, logbook data, electronic monitoring data, and observer data are used in combination to identify noncompliance.

If OLE determines that a vessel is fishing for pollock in a closed area under Alternative 5, or after the apportioned PSC for the vessel's cooperative or CDQ group has been exceeded under Alternative 2 or 3, the vessel will be subject to the appropriate enforcement remedy under [50 CFR 600.740](#).

5.5 Comparison of Proposed Alternatives to Current Salmon Bycatch Management Tools

Table 5-3 provides a comparison of the existing salmon bycatch management tools adopted under amendments 91 and 110 to the BSAI Groundfish FMP to the tools proposed in the alternatives being considered in this action.

Table 5-3 Comparison of existing salmon bycatch management tools adopted under amendments 91 and 110 to the BSAI Groundfish FMP to the tools proposed in this action

Tool	Current Salmon Bycatch Reduction Tools			Proposed Chum Salmon Bycatch Reduction Tools		Differences Between Tools
	Description	Chinook	Chum	Alt	Description	
PSC limit	n/a	✗	✗	2	NMFS apportions to each sector a PSC limit of [100,000-550,000] chum salmon.	n/a
PSC limit, application depends on abundance 679.21(f)(2) 679.21(f)(6)	ADF&G provides Chinook salmon abundance estimates by October 1. Based on the index, NMFS publishes the applicable Chinook salmon PSC limit. In years with no determination of low abundance, NMFS apportions PSC limits of 60,000 or 47,591 (if performance standard exceeded) Chinook salmon to each sector. In low abundance years, NMFS apportions a PSC limit of 45,000 or 33,318 (if performance standard exceeded) Chinook salmon to each sector.	✓	✗	3	ADF&G provides chum salmon abundance estimates by October 1, and NMFS publishes the applicable PSC limit. When estimates exceed all three river abundance thresholds under Option 1, or both thresholds under Option 2, there is no chum salmon PSC limit. When estimates exceed two river abundance thresholds under Option 1, or one or zero thresholds under Option 2, NMFS apportions to each sector a PSC limit of [100,000-550,000] chum salmon. When ADF&G estimates exceed zero or one thresholds under Option 1, NMFS apportions to each sector a PSC limit of [75,000- 412,500] chum salmon.	Unlike Chinook salmon, when estimates do not indicate low abundance, no chum salmon PSC limit would apply the following year. Both caps count all salmon bycatch regardless of origin, though chum salmon bycatch may include a higher proportion of non-U.S. hatchery origin fish.
Multiple-stock abundance index 679.21(f)(2)	ADF&G uses an aggregate run size for Chinook salmon from the Kuskokwim, Unalakleet, and Upper Yukon to determine abundance.	✓	✗	3	Option 1. Three-river (Norton Sound, Yukon, and Kuskokwim) chum salmon abundance index. Option 2. Yukon summer and fall chum salmon abundance index.	Similar to Chinook, Option 1 would use data from three river systems. Unlike Chinook, Option 2 would use data from a single river system.
PSC apportionment and monitoring 679.21(f)(3)(iii) and 679.21(f)(3)(v)	NMFS apportions the Chinook salmon PSC limit among sectors, and then further apportions it among cooperatives and CDQ groups in proportion to their pollock allocations. Cooperative managers monitor the Chinook salmon PSC limit and require their vessels to stop fishing once a PSC limit is hit.	✓	✗	2, 3 & 5	NMFS apportions the chum salmon PSC limit among sectors, and then further apportions it among cooperatives and CDQ groups in proportion to their pollock allocations. Chum salmon PSC limits are monitored and pollock fishing must stop once a PSC limit is hit.	No differences in approach. However, there are four options for apportioning the PSC limit to each sector: 3-yr. avg; 5-yr. avg; pro rata; and AFA.

Opt-out apportionments 679.21(f)(5)	To vessels that opt-out of IPAs, NMFS apportions a lower Chinook PSC limit to this group than the PSC limit for which they would be eligible if they participated in IPAs. PSC apportioned to vessels that opt-out of IPAs are not transferable.	✓	✗	n/a	n/a	NMFS recommends the Council identify an opt-out provision under Alternative 5, option 2.
Performance Standard 679.21(f)(6)	When a sector exceeds its annual threshold amount in three of seven consecutive years, NMFS apportions a lower PSC limit of 47,591 Chinook salmon or, during low abundance, 33,318 Chinook salmon, to that sector in all future years.	✓	✗	n/a	n/a	No alternative includes a chum salmon performance standard.
PSC transfers 679.21(f)(8)-(9)	Chinook salmon PSC may be transferred among sectors, among inshore cooperatives, among CDQ groups, and among vessels within a single cooperative. Intracooperative transfers of Chinook salmon PSC are completed by cooperative managers. Intercooperative, and inter-sector transfers of Chinook salmon PSC require NMFS approval. CDQ groups can receive transferable PSC without NMFS approval. Post-season transfers of Chinook salmon PSC are permitted with conditions.	✓	✗	2, 3 & 5	The same approach would apply to transfers of apportioned chum salmon PSC limits.	n/a

Incentive Plan Agreements (IPA) 679.21(f)(12)(iii)(E)	IPAs are contracts that create incentives and penalties for member vessels to avoid both Chinook and chum salmon. Three IPAs have been in place since 2010: CP IPA; Inshore SSIP; and MSSIP. The thirteen provisions under 679.21(f)(12)(iii)(E) provide a framework for IPAs to reduce salmon bycatch. Some provisions require that the IPAs employ a specific tool, such as rolling hotspot closures or salmon excluder devices. Others require the IPAs to describe how they would achieve a specific management objective - for example, keeping each vessel's Chinook salmon bycatch below the performance standard. Some provisions are specific to Chinook salmon, some are specific to chum salmon, and some to both.	✓	✓	4	To the existing 13 tools and management measures under 679.21(f)(12)(iii)(E), the following tools would be required to be added to each IPA: - Require each IPA to describe how historical genetic stock composition data is included in chum avoidance measures; - Require provisions that address chum bycatch outlier vessels; - Describe how IPAs monitor for potential chum avoidance closures more than once per week; - Prohibit all vessels from fishing in chum avoidance areas when bycatch rates exceed 5 chum per ton of pollock (CP) and 3 times base rate (CV and MS); - Require all vessels to use salmon excluders in both A and B season; - Require IPAs to provide weekly salmon bycatch reports to Western and Interior Alaska salmon users.	With one exception of the tools IPAs would be required to use for chum salmon avoidance, IPAs are required to use the same tools for Chinook salmon avoidance. The exception is that IPAs are not currently required to describe how they use historical genetic stock composition data for Chinook salmon avoidance.
Time/Area closure 679.21(f)(14) 679.22(a)(10)	<i>Applicable only to pollock vessels using trawl gear that are NOT operating under an approved IPA.</i> The Chum Salmon Savings Area (about 5000nm ²) is closed for August. If 42,000 chum salmon are caught in the Catcher Vessel Operational Area from August 15 through October 14, the closure area remains closed for the remainder of the period of September 1 to October 14.	✗	✓	5	A time/area closure would be in place from June 10 to August 31. There are three mutually exclusive options for a closure area. Option 1: All 40 stat areas within Clusters 1 and 2 Suboption 1: 29 stat areas within clusters 1 and 2 Option 2: 19-29 stat areas within clusters 1 and 2. Each season, industry would designate the stat areas based on chum catch, pollock CPUE, and relevant genetic data, and obtain NMFS approval. Option 3. The area-specific PSC limit would not apply during times of relatively higher chum salmon abundance. Option 4. The start date for the closure of the Winter Herring Savings Area would shift from September 1 to September 30. NMFS would apportion to each sector a PSC limit of [50,000 to 200,000] chum salmon. Only chum salmon caught in the closure area would count against the limit.	Unlike for the Chum Salmon Savings Area, vessels operating under an IPA would <u>not</u> be exempt from area closures. Unlike the Chum Salmon Savings Area, Alternative 5 closures may not apply during years of higher chum salmon abundance (Option 3). Unless the Chum Salmon Savings Area, Alternative 5 may be accompanied by greater opportunity to fish in the Winter Herring Savings Area (Option 4). No area would be automatically closed for a month-long period; however, the area-specific PSC limit (not less than 50,000 chum salmon) would be larger than the 42,000 chum salmon limit applicable to the

Comprehensive monitoring of salmon bycatch 679.21(f)(15) 679.51(a)(2)	Electronic monitoring or observers on every vessel. Every salmon is counted and biological and genetic samples are taken to understand stock origin.	✓	✓

	NMFS would close the area to any sector that exceeds its apportioned PSC limit until August 31.	Chum Salmon Savings Area and no area would be at risk of closure after August 31.
All	No change	n/a

6 Magnuson-Stevens Act and FMP Considerations

6.1 Consideration of the Magnuson-Stevens Act National Standards

Below are the 10 National Standards for fishery conservation and management as contained in the MSA. The MSA requires that every fishery management plan and every regulation implementing those plans be consistent with the National Standards. For any Council action, one or more of those standards can be in tension with one another. Therefore, in recommending a preferred alternative, the Council must consider how to balance the National Standards. This section provides an assessment of the proposed alternatives in relation to each National Standard, and a reference is provided to sections of the analysis that are particularly relevant to the consideration of the National Standard, although the referenced section may not be the only relevant information.

National Standard 1 — Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery.

The proposed alternatives are designed to reduce chum salmon PSC in the Bering Sea pollock fishery, with a particular focus on minimizing the bycatch of WAK origin fish (see Section 1.1). Chapter 2 contains a detailed description of all of the proposed alternatives and options, including an overall chum salmon PSC limit (Alternative 2), a variable chum salmon PSC limit based on WAK chum salmon returns the prior year (Alternative 3), and/or mechanisms to redistribute the pollock fleet away from areas with higher chum salmon encounters (Alternatives 4 and 5).

Conservation of BSAI groundfish stocks and management of the fisheries would continue under the existing harvest specifications process and inseason management authority to prevent overfishing and achieve, on a continuing basis, the optimum yield (OY) from each fishery under all proposed alternatives. The MSA defines “optimum” with respect to yield from the fishery, as the amount of fish which—

- a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
- b) is prescribed as such on the basis of maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and
- c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in the fishery.¹⁶⁸

As discussed in Section 3.2, OY in the BSAI Groundfish FMP is defined as a range over all target species between 1.4 million to 2.0 million mt and requires the sum of the TAC for all groundfish fisheries to fall within this range over the long term. The 2.0 million mt cap has constrained total harvest for many target groundfish species, including pollock, due to large stock sizes. While the sum of the ABC may exceed the upper bound of the OY range, the sum of all groundfish TACs must be at or below 2.0 million mt.

The Bering Sea pollock TAC has historically constituted a large portion of achieving the OY range.¹⁶⁹ However, the proposed alternatives would only affect the pollock B season. As discussed in Section 3.2.1.1.1, 55% of the annual Bering Sea pollock TAC is allocated to the B season. From 2019–2023, the B season pollock TAC has ranged between 583,825 mt (2022) and 757,651 mt (2020). In these years, the B season pollock TAC represented 29.2% and 37.9% of the 2.0 million mt cap. The 2022 and 2020 B season TAC levels represented 41.7% and 54.1% of the lower bound of the OY range of 1.4 million mt.

¹⁶⁸ 16 U.S.C. 1802(33).

¹⁶⁹ More information on the Alaska Groundfish Harvest Specifications is available [on NMFS's Sustainable Fisheries webpage](#).

Alternative 2 and 3 introduce a risk of unharvested B season TAC if the overall PSC limit was met. The analysis shows an overall PSC limit of 100,000 chum salmon under Alternative 2 or 3, as well as a PSC limit of 75,000 chum salmon under Alternative 3, Option 1 are most likely to become a binding constraint. Finally, the analysis also clearly indicates that overall PSC limits analyzed at the midpoint and upper end of the range were less likely to result in forgone pollock catch (see Section 4.3.2).

While it is hypothetically possible that the proposed action could interfere with the achievement of OY on a continuing basis, it is not expected to. All of the proposed alternatives are intended to provide the Bering Sea pollock fishery with the flexibility to fully utilize the B season TAC while incentivizing changes in PSC. Typically, the pollock B season begins on June 10 or shortly thereafter. If Alternative 2 or 3 were selected and the overall PSC limits were reached in a year, some amount of B season pollock TAC would have been harvested prior to reaching the PSC limit. The frequency of closures and the amount of pollock TAC that was not caught in the B season would likely increase with lower PSC limits. The analysis shows considerable variability among vessels and the different sectors with respect to historical PSC performance. This variability, along with the cooperative management structure of the fishery, may provide an opportunity for vessels to maximize their pollock harvest to the extent practicable.

Alternative 5 includes three mutually exclusive options for an inseason corridor with closure provisions. Compared to either Suboption 1 or Option 2, Option 1 would close the largest amount of fishing area if the corridor PSC limit is met (40 of 40 stat areas). A corridor closure under Option 1 would present a significant consequence, particularly for the inshore sector, which is highly reliant upon the corridor fishing grounds. There are also practical constraints in where these vessels could redistribute fishing effort (see Section 4.3.5.1.2). Therefore, some amount of TAC could be unharvested if a lower chum salmon cap is selected and the inshore cooperative met their apportionment early in the B season. As described in Section 4.3.5, it is expected that the vessels will perceive this risk and consequence and develop operational strategies to reduce the risk of exceeding the cap.

Even with an early end to B season fishing, based on historical analysis, it is extremely unlikely that the overall groundfish harvest would fall outside the BSAI OY range of 1.4 million to 2.0 million mt in any one year and even less likely that this would occur on a continuing basis.

More broadly, annual groundfish harvests can be highly variable. In any given year, actual catch levels are affected by changing ocean conditions, variability in stock recruitment, and fisheries interactions, among other factors. All of these factors are external to the proposed regulatory changes considered in this action and may result in years where achieving OY is difficult. The BSAI FMP also states that OY may need to be respecified in the future if major changes occur in the estimate of MSY for the groundfish complex. Likewise, OY may need to be respecified if major changes occur in the ecological, social, or economic factors governing the relationship between OY and MSY.

In terms of preventing overfishing, the eastern Bering Sea pollock stock is not currently at risk of overfishing and is considered stable (see Section 3.2 and 3.2.1). Alternative 2 and 3 would result in forgone pollock harvest if the overall PSC limit were met, which is expected to mitigate fishing mortality. Neither Alternative 4 nor 5 would inherently curtail the B season fishery, although both alternatives include elements to potentially move vessels to new locations where chum salmon PSC was either observed to be lower inseason (RHS program, Alternative 4) or historically (Alternative 5). None of the alternatives would impact the sustainable management of the pollock stock.

National Standard 2 — Conservation and management measures shall be based upon the best scientific information available.

This document represents the best scientific information available. The information contained in this analysis is the most current, comprehensive set of information available to the Council on the BSAI

pollock fishery, recognizing that some information, such as the operational costs of chum salmon bycatch avoidance or a composite run size estimate for the CWAK reporting group, are unavailable.

The SSC has reviewed the analysis for scientific merit over the course of their scientific peer review process and recommended that it be forwarded to the Council for decision-making as it includes the relevant information necessary to inform the Council’s recommendation on this proposed management action. Further, and in concordance with the National Standard 2 guidelines, the analysis provides a listing of relative uncertainties in associated with the cost and revenue estimates (see Sections 3.1.4.2 and 4.1.3), the use of Fleet Movement Model (see Section 3.1.5), AEQ estimates (see Section 3.1.3), estimates of impact rates (see Section 3.1.3), and the range of potential benefits that may result from increasing chum salmon returning to Western and Interior Alaska river systems (see Sections 3.3.4.2.2, 3.3.4.4.2, 4.5.2, and 4.5.4).

National Standard 3 — To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

NMFS conducts the stock assessments for eastern Bering Sea pollock stock (see Section 3.2) The SSC makes ABC recommendations to the Council, and the Council sets the TAC for pollock based on the most recent assessment and survey information. Eastern Bering Sea pollock will continue to be managed as a single stock under the proposed alternatives.

In evaluating the alternatives, this DEIS assesses the management of Western Alaska chum salmon stocks throughout their range. This assessment includes presenting and referencing historical harvest and spawning escapement estimates and an evaluation of how the alternatives may impact chum salmon returns in the future. NMFS does not manage directed salmon fisheries in the Bering Sea. NMFS manages bycatch of salmon in groundfish fisheries to achieve close coordination with management of salmon by the state of Alaska.

National Standard 4 — Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fisherman, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excess share of such privileges.

This action would not discriminate between residents of different states and it does not involve a direct allocation or assignment of fishing privileges.¹⁷⁰ Under 50 C.F.R. § 600.325(c)(1) “[a]n ‘allocation’ or ‘assignment’ of fishing privileges is a direct and deliberate distribution of the opportunity to participate in a fishery among identifiable, discrete user groups or individuals.” This action involves establishing management measures to reduce the amount of chum salmon incidentally caught by vessels participating in the pollock fishery. Pollock fishery participants received a direct allocation to participate in the pollock fishery and subsequent apportionments of PSC limits are not an allocation under National Standard 4. However, this action is a management measure that could impact total harvests by specific participants that reach their PSC limits. This action does not create a direct fishing privilege that allows the vessels to fish for chum salmon independent from that incidentally caught while fishing in the pollock fishery.

¹⁷⁰ NMFS recognizes that in the past it has treated apportionments of prohibited species catch as allocations under National Standard 4. See Final Environmental Assessment/Regulatory Impact Review for Proposed Amendment 110 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area, 2016, at 267-268, available at <https://www.fisheries.noaa.gov/action/amendment-110-fmp-groundfish-bering-sea-and-aleutian-islands-management-area>; *Groundfish Forum, Inc. v. Nat’l Marine Fisheries Serv.*, 2024 WL 4723744, at *8 (D. Alaska Nov. 8, 2024) (discussing treatment of bycatch limits as allocations in Amendment 111 to the BSAI fishery management plan). However, in the past apportionments of PSC have just been stated to be allocations without the in-depth consideration of whether they were the types of allocations covered by National Standard 4. For the reasons stated in the above discussion of the National Standards 4 analysis, NMFS concludes that PSC limits are not an allocation or assignment under National standard 4 because they do not represent a direct distribution or the opportunity to participate in a fishery.

While some of the alternatives would create limits on the amount of chum salmon that can be incidentally caught by boats targeting pollock, this is not a direct allocation under National Standard 4 because it does not create an independent right or opportunity to fish for chum salmon (or even retain chum salmon) independently of a direct pollock allocation. It merely distributes portions of the overall limit on prohibited species catch. Nothing in this action directly changes the amount of pollock that participants in that fishery can catch, however, if fishery participants reach their chum salmon PSC apportionment prior to fully harvesting their pollock allocation, their pollock harvests may be limited.

No element of any proposed alternative, option, or suboption considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and states in the Pacific Northwest region, participate in the Bering Sea pollock fishery and would be potentially impacted by the proposed action. No discrimination is made among fishermen, communities, or companies based on residency. This action also does not directly represent an allocation or assignment of fishing privileges.

Chapter 4 contains detailed information for both the Bering Sea pollock fishery and directed chum salmon fisheries on community engagement and dependency. These data encompass all states in which relevant communities are located, as well as an analysis of the potential direct and indirect effects of the proposed alternatives. For those alternatives that contain an apportionment of chum salmon PSC limits, options for how to establish those apportionments are considered and are based on past amounts of PSC caught by different sectors and/or the amount of pollock allocated to each sector. The CDQ Reserve Pool suboption is based on these same factors, but also provides flexibility if CDQ groups choose to harvest pollock with a different AFA sector than they have historically. The range of limits analyzed and apportionment methods are reasonably calculated to limit bycatch of Chum and do not negatively affect the conservation of salmon or pollock. None of these measures would modify provisions established to prevent the accumulation of excessive harvesting shares.

National Standard 5 — Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.

Efficiency in the context of the proposed action refers to economic efficiency. The analysis presents information on the relative importance of economic efficiency versus other considerations and provides information on the economic risks associated with the proposed PSC measures in Chapter 4. This action, and the alternatives under consideration weigh changes in efficiency for the pollock fishery with the potential benefits of reduced WAK chum salmon bycatch, including the potential for greater conservation of salmon stocks to Western and Interior Alaska communities and ecosystems. The alternatives being considered would allow the participants in the fishery to harvest pollock while minimizing WAK chum salmon bycatch.

National Standard 6 — Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The BSAI groundfish fisheries are structured to allow for variations in the fishery, resources, and available catch. The alternatives under consideration for this proposed action are consistent with this standard. Interannual variability in catch is illustrated in Section 3.2.1. The impacts at differing levels of both pollock and salmon abundance are considered. Variation in chum salmon encounter rates between sectors have also been considered.

National Standard 7 — Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication. The analysis should demonstrate that the benefits of fishery regulations are real and substantial relative to the added research, administrative, and enforcement costs, as well as costs to the industry of compliance.

The alternatives under consideration for this proposed action are consistent with this standard. Chapter 4 describes the potential impacts from the Alternatives and options, including costs of compliance with PSC

limits under Alternatives 2, 3, and 5, as a management measure. This analysis further describes the differences between the potential costs of compliance and potential benefits to pollock fishery participants as well as communities that depend upon chum salmon. Although there is uncertainty associated with their realization, the analysis includes a description of a broad range of potential benefits to communities that depend on salmon. Some are quantifiable and others that are non-quantifiable but are nonetheless critically important to Western Alaska communities and ecosystems.

National Standard 8 — Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

This National Standard is considered broadly to include both fishing communities dependent on WAK chum salmon as well as communities dependent on the B season pollock fishery.

The proposed alternatives are intended to reduce WAK chum salmon bycatch in the Bering Sea pollock fishery, consistent with the Magnuson-Stevens Act, in light of the critical importance of chum salmon to Western Alaska communities and ecosystems (see Section 1.1). To the extent that the proposed alternatives reduce WAK chum salmon bycatch in the Bering Sea pollock fishery, there could be broader benefits to the people, communities, and Tribes across Western and Interior Alaska that are engaged in or dependent upon chum salmon. Regional patterns of fishing in Western and Interior Alaska are described in Section 4.4.3.1. Communities in Western and Interior Alaska that have been dependent or engaged in commercial chum salmon fishing are shown in a series of tables in Section 4.4.3 of the April 2024 SIA and incorporated by reference into this analysis. Commercial fishing trends are also summarized by region in Section 4.4.4.1 of this document.

The potential for each proposed alternative to provide these broader benefits are described in Section 4.5. There is uncertainty in the magnitude and in the salmon-dependent communities that may be beneficiaries from expected WAK chum salmon savings because it is not possible to connect estimated AEQ bycatch reductions to individual river systems and tributaries throughout Western and Interior Alaska. The magnitude of potential positive effects to Western Alaska communities from any proposed alternative is also likely to be reduced by multiple factors and policy steps that separate AEQ bycatch savings from directed harvest opportunities.

Multiple communities across the BSAI region, as well as coastal communities elsewhere in Alaska and the Pacific Northwest, participate in the pollock fishery in one way or another. These community connections include being the homeport to participating vessels, the location of processing activities or product transfer, the location of fishery support businesses, the home of employees in the different sectors, or as the base of ownership or operations for fishery participants (see Section 4.2.1.4).

The analysis shows the proposed actions to reduce chum and WAK chum salmon in the Bering Sea pollock fishery could constrain the pollock fishery under some conditions and consequently may impact the communities that depend on the fishery. Pollock dependent communities could be directly and indirectly impacted by an overall chum salmon PSC limit (Alternative 2 or 3), particularly a 100,000-chum salmon PSC limit compared to caps analyzed at the mid-point and upper end of the range. Alternative 3 provides greater flexibility to the pollock fleet and by extension the communities engaged in or dependent upon the fishery because a PSC limit would not have been in effect each year, assuming conditions in the future are similar to what has been observed during the status quo (see Section 3.3.4.3).

Three different options for an inseason corridor with closure provisions are being considered under Alternative 5. Option 1, which would close the entire corridor to a cooperative or set that attained the corridor PSC limit, provides the least flexibility. While affected vessels could return and continue fishing inside the corridor after August 31, they would be required to fish outside the corridor's perimeter from

the date the corridor PSC limit was met through August 31 or postpone fishing if it was infeasible for them to do so. Communities that depend on the pollock fishery could be impacted, particularly Unalaska, Akutan, and the Aleutians East Borough where currently active shore-based processors are located. Inshore CVs that deliver to shore-based processors would face greater operational constraints and smaller CVs have a greater risk of incurring the costs of a total corridor closure.

The proposed alternatives have been developed to balance the need to minimize chum salmon bycatch, and in particular WAK chum salmon bycatch in the Bering Sea pollock fishery, while also providing for sustained participation of fishing communities connected to the pollock fishery, consistent with MSA section 303(a)(11). The alternatives are intended to balance National Standards 1, 8, and 9 by finding measures that maximize the reductions in WAK chum salmon PSC while minimizing any potential negative effects to the pollock fishery from those measures.

National Standard 9 — Conservation and management measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The proposed action is specifically intended to minimize chum salmon bycatch, with particular attention to reducing WAK chum salmon bycatch, in the Bering Sea pollock fishery, to the extent practicable. All of the alternatives are structured to minimize this bycatch. In particular, Section 3.3.4 provides an assessment with the best scientific information available on the likely impacts of the proposed management measures for chum and WAK chum salmon. Expected impacts on the bycatch of Chinook and herring are also considered in Sections 3.4.1 and 3.5.1, respectively.

The necessary context for considering the practicability of chum salmon bycatch reductions relative to the status quo is provided in Section 4.3. In general, the proposed alternatives aim to incentivize chum salmon, and WAK chum salmon, bycatch reductions. Vessels will want to avoid the risk of meeting a PSC limit (Alternatives 2, 3, or 5) and being partially (Alternative 5) or forgone pollock harvests (Alternative 2 and 3).

The analysis is clear that the Bering Sea pollock fishery would incur higher costs to avoid chum salmon PSC and maximize the harvest of B season pollock quota under some alternatives and conditions. The precise extent to which these costs would affect groundfish harvests and negatively impact the economic viability of pollock fishery and processing operations is unknown. However, the analysis demonstrates the lower overall chum salmon PSC limits analyzed under Alternatives 2, 3, and 5 could reduce pollock harvests and revenues for the associated sectors and communities compared to status quo. The analysis is also clear that the potential costs of the proposed action on the different sectors are likely to vary given the diversity in vessels' operational capacity and avoidance behavior.

National Standard 10 — Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

Chapter 4 highlights any areas of concern for safety of human life at sea in relation to the proposed alternatives. In general, the alternatives are not expected to have significant impacts on safety. Implementation of an overall chum salmon PSC limit (Alternative 2 and 3) may require the Bering Sea pollock fleet to rely on more established avoidance techniques, such as test tows and increased movement. These tools are generally techniques that have been employed under the IPAs and through previous fishing operations and are not expected to pose increased concerns for safety. Alternative 4 would add provisions into the regulatory requirements for IPAs that are intended to heighten avoidance protocols for WAK chum salmon. These provisions have primarily been adopted by the pollock fleet in recent years and rely on increased movement and established gear (*i.e.*, use of excluders). The adoption of Alternative 4 is not expected to create safety at sea concerns.

Specific to Alternative 5, the inseason corridor cap may incentivize increased reliance on established avoidance techniques in order to prevent the inseason corridor closure. If the corridor cap is met, the

options under Alternative 5 may present different considerations for safety at sea. Suboption 1 and Option 2 would not close the full corridor, but would leave some stat areas open, which for Suboption 1 would, or for Option 2, could, be located near the port communities. Under Alternative 5, Option 1 the full corridor would close, which would include the areas nearest the Aleutian Islands/Alaska Peninsula. The inshore sector includes CVs of diverse size, fuel, and hold capacity. In 2023, the 9 CVs less than 100 ft LOA traveled further than 344 nm from port (Table 4-27). While there are likely many reasons for this maximum distance traveled, traveling outside of the corridor area may pose safety risks for some of the smaller CVs in the inshore sector. If there is a corridor closure, these smaller CVs may choose to stand down for the remainder of the season and transfer their quota to a larger CV or they may choose to wait until the corridor reopens on September 1 to continue fishing. If either of these things occurred, any effects to safety at sea would be non-existent or minimal. However, if an alternative were to extend the season, the fleet could be exposed to an increased risk of poor weather.

6.2 Council's Ecosystem Vision Statement

In February 2014, the Council adopted, as Council policy that shall be given effect through all of the Council's work, including long-term planning initiatives, fishery management actions, and science planning to support ecosystem-based fishery management. The Ecosystem Policy includes three parts:

Value Statement: The Gulf of Alaska, Bering Sea, and Aleutian Islands are some of the most biologically productive and unique marine ecosystems in the world, supporting globally significant populations of marine mammals, seabirds, fish, and shellfish. This region produces over half the nation's seafood and supports robust fishing communities, recreational fisheries, and a subsistence way of life. The Arctic ecosystem is a dynamic environment that is experiencing an unprecedented rate of loss of sea ice and other effects of climate change, resulting in elevated levels of risk and uncertainty. The North Pacific Fishery Management Council has an important stewardship responsibility for these resources, their productivity, and their sustainability for future generations.

Vision Statement: The Council envisions sustainable fisheries that provide benefits for harvesters, processors, recreational and subsistence users, and fishing communities, which (1) are maintained by healthy, productive, biodiverse, resilient marine ecosystems that support a range of services; (2) support robust populations of marine species at all trophic levels, including marine mammals and seabirds; and (3) are managed using a precautionary, transparent, and inclusive process that allows for analyses of tradeoffs, accounts for changing conditions, and mitigates threats.

Implementation Strategy: The Council intends that fishery management explicitly take into account environmental variability and uncertainty, changes and trends in climate and oceanographic conditions, fluctuations in productivity for managed species and associated ecosystem components, such as habitats and non-managed species, and relationships between marine species. Implementation will be responsive to changes in the ecosystem and our understanding of those dynamics, incorporate the best available science (including local and traditional knowledge), and engage scientists, managers, and the public.

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8 References

8.1 Documents Incorporated by Reference

Bering Sea Salmon PSC Analyses

- **Bering Sea Chum Salmon Bycatch Preliminary Draft Environmental Impact Statement** (Bering Sea Chum, preliminary draft EIS, NPFMC, 2024). The [preliminary EIS prepared for the Council's April 2024 meeting](#) contains substantial, additional information directly related to this analysis.¹⁷¹
- **April 2024 Social Impact Assessment** (Bering Sea Chum SIA, NPFMC, 2024). The [SIA prepared for the Council's April 2024 meeting](#) contains substantial additional information on communities engaged in or dependent on the Bering Sea pollock fishery as well as rural and Alaska Native communities across Western and Interior Alaska that rely on chum salmon for subsistence and commercial livelihoods.¹⁷²
- **Bering Sea Chinook Salmon Bycatch Management Final Environmental Impact Statement/Regulatory Impact Review for amendment 91 to the FMP for Groundfish of the BSAI** (Chinook EIS/RIR, NPFMC/NMFS, 2009). The Chinook EIS/RIR provides decision-makers and the public with an evaluation of the environmental, economic, and social effects of management measures for Chinook salmon bycatch in the BSAI management areas, and it is referenced for an understanding of the impacts on salmon bycatch management in the Bering Sea pollock fishery.¹⁷³
- **Environmental Assessment/Regulatory Impact Review for amendment 110 to the FMP for Groundfish of the BSAI** (NMFS, 2016). This [EA/RIR](#) provides decision-makers and the public with information on the environmental, economic, and social effects of Chinook and chum salmon bycatch management in the Bering Sea pollock fishery.¹⁷⁴

Essential Fish Habitat Documents

- This analysis also relies on the information and evaluation contained in EFH 5-year Review documents previously reviewed by the Council, and the BSAI Groundfish and Salmon FMPs. The documents listed below contain information about the EFH 5-year review component evaluations, and the fishery management areas, fisheries, marine resources, ecosystem, social, and economic elements of the fisheries of Alaska.
- **Environmental Assessment for the EFH Omnibus Amendments Package** (NPFMC, 2023a).¹⁷⁵ This EA evaluated the updates adopted by the Council to EFH information in FMPs and environmental impacts from the proposed amendments. The 2023 EFH 5-year Review concluded that no change to the conclusions of the evaluation of fishing effects on EFH is warranted based on new information. None of the FMP amendments required regulatory action.
- **EFH 5-year Review Summary Report** ([Harrington et.al, In prep](#)).¹⁷⁶ The EFH 5-year Review summary report contains the updates to new environmental and habitat data, improving the

¹⁷¹ Available at the April 2024 archived meeting agenda (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

¹⁷² Available at the April 2024 archived meeting agenda (<https://meetings.npfmc.org/Meeting/Details/3039>), agenda item C2.

¹⁷³ Available at NMFS webpage--<https://www.fisheries.noaa.gov/action/amendment-91-fmp-groundfish-bering-sea-and-aleutian-islands-management-area>

¹⁷⁴ Available at NMFS webpage--<https://www.fisheries.noaa.gov/action/amendment-110-fmp-groundfish-bering-sea-and-aleutian-islands-management-area>

¹⁷⁵ Available at NMFS webpage - <https://www.fisheries.noaa.gov/alaska/habitat-conservation/alaska-essential-fish-habitat-omnibus-amendments>

¹⁷⁶ Available at the archived meeting page for the February 2023 Council meeting (<https://meetings.npfmc.org/Meeting/Details/2975>), agenda item C4.

models to map EFH, updating the model to evaluate fishery impacts on EFH, updating the assessment of non-fishing impacts on EFH, and assessing information gaps and research needs.

- **2022 Evaluation of Fishing Effects on Essential Fish Habitat** ([Zaleski et al., 2024](#)). The fishing effects evaluation is part of the EFH 5-year Review that addresses EFH component 2, fishing activities that may adversely affect EFH. This discussion paper presents the 2022 fishing effects evaluation for species in the BSAI Groundfish, GOA Groundfish, and BSAI Crab FMPs.¹⁷⁷

Community-Related Data

- **Annual Community Engagement and Participation Overview (ACEPO).** [ACEPO](#) is an annual report that provides an overview of communities that are substantially engaged in the harvesting and processing of groundfish or crab fisheries off Alaska. The ACEPO also contains detailed community sketches, some of which are used to describe communities that are substantially engaged in or dependent on the Bering Sea pollock fishery.¹⁷⁸
- **Community Profile Updates: Akutan and Unalaska, Alaska.** Akutan and Unalaska/Dutch Harbor are communities identified in this SIA as being substantially engaged in or dependent on the Bering Sea pollock fishery. [The Baseline Commercial Fishing Community Profiles for Akutan and Unalaska](#) were updated in 2023 and the relevant information for these communities is summarized and incorporated throughout Chapter 4.¹⁷⁹
- **Community Commercial Fishing Community Profile Updates: Akutan and Unalaska, Alaska (2005).** This [report](#) provides information central to the understanding of community engagement in, and dependence on, the range of Federally managed commercial fisheries.¹⁸⁰

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¹⁷⁷ Available at NOAA's document repository - <https://repository.library.noaa.gov/view/noaa/66042>.

¹⁷⁸ Available at the North Pacific Fishery Management Council's archived meeting page, for the April 2023 Council meeting (<https://meetings.npfmc.org/Meeting/Details/2983>), agenda item D5.

¹⁷⁹ Available at https://www.npfmc.org/wp-content/PDFdocuments/resources/Akutan_Unalaska_CommunityProfiles_2023.pdf

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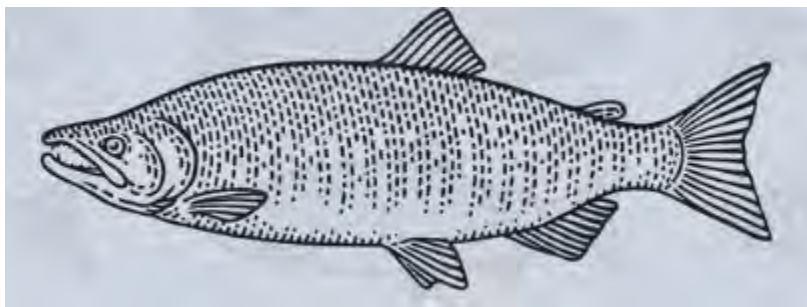
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Bering Sea Chum Salmon Bycatch Management Environmental Impact Statement

Scoping Report



**United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Alaska Region**

October 2023



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Introduction

This report summarizes the public comments the National Marine Fisheries Service (NMFS) received during the July 11, 2023 through September 15, 2023 scoping period for the Environmental Impact Statement (EIS) that will analyze issues related to minimizing chum salmon bycatch in the Bering Sea pollock fishery in the Bering Sea subarea of the Bering Sea and Aleutian Islands (BSAI) Management Area¹. That scoping period began the public process of developing the EIS in accordance with the National Environmental Policy Act (NEPA). The EIS is intended to evaluate the potential environmental, social, and economic effects of alternative management measures designed to achieve the North Pacific Fishery Management Council's (Council) Purpose and Need for this issue and inform the Council's recommendations to the NMFS on this proposed action. The EIS will also serve as NMFS's central informational document in the agency's decision-making on this proposed action and will help ensure that management of the Alaska groundfish fisheries complies with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and other relevant statutes.

What is this Action?

This action would minimize the bycatch of Western Alaska origin chum salmon in the Bering Sea pollock fishery to the extent practicable (National Standard 9 and section 303(1)(11) of the Magnuson-Stevens Act) and consistent with the other National Standards. This action would create another layer in the Council's existing salmon bycatch management program. The current salmon bycatch management program is largely formed under Amendments 91 and 110 to the BSAI Groundfish FMP which have established a series of measures to minimize Chinook and chum salmon bycatch in the Bering Sea pollock fishery. In April 2023, the Council stated that its intent with this action is to minimize Western Alaska chum salmon bycatch while balancing the National Standards and maintaining the objectives of salmon bycatch management measures established within the existing program.

The Council has received scientific reports outlining the impact of warming ocean conditions on chum salmon mortality at sea, as well as substantial public comment and input from Western and Interior Alaska Tribes, Tribal Consortia, and subsistence salmon harvesters describing the importance of chum salmon for food security, wellbeing, the continuation of meaningful cultural practices and related Traditional Knowledge (TK) systems, as well as broader concerns of stewardship practices for salmon resources. The Council has also received public comments and annual presentations from pollock industry representatives on their efforts to minimize Chinook and chum salmon bycatch. Implementing additional chum salmon bycatch management measures could potentially have some positive benefit on the number of chum salmon that return to Western Alaska rivers. Any additional chum salmon returning to Alaska river systems improves the ability to meet the State of Alaska's spawning escapement goals which is necessary for the long-term sustainability of chum salmon fisheries.

¹ NMFS monitors salmon PSC as either "Chinook PSC" or "non-Chinook PSC." Sockeye (*Oncorhynchus nerka*), coho (*O. kisutch*), pink (*O. gorbuscha*), and chum salmon (*O. keta*) are included in the non-Chinook PSC category, but over 99% of the salmon bycatch in the non-Chinook category are chum salmon.

Overview of the Preliminary Purpose and Need and Alternatives

Preliminary Purpose and Need

In April 2023, the Council adopted the following preliminary Purpose and Need Statement with additional language added by NMFS that addresses National Standard 9:

Salmon are an important fishery resource throughout Alaska, and chum salmon that rear in the Bering Sea support subsistence, commercial, sport, and recreational fisheries throughout Western and Interior Alaska. Western and Interior Alaska salmon stocks are undergoing extreme crises and collapses, with long-running stock problems and consecutive years' failures to achieve escapement goals, U.S.-Canada fish passage treaty requirements, and subsistence harvest needs in the Yukon, Kuskokwim, and Norton Sound regions. These multi-salmon species declines have created adverse impacts to culture and food security and have resulted in reduced access to traditional foods and commercial salmon fisheries.

The best available science suggests that ecosystem and climate changes are the leading causes of recent chum salmon run failures; however, non-Chinook (primarily chum) salmon are taken in the Bering Sea pollock trawl fishery, which reduces the amount of salmon that return to Western and Interior Alaska rivers and subsistence fisheries. It is important to acknowledge and understand all sources of chum mortality and the cumulative impact of various fishing activities. In light of the critical importance of chum salmon to Western Alaska communities and ecosystems, the Council is considering additional measures to further minimize Western Alaska chum bycatch in the pollock fishery.

The purpose of this proposed action is to develop actions to minimize bycatch of Western Alaska chum salmon in the pollock fishery consistent with the Magnuson-Stevens Act, National Standards, and other applicable law. In particular, National Standard 9 provides that conservation and management measures shall, to the extent practicable, (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. Consistent, annual genetics stock composition information indicates that the majority of non-Chinook bycatch in the pollock fishery is of Russian/Asian hatchery origin; therefore, alternatives should structure non-Chinook bycatch management measures around improving performance in avoiding Western Alaska chum salmon specifically.

The Council intends to consider establishing additional regulatory non-Chinook bycatch management measures that reduce Western Alaska chum bycatch and meet the following objectives; (1) provide additional opportunities for the pollock trawl fleet to improve performance in avoiding non-Chinook salmon, while maintaining the priority of the objectives of the Amendment 91 and Amendment 110 Chinook salmon bycatch avoidance program; (2) meet and balance the requirements of the Magnuson-Stevens Act, particularly to minimize salmon bycatch to the extent practicable under National Standard 9; (3) include the best scientific information available, including Local Knowledge (LK) and TK, as required by National Standard 2; (4) take into account the importance of fishery resources to fishing communities including those that are dependent on Bering Sea pollock and subsistence salmon fisheries as required under National Standard 8; and (5) achieve optimum yield in the BSAI groundfish fisheries on a continuing basis, in the groundfish fisheries as required under National Standard 1.

Preliminary Alternatives

Alternative 1: Status Quo, no action

Alternative 1 is the current management of the Bering Sea pollock fishery with the measures to minimize non-Chinook salmon PSC under BSAI FMP Amendment 110, as described in the Purpose and Need statement and the associated monitoring and genetic data collection and analysis.

All action alternatives apply to the entire Bering Sea pollock B season, the season in which chum salmon are taken as bycatch.

Alternative 2: Overall PSC limit for chum salmon

Option 1: Chum salmon PSC limit (a range to be informed by PSC data).

PSC limits are apportioned among Community Development (CDQ), catcher/processor (CP), mothership, and inshore sectors based on historical total bycatch by sector. The inshore limit is further apportioned among the inshore cooperatives. The CDQ limit is further apportioned among the CDQ groups. Reaching a PSC limit closes the pollock fishery sector to which the PSC limit applies.

Option 2: Weighted, step-down PSC limit triggered by a three-river chum index (Kwiniuk (or index developed for Norton Sound area), Yukon, Kuskokwim) that is linked to prior years' chum abundance/amount necessary for subsistence (ANS)/escapement and weighted to account for variance in stock sizes across river systems.

PSC limits would be triggered and in effect when one or more Western Alaska chum index areas fails to meet index thresholds. As more areas fail to meet index thresholds, chum PSC limits would step-down and become more restrictive. PSC limits are apportioned among CDQ, CP, mothership and inshore sectors. The inshore limit is further apportioned among the inshore cooperatives. The CDQ limit is further apportioned among the CDQ groups. Reaching a PSC limit closes the pollock fishery sector to which the PSC limit applies.

Alternative 3: PSC limit for Western Alaska chum salmon

Option 1: Western Alaska chum salmon PSC limit (range to be informed by PSC data).

PSC limits are apportioned among CDQ, CP, mothership, and inshore sectors based on historical total bycatch by sector. The inshore limit is further apportioned among the inshore cooperatives. The CDQ limit is further apportioned among the CDQ groups. Reaching a PSC limit closes the pollock fishery sector to which the PSC limit applies.

Option 2: Weighted, step-down Western Alaska chum PSC limit triggered by a three-river chum index (Kwiniuk (or index developed for Norton Sound area), Yukon, Kuskokwim) that is linked to prior years' chum abundance/ANS/escapement and weighted to account for variance in stock sizes across river systems.

PSC limits would be triggered and in effect when one or more Western Alaska chum index areas fails to meet index thresholds. As more areas fail to meet index thresholds, chum PSC limits would step-down and become more restrictive. PSC limits are apportioned among CDQ, CP, mothership, and inshore sectors. The inshore limit is further apportioned among the inshore cooperatives. The CDQ limit is further apportioned among the CDQ groups. Reaching a PSC limit closes the pollock fishery sector to which the PSC limit applies.

Alternative 4: Additional regulatory requirements for Incentive Plan Agreements (IPA) to be managed by either NMFS or within the IPAs

Option 1: Require a chum salmon reduction plan agreement to prioritize avoidance in Genetic

Cluster Areas 1 and 2 for a specified amount of time based on two triggers: 1) exceeding an established chum salmon incidental catch rate; and 2) exceeding a historical genetic composition (proportion) of Western Alaska chum salmon to non-Western Alaska chum salmon.

Option 2: Additional regulatory provisions requiring IPAs to utilize the most refined genetic information available to further prioritize avoidance of areas and times with higher proportions of Western Alaska and Upper/Middle Yukon chum stocks.

Scoping and the Role of Public Comment Under NEPA

NEPA is a procedural law with an environmental emphasis intended to facilitate better government decisions concerning the management of our lands and oceans. Drafters of the law believed that by requiring a process designed to provide decision-makers with the best information available about a proposed action and its various alternatives, fewer adverse impacts would occur. NEPA does not dictate protection of the environment, but instead assumes that common sense and good judgment, based on a thorough analysis of impacts of a reasonable range of alternatives, will result in the development of the Nation's resources in a way that minimizes adverse impacts to our environment. This goal is facilitated by requiring a public process whereby the responsible government agency, together with the stakeholders associated with a particular natural resource and development project, present relevant information for use in making decisions.

The development of this EIS provides the opportunity for public participation. Scoping is the term used for involving the public in the NEPA process at its initial stages. In the initial stages of the NEPA process, federal agencies involve the public through the scoping process, which gives the public, other agencies, and interest groups a formal opportunity to comment on potential issues associated with the proposed action. Scoping helps to identify the environmental issues related to the proposed action and identify alternatives to be considered in the EIS. Scoping is accomplished through written communications and consultations with agency officials, interested members of the public and organizations, Alaska Native representatives, and State and local governments.

Where Are We in the NEPA Process Now?

In December 2022, the Council reviewed a discussion paper for this action. In April 2023, the Council reviewed recommendations for concepts for alternatives put forward by the Salmon Bycatch Committee. After review and discussion, NMFS determined that it would develop an EIS for the proposed action based on uncertainty or disagreement regarding the relevant science. The formal scoping period for this EIS began with the publication of a Notice of Intent in the Federal Register on July 11, 2023 (88 FR 44096) announcing NMFS's intention to develop an EIS and inviting public comment through September 15, 2023. In the Notice of Intent NMFS requested written comments from the public on the range of alternatives to be analyzed and on the environmental, social, and economic issues to be considered in the analysis. The NOI was also posted on NMFS website at:

<https://www.fisheries.noaa.gov/resource/document/bering-sea-non-chinook-chum-salmon-bycatch-reduction-environmental-impact>. The NOI was initiated and promulgated under the 2020 Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1503.4).

This Scoping Report summarizes the public comments received during the scoping period and informs NMFS, the Council, and the public of the issues that the public would like the Council to consider in developing the Purpose and Need, reasonable range of alternatives, and significant issues to consider in the analysis of the EIS. If the Council decides to proceed with this action at its October 2023 meeting as expected, a draft EIS will be prepared (DEIS). The DEIS will incorporate the Purpose and Need statement,

range of alternatives, and the significant issues to analyze as determined by the Council at the October 2023 meeting. A Notice of Availability for the DEIS would be expected to publish in the Federal Register mid-year 2024 in (Figure 2). Information on this action as it progresses through the NEPA process will be available on the NMFS Alaska Region website:

<https://www.fisheries.noaa.gov/resource/document/bering-sea-non-chinook-chum-salmon-bycatch-reduction-environmental-impact>.

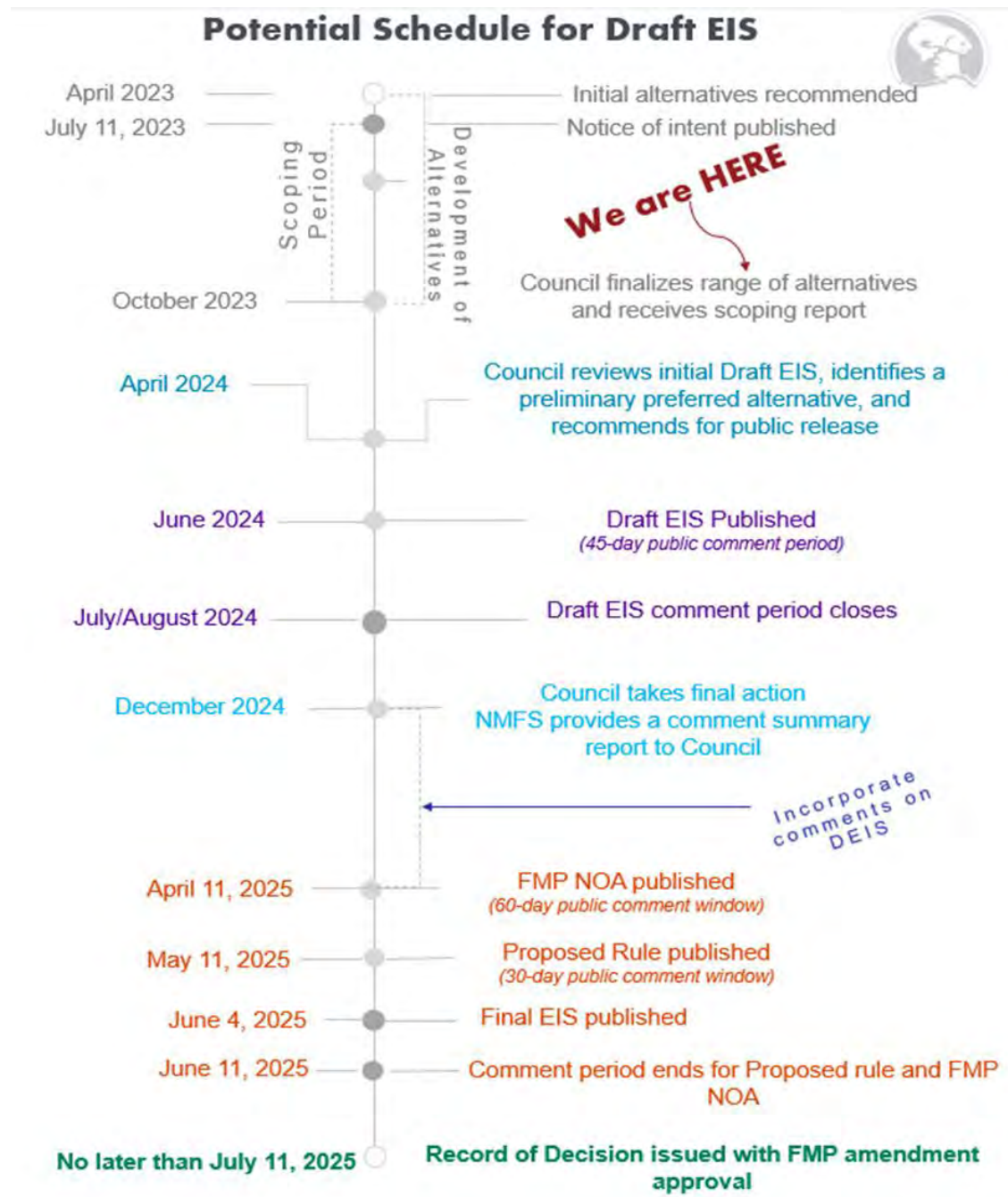


Figure 2. Anticipated schedule for the proposed action as it moves through the Council process.

Tribal Engagement

NMFS has engaged with Alaska Tribal governments and entities and Alaska Native Claims Settlement Act (ANCSA) Corporations regarding the development of the subject DEIS, inviting their comments on the NOI for this action and participation in the Council process. NMFS received public comments on the NOI from Alaska Tribal representatives that specifically addressed Tribal issues related to this action. NMFS has also accepted a request by the Kuskokwim River Inter-Tribal Fish Commission (KRITFC) to be a cooperating agency for this EIS as described in the next section.

NMFS has special obligations to consult and coordinate with Tribal governments and ANCSA corporations pursuant to Executive Order 13175 on “Consultation and Coordination with Indian Tribal Governments” and the Executive Memorandum of April 29, 1994, on “Government-to-Government Relations with Native American Tribal Governments.” Additionally, a recent Presidential memorandum affirms the Federal government’s commitment to including Tribal voices in policy deliberations that affect Tribal communities and recognizes that strong communication is fundamental to a constructive relationship.²

Tribal governments and ANCSA corporations have the opportunity to comment to NMFS at any time; however, comments submitted during the Council process of developing and analyzing alternatives for actions are very helpful and informative for the Council’s decision making process.

More information on the consultation process and contact information is provided at the following website: <https://www.fisheries.noaa.gov/alaska/consultations/tribal-consultations-alaska>.

Cooperating Agencies

The CEQ regulations for implementing the procedural provisions of the NEPA emphasize agency cooperation early in the NEPA process (40 CFR 1501.8). The implementing regulations provide for any federal, State, Tribal, or local agency to be a cooperating agency if it has special expertise with respect to any environmental issue to be addressed in an EIS. Cooperating agencies agree to participate in the early development of the EIS and assist in the writing and review of portions of the EIS that are within their expertise or management responsibility.

The KRITFC requested to be a cooperating agency for this EIS (see Appendix 1). The KRITFC has special expertise on issues related to subsistence use of chum salmon and collaborative management of Kuskokwim River salmon stocks. KRITFC is a Tribal consortium with authorizing resolutions from 27 federally recognized member Tribes throughout the Kuskokwim drainage to act on their behalf in fisheries management, research, and monitoring using the best available Indigenous Knowledge and science. Additionally, since 2016, via authorization of a formal Memorandum of Understanding and Section 804 of the Alaska National Interest Lands Conservation Act (ANILCA), KRITFC and U.S. Fish and Wildlife Service at Yukon Delta National Wildlife Refuge have collaboratively managed Kuskokwim salmon stocks. This includes Chinook, chum, and coho salmon runs for the protection of all three species and the prioritization of rural subsistence harvests as mandated by Title VIII of ANILCA. KRITFC staff have specific experience in the development of management plans based on precautionary, adaptive, and collaborative management. The KRITFC staff will assist NMFS in the development of this EIS to ensure a thorough analysis of issues outside the expertise of NMFS.

² More information can be found at the following website: <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/26/memorandum-on-tribal-consultation-and-strengthening-nation-to-nation-relationships/>.

Summary of Public Comments Received During Scoping Period

NMFS received 11 individual submissions of public comments. Comments were submitted by representatives of fishing industry, Alaska communities, tribal representatives, and individual fishery participants. NMFS Alaska Region staff compiled all incoming comment submissions to maintain a comprehensive list of all public comments. Additionally, staff assigned each submission a unique identification number. The submissions of comment and their attachments are available directly at <https://www.regulations.gov> under the docket number NOAA-NMFS-2023-0089.³ NMFS reviewed all letters and attachments and summarized the comments received into 87 distinct comments.

This Scoping Report is intended to present a summary of comments for the Council to consider in its deliberation in finalizing its Purpose and Need, reasonable range of alternatives, and significant issues to analyze in the DEIS for this proposed action. Comment submissions with content pertinent to the NOI are included in this Scoping Report. Comment content includes assertions, suggested alternatives or actions, data, background information, or clarifications relating to the DEIS preparation. As the EIS is developed, each comment will be considered. Only those analytical issues that provide an understanding of the impacts of the proposed action and its alternatives on the human environment will be addressed in the EIS. The NEPA implementing regulations define the human environment as comprehensively the natural and physical environment and the relationship of present and future generations of Americans with that environment.

Comments are summarized by topic for this report. In many cases, comments from more than one commenter address the same concern. In those instances, NMFS Alaska Region staff have combined similar themes into a single, summarized comment that most fully represents and articulates the concern expressed by multiple commenters. Therefore, the number of unique comments under each section in this report does not reflect the number of individual comments on any particular topic or subtopic. Comments with a distinct perspective have generally been summarized in part or whole or are partially extracted from the full comment and may include specific details to convey the context of the point being made. Further, some individual comments address more than one interrelated topic in such a way that the comment is not easily separated into the topic framework of this report. Depending on the context of the comment, it could have been included in the section that covers any one of those categories in this report. However, such comments are generally included in only one topic section of the report. This approach is meant to reduce duplication within the report and is not intended to minimize the importance of the other topics within a particular comment. For the full text of individual comments, please reference the comments directly at <https://www.regulations.gov> under docket number NOAA-NMFS-2023-0089.

During the process of identifying substantive content for this report, all comments were treated equally. The emphasis is on the content of the comments. They are not weighted by organizational affiliation or other status of commenters. No effort has been made to tabulate the number of people for or against a specific aspect of a topic. In the interest of producing an EIS that both meets the mission of NMFS and best serves all stakeholders, all comments are considered equally on their merits.

³ Visit www.regulations.gov and enter the docket number NOAA-NMFS-2023-0089 in the search bar.

Quality Control and Review

This Scoping Report was reviewed by the DEIS preparers. Additionally, various procedures were established in the summary process to prevent a submission or comment from being inadvertently omitted. Communication and cross-checking between the submissions and the comments have ensured that all submissions received during the comment period are included in the report. This process of quality control and review is ongoing through the development of the EIS.

List of Scoping Comment Topics

Topic 1: Purpose and Need Statement

- 1.a. Support Purpose and Need Statement
- 1.b. Oppose Purpose and Need Statement
- 1.c. Additional comments on Purpose and Need Statement

Topic 2: Alternatives/Options

- 2.a. Alternatives: support specific alternatives / options
- 2.b. Alternatives: oppose specific alternatives / options
- 2.c. Alternatives: additional comments / suggestions

Topic 3: Comments on significant issues to analyze or consider

- 3.a. Analytical methods and scientific, Local and Traditional Knowledge, and other information
- 3.b. Management, economic, social, and cultural considerations
 - i. Pollock trawl fishery
 - ii. Subsistence fisheries
 - iii. Alaska Natives / Tribes
- 3.c. MSA National Standards
- 3.d. Climate change / Greenhouse gas emissions

Topic 4: Out of the scope of the Purpose and Need for this action.

Scoping Comment Summaries by Topic

Topic 1: Purpose and Need Statement: Minimize non-Chinook (primarily chum) salmon bycatch in the Bering Sea pollock fishery

1.a. Support Purpose and Need Statement

1. The purpose and need adopted by the Council in April 2023 appears to comprehensively address the need for action. It appropriately highlights that the majority of chum salmon bycatch in the pollock fishery is of Russian/Asian hatchery origin. It therefore recognizes that alternatives should structure chum salmon bycatch management measures around improving performance in avoiding Western Alaska chum salmon specifically while at the same time maintaining the priority of the objectives of the Amendment 91 and Amendment 110 Chinook salmon bycatch avoidance program.
2. We maintain ongoing support for the priority stated in the Notice of Intent and Purpose and Need to focus this action on reducing bycatch of chum salmon of Western Alaska origin in the Bering Sea.

1.b. Oppose Purpose and Need Statement

NMFS received no comments that directly opposed the Purpose and Need Statement

1.c. Additional comments on Purpose and Need Statement

1. The implementation of the BSAI groundfish FMP must meet its own objectives, including the reduction of bycatch to biologically and socially acceptable levels.
2. The Purpose and Need statement for this EIS should be revised to set a chum salmon PSC cap on the Bering Sea pollock fishery that provides equity in the conservation measures ensuring the Western Alaska chum salmon stocks do not collapse.
3. The Purpose and Need statement for this EIS should be revised to include true Ecosystem- based Fishery Management that would allow for lower bycatch caps (limits) for all species seeing a decline in population and caps and conservation measures imposed on the trawl fleet; and management of the pollock fishery, including setting caps for bycatch with a comprehensive look at the fishery impacts to the whole ecosystem, including other fisheries, communities, and habitat. Such ecosystem management should also balance the economic benefits of the pollock fishery with the economic, cultural, and ecological devastation it causes and exacerbates, rather than giving the economic benefits an unbalanced weight.

Topic 2: Alternatives / Options

2.a. Alternatives: support specific alternatives / options

NMFS received no comments that directly supported any of the alternatives in their entirety as presented in the NOI.

2.b. Alternatives: oppose specific alternatives / options

1. We opposes Alternative 1 status quo in its entirety. The status quo involved the highest capture of prohibited chum species in a time where the run was so low that in-river subsistence harvest was prohibited. To continue this practice would have a devastating effect on these already threatened runs. Bycatch of chum salmon by the metric tons is unacceptable under any circumstance and especially now with remote Western Alaska seeing the decline and collapse closing fisheries.
2. None of the three action alternatives curb bycatch to an acceptable, equitable level. We request additional alternatives for effective and meaningful bycatch avoidance.
3. Alternative 3: The Western Alaska chum limit will not protect chum during this crisis.
4. Additional regulatory requirements to the pollock industry's IPAs are insufficient to ensure meaningful reduction of chum salmon bycatch now and in the future. The increase in overall chum salmon bycatch after the implementation of Amendment 110 and its reliance on IPA-level chum salmon avoidance demonstrates the inadequacy of the industry to reduce chum salmon bycatch without rigorous Tribal, agency, Council, and public oversight and pressure. We do not support Alternative 4 to insert regulatory requirements into the IPAs without also implementing provisions in Alternatives 2 and 3, including a PSC cap linked to Western Alaska chum salmon abundance and time and area closures.

5. The Western Alaska chum PSC limit presented in Alternative 3 is inadequate to protect threatened chum salmon runs in the Yukon and Kuskokwim Rivers. Chum salmon runs in the Yukon and Kuskokwim Rivers are at an all-time low. Runs are currently insufficient to maintain sustainability. In such desperate times, every salmon counts. While the PSC limit is roughly the average of the last decade bycatch, this period contains the steady decline and near total collapse of the salmon runs in Western Alaska. If anything, the PSC limit should be aligned with the limits prior to the salmon crash, meaning the limit should be cut in half at a bare minimum.
6. We oppose Alternative 4 as a standalone alternative, but we support Alternative 4 in conjunction with variable caps as described in Alternatives 2 and 3, with some modification⁴. The increase of chum bycatch after the implementation of Amendment 110 demonstrates the inability of the industry to reduce bycatch without rigorous oversight and public involvement. Without a variable cap any regulatory requirements are insufficient to ensure the bycatch reduction needed to preserve our salmon.
7. Multiple management measures, including IPAs, have failed to prevent Bering Sea Chinook and chum salmon bycatch from occurring at high levels in some years while multiple directed fisheries in Alaska are closed for conservation purposes. NMFS and the Council have used industry-run voluntary measures, which failed to prevent the 2005-2007 bycatch of over 292,000 Chinook that preceded stock collapses. Regulations implemented in 2016 incorporated chum salmon avoidance into the IPAs, which failed to prevent chum bycatch from increasing significantly over the past decade. For the most vulnerable stocks, in some years the only source of anthropogenic removals is trawl bycatch. The inability to constrain chum salmon bycatch with voluntary measures should inform the need to develop alternatives that can better meet the purpose and need to reduce chum salmon bycatch.

2.c. Alternatives: additional comments / suggestions

Public comments recommended the following types of additional alternatives:

- Alternatives should include PSC limits that extend well below average PSC levels.
- Chum PSC limits should be linked with chum abundance.
- Options for PSC limits should include incentive-based allocations and/or re-allocations reflecting good and poor performance.
- PSC limits should have meaningful short- and long-term impacts.
- Time and area closures should be considered.
- Consider additional tools relative to IPAs.
- Other suggestions for alternatives include 24/7 electronic monitoring, reducing the pollock TAC, and applying Alternatives 2, 3, and 4 to both the A and B seasons.

Chum salmon bycatch (PSC) limits

1. The range of alternatives must include PSC limits that are sufficiently low to restrict bycatch to protect Western Alaska chum salmon stocks. Evaluating “average” PSC levels 2011-2022 (as stated in the Council motion) inappropriately focuses the analysis on a 12-year time period when chum salmon bycatch was well- above (nearly double) the long-term average from 1991-2022. If historical averages are used to set PSC limits, they must reflect the full range of bycatch levels. A reasonable range of alternatives must include PSC limits that extend well below average PSC levels to meet the mandate of National Standard 9 to reduce bycatch.

⁴ Described in other comments in this Scoping Report.

2. Analyze a reasonable range of alternatives that includes abundance-based limits. A Western Alaska chum salmon abundance index should consider both escapement and the subsistence needs of fishery-dependent communities. Chum salmon abundance has historically fluctuated, and there is sufficient data to effectively link PSC levels to Western Alaska chum abundance. This would provide the ability to have lower PSC limits in place to conserve the resource for dependent communities and the ecosystem more broadly when Western Alaska chum salmon runs are depressed.
3. A chum PSC limit should be linked with chum abundance to the extent possible. At times of very high abundance, it makes sense to ease PSC restrictions, and at times of low and very low chum abundance, PSC limits should be ratcheted down to better account for salmon sustainability as well as community and subsistence needs. Regardless of high or low abundance, PSC caps should still be meaningful to reduce overall chum salmon bycatch.
4. Link chum PSC limits to abundance, with meaningful reduction achieved at all levels. As with all responsible management, limits should fluctuate with abundance, rather than being set at a single static level. The EIS should consider abundance indices for Western Alaska chum as a trigger for setting annual limits. The conservation of both the chum resource and Bering Sea fishing opportunity will be collectively better served by considering a management framework that responds to abundance.
5. Set a PSC limit commensurate with chum abundance. In years where the runs are threatened, an inflexible chum cap doesn't protect the run. In years of plenty, the caps act as an arbitrary limit where none is needed. Instead, we recommend setting a variable cap based on the anticipated run size in Western Alaska, first ensuring that escapement and the subsistence needs of the fishery dependent communities in Western Alaska are met. Moreover, when escapement goals are consistently not met and the communities' subsistence needs are not met, the PSC cap for coming years should be reduced to permit recovery of the depleted salmon runs.
6. Chum bycatch should be reduced at all levels of salmon abundance. There may be value from a number of perspectives in exploring linkages to escapement and subsistence needs. These are extremely important considerations. However, in doing so, there needs to be appropriate awareness with regard to the potentially problematic nature of such issues, as well as the importance of reducing bycatch at any level of salmon abundance.
7. Alternatives must include variable caps that fluctuate depending on the abundance of the run size with close attention to escapement goals and the subsistence needs of Western Alaska over time while these populations regain abundance to stabilize for communities of Western Alaska.
8. Option 1 for both Alternative 2 and Alternative 3 (limiting the allocation of a potential PSC cap based on historical total bycatch) creates a perverse incentive, rewarding the vessels and sectors with the worst historical performance. The options being considered relative to PSC allocations of a PSC limit should be broadened to include incentive-based allocations and/or re-allocations, rewarding good bycatch performance and forcing poor performers to improve or face stricter PSC limits. Allocations strictly based on historical performance or pro-rata shares also ignores other spatial constraints of the inshore and offshore sectors and the disproportionate impacts each may have specifically on Western Alaska chum.
9. An overall or Western Alaska chum PSC limit, as presented in the Alternatives, must be low enough to have a meaningful impact short- and long-term. A high static cap will have no conservation outcome for communities that depend on salmon returns as a way of life. The values suggested in the 2023 April Council motion call out "average" bycatch levels to be analyzed from 2011-2022. However, during that 12-year time period, chum bycatch was well-above (nearly double) the long-term average from 1991-2022. This sets a dangerous precedent for selecting an "average" PSC limit based on historically high and unacceptable levels of bycatch.

10. The long overdue development of a chum PSC limit must include numbers and mechanisms that will result in effective changes to the pollock fleet's fishing behavior significant reductions. The short time period of 2011 through 2022 to analyze bycatch levels is far too narrow to capture the relevant history and current conservation needs around chum salmon and their interactions with off-shore industrial fisheries. It focuses attention on a time when chum PSC has been nearly double historic averages, and river returns at historic lows, indicating the potential or even intent to codify an unsustainable and unacceptably high level of PSC through an inflated limit.
11. Chum bycatch should be immediately reduced at least by half the recent bycatch levels to no more than 250,000. These reduced Chum salmon bycatch caps are reasonably attainable and should be implemented right away. Even lower salmon bycatch caps should be implemented for the longer term in order to support Western Alaska chum salmon recovery. Within a year that bycatch should be further reduced to a 150,000 chum salmon PSC limit. These lower limits should remain in place until such time that the Western Alaska salmon fishery rebounds enough to support a healthy salmon population that meets both the needs of subsistence users and escapement goals for future returns.
12. An overall or western Alaska-focused chum PSC limit, as presented in Alternatives 2 and 3 must be low enough to account for the long-term nature of the salmon crisis, and to have a meaningful and durable impact in both the short- and long- terms. A high PSC limit will not have a meaningful outcome for salmon or Tribal subsistence communities, nor will it address the long-standing nature of the problem. A cap must be significantly lower than the bycatch amounts extending back for decades, which is the duration of this problem.
13. PSC limit numbers must include a full range of numbers at the 'low' end of the spectrum. To do otherwise would not be respectful of the needs to consider all options, to consider the magnitude of the salmon crisis in subsistence communities (who have been expected to have little to no harvest, while anything approaching this has been considered unimaginable with regard to the pollock industry), and to produce an honest, transparent analysis and statement of values with regard to different fisheries, different fishing communities, different National Standards, different social and economic impacts and different bodies of knowledge.
14. Conservation measures for chum salmon should be shared. If fisheries in western Alaska are shut down, then the PSC limits should reflect the shutdown. It can no longer be ignored that what happens in the pollock fishery affects what's taking place in our rivers. Communities on the Yukon, Kuskokwim and numerous other rivers in western Alaska face the strictest of management measures - criminalization - for any harvest of chum or Chinook. If the strictest of measures are taken inriver, strict measures should be seen in federal ocean fisheries.
15. Set meaningful chum and Chinook salmon PSC caps for the Bering Sea pollock fishery, sharing the burden of conservation, preserving the sustainability of salmon, and pursuant to NOAA's Ecosystem-Based Fisheries Management policy. NMFS should revise the range of Alternatives for this EIS to set a chum salmon PSC cap on the Bering Sea pollock fishery that provides equity in the conservation measures ensuring the Western Alaska chum salmon stocks do not collapse. Since the mid- 1990s the Council has recognized the need to adopt meaningful measures to limit the impacts of the Bering Sea pollock fishery on chum salmon through bycatch limits. However, the Council has a long history of not enacting meaningful management measures to address concerns over the number of chum salmon taken as bycatch in the Bering Sea pollock fishery. In 2012, the Council did attempt to develop chum salmon bycatch management measures and was presented with alternatives that included area closures, seasonal caps, and temporal caps. However, the Council refused to select an alternative that would provide meaningful reductions in bycatch of both Chinook and chum salmon since it would result in reduction of the pollock harvest. Instead, under Amendment 110 in 2016, the Council integrated an avoidance program

for chum salmon within the trawl fleet's Incentive Plan Agreements. Since the integration of chum salmon avoidance incentives in the pollock fishery's IPAs in 2016, the number of chum salmon caught by the trawl fleet has been well over the ten-year average of 226,304 fish, and were in fact, the highest bycatch years since 2006.

16. An appropriate metric to trigger a lower bycatch limit in the following year in specific areas during the B-season could include any or all of a combination of failures to meet subsistence needs, escapement failures or other available data such as directed fishery CPUE or in-river fish counts. Over 27 percent of the 2022 western Alaska chum bycatch were age 4 and otherwise could have returned that year or the following year to contribute to escapements. The chum life cycle can be highly variable in terms of their spawning age. Chum typically return to spawn between three and five years old and most frequently at age 4. Historically, over two-thirds of the chum returning to the Yukon River were age four; five year old fish were the second most common returning age of spawners. Most of the chum taken as bycatch are adult fish age three and four. Each successfully spawning chum on average generates nearly two returning fish. In other words, a bycatch limit that responds to poor escapements or other abundance metrics could allow for more returning chum the next year and provide for better future returns. We request that NMFS develop this alternative as part of the agency's obligations under NEPA, regardless of the outcome of the Council's October meeting.
17. During recent periods when chum salmon population declines and direct target and subsistence fishers were severely limited or shut down, the pollock fishery annually caught greater than the ten-year average of chum bycatch. This represents many more fish caught by the pollock trawl fleet than Alaska direct target commercial fishers, subsistence harvesters, and sport fishing combined. The sharp decline in Alaska's chum salmon populations and the high bycatch of chum salmon necessitates NMFS provide a preferred alternative that sets a meaningful PSC limit on chum salmon for the Bering Sea pollock fishery, and not simply a continuation of the status quo or additional IPA measures.
18. Select a Preferred Alternative, based on an Ecosystem-based Fishery Management approach that provides meaningful reductions in bycatch of both Chinook and chum salmon even if it results in reduction of the pollock harvest. While we have grave concerns over the state of chum salmon returning to Western Alaska, and the impacts of bycatch of chum salmon by the pollock trawl fleet on Western Alaska populations, the focus of setting a chum salmon PSC limit without thorough discussion and analysis of the pollock fishery's impacts on other bycatch species and habitat, including Chinook salmon, squid, herring, crab, and halibut is disingenuous and counter to the purpose and intention of the Magnuson-Stevens Act. Pitting and prioritizing one bycaught species against and over others does not get to the root of the problem. Setting PSC limits with a single species focus allows the pollock fishery to continue to take bycatch of all species at an unsustainable level, while keeping a TAC that maximizes and prioritizes the pollock fleet's economic gains. Meanwhile, those fisheries targeting bycaught species continue to shoulder the burden of conservation measures for the recovery of their target species.
19. The Council has used bycatch limits for Bering Sea Chinook to varying degrees for several decades but has set those limits at such high levels that the pollock industry has not shared in conservation burden borne by Alaska fishermen. For example, one of the Council's proposed alternatives would set limits based on average recent bycatch which ranged between 315,000 to 377,000 chum depending on the selected time period. A limit developed under this range of could allow for the bycatch of over 60,000 western Alaska chum each year over time. Even ten to twenty percent reductions using this range may not meaningfully improve escapements or subsistence harvests, let alone provide sufficient salmon escapements to strengthen runs to the point of restoring an important commercial salmon fishery.

Time/area closures

1. Given the failure of previous management measures to constrain chum bycatch we request that NMFS and the Council consider developing an alternative that considers spatial and temporal management measures triggered by abundance-based metrics.
2. While proposed Alternative 4 considers spatial and temporal management measures by adding chum salmon bycatch reduction plan agreements to IPAs, it links those measures to pollock catch rates or the proportion of western Alaska stocks relative to other chum stocks, rather than to western Alaska chum salmon abundance. In other words, bycatch of western Alaska chum could remain high when there are high pollock catch rates or there is a large abundance of other chum stocks. Specifically, NMFS should develop an alternative with temporal bycatch limits and spatial closures that:

(1) considers limits for specific areas during the portions of the B-Season when western Alaska chum bycatch is highest, and

(2) utilizes abundance metrics such as escapements or amounts necessary for subsistence to trigger closures rather than industry catch rates or abundance of other stocks. Past, recent and ongoing chum genetic stock composition analyses can inform the development of an alternative that links bycatch limits with the spatial and temporal distribution of chum salmon bycatch. The largest numbers of bycaught chum that originate in the northeastern Pacific – whether from western Alaska or other parts of Alaska – occur in portions of the Bering Sea east of 170° longitude. Most of the bycatch of western Alaska or other Alaskan fish there occurs during the middle of the B-season, frequently in pulses such as in mid-July and mid-August.

Representatives of western Alaska chum fishermen participating in the Council’s Salmon Bycatch Committee recommended this alternative with two options that would set area-specific bycatch limits in Cluster 1 and close the area for either the early weeks of the B-Season or the entire B-Season. The Council refused to move this alternative forward for further analysis. The Council’s September 2023 analysis indicates that agency staff consulted multiple representatives from the pollock industry in the development of alternatives, but did not consult with individuals who represent western Alaska chum fisheries.

3. Time and area closures should also be considered in addition to an overall PSC cap to target returning Western Alaska chum salmon migrating through the Bering Sea on their journey to natal rivers. Tribal representatives developed a comprehensive set of alternatives for the NPFMC’s Salmon Bycatch Committee for their March 20 meeting ([listed as Proposal 4](#)). That set of alternatives represents a reasonable range and should be included in the analysis.
4. We recommend time and area closures. We applaud efforts to reduce bycatch of chum salmon in the Bering Sea pollock fleet, including but not limited to genetic sampling and identification of spatial, temporal, and thermal trends of chum salmon in the pollock fishery. We encourage the continued use of said studies to further reduce the chum salmon bycatch in the pollock fishery and encourages further efforts to accomplish this priority. As the knowledge in these areas increases, we further support time and area closures to further decrease chum bycatch. Identifying times and areas of high bycatch will allow the fleet to avoid the valuable salmon runs of their further depletion.
5. Time and area closures must also be considered in addition to a PSC cap. The migratory behavior of chum salmon lends itself to an evaluation of time and area closures as part of the analysis. For

instance, there is indication that early B-season tends to see higher proportions of Western Alaska chum, especially in genetic sampling or Cluster Area 1. Focusing timed closures in areas with high Western Alaska chum salmon bycatch rates will ease choke points for returning chum salmon and will allow the most fit individuals to return to their natal rivers to spawn or provide for subsistence users. The available data from time and area closures provides valuable insight into linkages between amounts of bycatch, genetic composition of bycatch, temporal dimensions of bycatch, and spatial dimensions of bycatch.

6. Consider options for time and area closures that have the ability to conserve salmon at key migration times, respond to instances of high PSC rates with dynamic closure options, and focus areas that have Western Alaska chum savings potential specifically. While reducing overall chum PSC is critical, and responding to high PSC rates can help that, there is also benefit to distributing PSC take across time and area. PSC concentrated in singular spaces and times are more likely to remove genetically similar groups. Genetic diversity is a critical component of run plasticity, or, the ability to adapt to and survive ecosystem changes. The conservation of both the chum resource and Bering Sea fishing opportunity will be collectively better served by considering a management framework that responds to abundance as well as temporal and spatial dynamics.

Additional approaches to minimizing chum bycatch (PSC)

1. Other tools that could be explored relative to IPAs that have been part of previous chum salmon management regimes and inter-cooperative agreements, include a chum salmon weekly dirty 20 list (phased out during Amendment 110), inter coop incentives, and outlier provision regulations.
2. Apply Alternatives 2, 3, and 4 to both the A and B season. While the B season has historically seen the highest annual chum salmon bycatch, we request the A season be included as well. Ocean conditions in the Bering Sea are changing rapidly, as are the migration and feeding patterns of the many species that call it home. Salmon runs are currently in a crisis state, which mandates increased scrutiny and monitoring throughout the seasons.
3. Implement video monitoring on all trawl fishing vessels with 24/7 coverage to ensure salmon bycatch does not exceed these hard cap limits.
4. The pollock TAC must be 'on the table' as part of the solution. Part of the suite of behavioral or other changes must include the possibility that the pollock fleet may simply need to fish significantly differently and/or even simply fish less. The TAC must not be treated as sacred. It is just one factor among many, which must be considered; and it must be considered, including changing it, not just protecting it for its economic value.

Topic 3: Comments on significant issues to analyze or consider

3.a. Analytical methods and scientific, Local and Traditional Knowledge, and other information

Genetics Information

1. Genetic Diversity - From 2013-2023, over 3.1 million chum salmon have been taken as bycatch in Bering Sea groundfish fisheries. The cumulative impact of these removals on the genetic diversity and therefore the overall resilience of salmon populations in Western Alaska should be evaluated as part of the EIS. Genetic diversity in the fittest salmon returning to natal rivers is a key element of a populations' resilience and ability to recover from a depressed state. In an increasingly unpredictable and warming climate, anthropogenic activities like bycatch that suppress life-history diversity could have serious consequences, particularly for depressed

populations persisting at ecological and physiological limits. The genetic diversity of each stock is the fail-safe that the population has to adapt and survive over time. If the same genetic portion of that run is removed, such as when bycatch events capture large groups of migrating fish that are likely to be genetically similar, it makes populations more vulnerable to extinction, with compounding effects for salmon-dependent ecosystems and communities.

2. The effectiveness of Western Alaska chum bycatch reduction measures must carefully consider the existing genetics data. Estimates of total Western Alaska chum salmon catch in the pollock fishery are available by Cluster (1-4) and Early/Late time periods (Early: Weeks 24-32, and Late: Weeks 33-43). Accurately predicting the spatio-temporal distribution of Western Alaska chum based on historical genetics information is the primary pathway for effectively reducing bycatch of Western Alaska chum salmon specifically. The EIS should carefully explore the patterns of historical Western Alaska chum salmon distributions to utilize for in-season management measures. If, hypothetically, a three-year time series most accurately reflects future year Western Alaska chum salmon distributions, then the following table would be most useful in determining areas and times that should be subject to increased bycatch avoidance. We envision these tables being updated with the latest genetics information on an annual basis, with trends being monitored continuously (as is currently done informally within the existing IPA management.). Thresholds may also be established such as cluster 4/Late (2% Western Alaska chum proportion), whereby all salmon bycatch avoidance measures are suspended so as not to force the fleet into areas of higher Western Alaska chum salmon. Only the IPAs can adapt to annual changes in genetics information to ensure ongoing prioritized avoidance of Western Alaska chum salmon specifically.
3. Advances in genetic sampling indicate there may be significant spatial trends in chum bycatch in the pollock fishery. For instance, Western Alaska chum is a greater proportion of overall chum bycatch in certain areas, especially in genetic sampling area Clusters 1 and 2. It follows that management measures to reduce chum bycatch should utilize spatial, temporal and thermal trends in extant data to identify ways to maximize reductions in Western Alaska chum bycatch specifically. We encourage NMFS and the Council to consider emerging technologies, such as genetic sampling, proactively in the EIS so that the document is forward-thinking and responsive to the development of more precise management tools longer-term.
4. Severe data limitations exist which could complicate effective development of a reliable index of Western Alaska chum abundance under Option 2 for both Alternative 2 and Alternative 3. Accurate chum salmon run reconstructions via weir projects, sonar counts, test fisheries, aerial surveys, etc. are highly dependent on funding availability, stream flows/flooding, turbidity, weather, and other extemporaneous factors. Reliable and consistent data streams are questionable, as is the arbitrary selection of highly diverse river systems (limited by available data of varying quality) to represent overall Western Alaska chum salmon abundance in the Bering Sea. At present there are three broad categories of data that could inform an index of Western Alaska chum abundance: (i) genetic analyses from pollock fishery bycatch; (ii) escapement/run reconstruction data; and (iii) commercial and subsistence harvest (ANS) data. To formalize a process whereby PSC limits are dependent on any of these three sources would be to assume both ecosystem stationarity and the future availability of those data from an external management body.
5. More research is needed on origin of chum caught in the Bering Sea pollock trawl fishery for meaningful western Alaska bycatch avoidance.

Local (LK) and Traditional/Indigenous Knowledge (TK)

1. TK should be a key component of an EIS and its analysis of social and environmental impacts of salmon bycatch in the pollock fishery, especially as they relate to Western and Interior Alaska communities. It would be impossible to accurately capture the impacts of salmon declines and conservation, or develop successful responses, without incorporating the LK and TK rooted in Western Alaska tribes and rural communities as a foundational source of information and rubric for assessment. Salmon loss to salmon-dependent cultures and communities results in impacts that include and far exceed the economic reliance more readily quantified in statistical analysis. The catastrophic effects of salmon declines, and the extraordinary benefits of conservation, have impacts on livelihood, nutrition, cultural identity, education, spiritual practice, rural economy practices, and many other aspects of community wellness that must carry fundamental weight in analysis, far beyond anecdotal narrative. LKTK as well as Tribal consultation can provide additional context and content necessary for properly assessing alternatives for action.
2. TK is part of the best information available, yet has not been treated as such despite National Standard 2. Fisheries science (and its particular model-, instrumentation-, and quantification-based approaches) has failed to steward the resource on its own. Millions of Chinook and chum salmon have been wasted as bycatch in the pollock fishery over the past several decades, many of which were bound for western and interior Alaska. Our Tribes do not believe this is insignificant at any level - not in terms of its species level effects, its effects on the ecosystem, and its effects on our communities and their *iluagniq* (well-being, in Inupiaq).

Other analytical approaches and information issues to consider

1. The number of chum salmon that return to Western Alaska rivers given additional chum salmon bycatch measures must be analyzed quantitatively. Assessing numerical savings of Western Alaska chum salmon attributed to Incentive Plan Agreement salmon bycatch measures is difficult given the inability to predict fleet behavior and simulate hypothetical fishing effort. Council and Agency analysts have indicated any IPA options proposed under Alternative 4 will only be qualitatively evaluated, however, we believe this creates an unequal comparison between the existing alternatives.
2. We note that the Council's preliminary review analysis highlights that no low abundance threshold has been established by the Alaska Department of Fish and Game for chum salmon; and that a low abundance threshold would need to be determined by the Council, with perceptions of high vs. low abundance strongly influenced by the time series of data selected.
3. The Council analysis shows no direct correlation between whether the ANS are met and total run reconstruction estimate. We believe the absence of a direct correlation makes this metric a poor indicator of the stock status for Western Alaska chum salmon on a given drainage.
4. SeaState, Inc. developed a catch per unit effort simulation framework to analyze the effects of lowering the base rate (up to 50%) as well as increasing the size of closure areas. The results included five simulated scenarios with maximum estimates of total Western Alaska chum salmon savings of 3,522 (704 per annum average) fish over the recent five-year period (2018-2022). In two of the five years assessed, however, Western Alaska chum catch was estimated to increase relative to the status quo. Further, the proportion of estimated Western Alaska chum in the overall bycatch was calculated for each scenario. Across all scenarios in which chum salmon bycatch management measures were increased—expanding bycatch avoidance areas and decreasing by half the bycatch rate at which bycatch avoidance areas are identified—estimated reductions of the Western Alaska bycatch proportion decreased by a maximum of 1%. In fact, as the rolling hot spot program is enhanced to move the fleet more aggressively, there is increased variability in the predicted Western Alaska chum catch and diminished bycatch mitigation returns. The simulation highlights the difficulty in attempting to avoid 18% of a total population

of a given species, with a very limited understanding of the true spatio-temporal distribution of Western Alaska chum. Quantitative analyses of IPA bycatch mitigation measures are therefore essential to understand estimated impacts to the fleet as well as benefits to in-river salmon returns.

5. Performance metrics relative to bycatch tradeoffs should be extensively and quantitatively assessed for each of the chum salmon bycatch reduction measures considered within this EIS. It is critical to understand that increased avoidance of Western Alaska chum salmon may lead to bycatch tradeoffs. This was particularly evident in the chum salmon analysis completed in 2012, which showed that management actions to move the fleet away from the most productive fishing grounds to avoid chum salmon would extend the season and thus have adverse effects on Chinook salmon bycatch. SeaState, Inc. simulations resulted in marginal increases of Chinook salmon bycatch. However, Chinook bycatch is not the only tradeoff that must be considered. The 2023 B season has provided an example of additional regulatory constraints that must be considered in the context of this EIS. Catcher vessels operating within the Catcher Vessel Operational Area this B-season encountered large schools of herring at depths and in areas not traditionally encountered. Exceeding the pollock fishery's herring PSC limit was avoided by using the cooperative structure to implement voluntary closures to limit herring bycatch. However, catch of chum salmon of the inshore sector more than doubled within three days of implementing voluntary herring bycatch avoidance areas, clearly demonstrating the spatial mismatch of chum and herring distributions. Catcher/processor vessels were also forced to abandon pollock fishing in low chum bycatch areas within the Winter Herring Savings Area and move closer to the shelf break due to increasing herring catches. Chum salmon bycatch rates were significantly higher near the shelf break. These are examples of the daily decisions vessel captains face and the bycatch tradeoffs that must be considered.
6. A chum salmon abundance index should consider both escapement and the subsistence needs of fishery-dependent communities. To be more equitable, NMFS and the Council must concede that the unique life history of salmon and the ecosystems and people dependent upon them necessitates a comprehensive, gravel-to-gravel approach to management. When escapement goals are consistently not met and communities are significantly below their subsistence harvest goals (as measured by ANS), managers are not fully evaluating the systems impacted by their decisions. Bycatch is one of the few salmon life-stage specific mortalities that managers can control, and NMFS and the Council must do more to reduce Western Alaska chum salmon bycatch in a way that is responsive to community and ecosystem needs.
7. Analysis should never assess impact by describing total chum PSC as a percentage of target catch. The extraordinary size of the pollock harvest does not provide an appropriate context for the value and impact of salmon conservation. Incorporate meaningful biological analysis of salmon reproduction and recovery. In past analyses, we have observed a lack of robust salmon science as a cornerstone of impact assessment. Rather, analysis tends to focus on Western Alaska chum as a percentage of overall chum, and a percentage of a total annual escapement goal. This over simplifies the known dynamics of salmon resilience and reproduction, and the value of salmon conservation and biodiversity conservation over time. For example, a management mechanism resulting in an additional 500 chum salmon returning to a salmon system could be assessed as a small benefit, when compared strictly to the annual needs for escapement and subsistence. However, 500 salmon returning to a system in crisis can have a substantial impact on recovery for that system, based on reduced competition for habitat, feed availability, and other critical aspects of reproduction and juvenile survival. Another important component of salmon resilience is genetic diversity in returning salmon, and the long-term impacts of sustained genetic removals. An individual run is made up of a spectrum of genetically similar but not identical salmon; that

returning mixture results in a temporal, spatial and genetic spawning diversity critical to resilience within a dynamic and changing system. Salmon managers have recognized and responded to this within management schemes, including both the State of Alaska today and indigenous stewards throughout the history of these systems. When there are high salmon bycatch events that are likely to contain significant numbers of the same genetic group, or consistent significant removals during the same period of the run each year, the consequences of that genetic composition are as important as the number of fish. Analysis should incorporate the best available science around salmon recovery, including spawning brood tables accounting for reproduction and survival factors at different levels of abundance, and the impacts of genetic removals in the short term and compounded over time.

8. The scope of this EIS analysis must be broad enough to consider biological, ecosystem-wide, and human dimension issues.
9. We request an inquiry into the problem of *Ichthyophonus* found in the massive amounts of pollock processing waste thrown overboard as this diseased waste must be investigated as an additional factor, along with bycatch, of salmon decline. The salmon are known to key into this waste and eat it and *Ichthyophonus* has been detected in salmon on the spawning grounds.

3.b. Management, economic, social, and cultural considerations

3.b.i. Bering Sea pollock fishery Incentive Plan Agreements

1. The current IPAs are the most effective tool for managing Western Alaska chum salmon bycatch now and into an uncertain future. IPAs have two primary tools to further incentivize the fleet to avoid chum salmon generally and Western Alaska chum specifically. Those tools include reducing the bycatch rate threshold (base rate) at which bycatch avoidance areas are considered in areas and times when Western Alaska chum salmon are known to be in greatest abundance. It is important to recognize, however, that careful consideration and extensive analysis was conducted to establish the current base rate for chum salmon. It is predicated on a clear demonstration that lowering base rates below the 0.20 threshold diminishes returns on chum salmon savings; and while possibly reducing impacts on Western Alaska chum specifically, it would likely increase chum catch overall. Years of bycatch data were analyzed to show that closing areas at an extremely low bycatch rate threshold significantly decreases the likelihood that chum salmon abundance is lower outside of those areas. The second primary tool is to enlarge bycatch avoidance areas further, when and where Western Alaska chum salmon are known to be present. Again, chum salmon appear on the grounds in discrete areas and for very short time windows, suggesting that schools move rapidly and do not remain stationary occupying large areas. Accordingly, while Western Alaska chum salmon savings may be achieved, overall chum salmon bycatch reductions are in question.
2. Chum salmon move up onto the Bering Sea shelf and overlap with the pollock fishery in greater numbers as water temperatures increase. Additionally, chum salmon predation of Age 0 pollock increases when abundance is high, as was the case during the protracted warm phase of 2015-2021. Salmon productivity has also historically faltered during warm phases in which the primary productivity shifts from being an ice dominated ecosystem characterized by large lipid rich zooplankton abundance to warmer waters fueling multiple phytoplankton blooms and small copepod abundance and coccolithophore blooms. In short, we believe the current IPA system to be best suited to address the increasing variability in pollock and salmon abundance on the fishing grounds, as well as adapt to longer term changes in species distributions and

abundance due to climate change. Clear incentives are in place to reduce bycatch of chum salmon at all levels of pollock and salmon abundance.

3. IPA revisions can be made at any time and become effective upon Agency approval, providing an avenue for immediate action to address low Western Alaska chum salmon runs. In 2019 and 2020, the Western Alaska chum component of the overall chum bycatch was reduced from a historical annual average of approximately 18% to just 9%. The 50% decline of those stocks in the stock composition highlights the ability of the genetics data to provide limited information on stock status in the marine environment. In response to those declines, the IPA for the CP sector implemented three new measures to further prioritize and reduce chum salmon bycatch for the 2022 B season. Provisions were included to: (i) categorically close all areas with extremely high chum bycatch to all vessels regardless of performance; (ii) make the IPA more responsive to sudden spikes of chum bycatch by implementing bycatch avoidance areas bi-weekly instead of weekly; and (iii) implement a chum outlier provision. These changes have been successful at reducing chum salmon bycatch in the combined CP and CDQ sectors for 2022 and 2023, although it is unclear what additional external factors (including average bottom temperature) have contributed to the reductions.
4. As species distributions shift, the IPA can continue to be responsive to updated genetics information by adapting to inter-annual changes that may occur. Static regulations may direct the pollock fleet to prioritize areas and times where Asian origin hatchery fish are more prevalent, thereby increasing interactions with Western Alaska chum in the future. The greatest challenge of managing chum salmon bycatch in-season is the inability of current genetics to “independently assign” a river of origin either in real time or postseason for each genetic sample collected. In other words, in managing rolling hot spot closures, there is no way to determine whether specific hotspots of chum salmon abundance are predominantly aggregations of hatchery fish produced in Russia / Asia, or chum salmon bound for the Yukon River. In fact, it is impossible to determine post season if/whether a chum salmon caught during a specific haul was a chum salmon reared in the Kuskokwim River or originated from a hatchery in Japan. Only through Bayesian analyses is an estimate of the relative stock of origin proportion possible, albeit on a coarse spatial and temporal scale. We use the most current genetics data to inform when and where bycatch avoidance should be prioritized to minimize impacts on Western Alaska chum salmon.
5. Voluntary IPAs or similar approaches cannot be relied upon as the sole approach to this problem. It took public outcry to get the pollock fleet (and managers) to recently start seriously re-engaging the problem of chum bycatch. Even if the fleet can produce measurable and significant outcomes through these means and mechanisms, they cannot be left to their own devices to do so. Industry should be encouraged to work on such approaches, which may make a good component of a suite of solutions.
6. There has long been a sentiment that if chum are avoided the trawlers will catch more Chinook and vice versa. Industry can and should adopt measures that will allow for sustainable fisheries for all species. No longer pin Chinook and chum salmon bycatch against one another.
7. Amendment 110 clearly showed the trawling industry requires serious oversight to reduce bycatch; voluntary or regulatory requirements are not enough. Efforts such as the 1994 Chum Salmon Savings Area, the 2001 voluntary rolling hot spot closure system, the 2007 BSAI Amendment 84 allowing inter-cooperative Agreements, exemptions from Salmon saving Area Closures, 2010 BSAI FMP Amendment 91, IPAs, observer coverage in the GOA, the 2016 Amendment 110 to the BSAI FMP and GOA FMP were all enacted and bycatch continues and has actually increased. This industry can and must share the burden placed on other fisheries. The cost to them must be passed on to the consumer as a cost of doing business. The time of

"bycatch and bycatch mortality to the extent practicable where appropriate" has long been passed. Conservation measures shall minimize bycatch. Bycatch is wanton waste of communities' food security. This requires rigorous oversight for fairness and equity and promotion of conservation.

8. Alternatives must include measures beyond IPAs. Establishing a non-Chinook PSC limit and management framework is a critical and long-awaited step for our region, which has borne the entirety of regulatory conservation of Western Alaska salmon. We emphasize the importance of moving forward with an equitable standard for regulatory salmon conservation for the Bering Sea pollock fleet, recognizing that voluntary measures are a helpful but incomplete strategy for meaningful conservation-based management. Simply adding regulatory structure to the existing IPAs developed by the pollock industry would not achieve the standard of equitable or meaningful conservation needed in the North Pacific. While the factors contributing to salmon declines are complex, PSC is a known and significant contributor to mortality, and regulatory measures to limit and manage PSC provides a critical path to conserve salmon.

3.b.ii. Subsistence fisheries

General

1. The conservation of both the chum resource and Bering Sea fishing opportunity should be balanced with the subsistence needs of the Western Alaska region. For this reason, we note that recent catch years have resulted in chum PSC take that is beyond what would be sustainable or equitable at any level of Western Alaska chum abundance. The current authorized levels of salmon bycatch are not low enough to ensure there is enough salmon for subsistence users. Subsistence communities depend on these shared resources and have been adversely affected by in-river restrictions and complete closures to subsistence salmon harvest this past year.
2. It is imperative to the people of these regions that immediate action be taken to the reduce Bering Sea trawl fisheries the bycatch of Chinook and Chum salmon. Over many years, subsistence communities with extremely limited resources have been making many conservation efforts to protect the future viability of the fishery. Despite these efforts, access to this critical food source is now being severely restricted. Subsistence salmon harvest in recent years is the lowest harvest levels recorded for Western Alaska communities. It is reasonable that the billion-dollar commercial trawl fisheries should take responsibility to further reduce salmon bycatch. Every salmon that makes it to the spawning grounds counts in this time of diminished returns, and every salmon is needed for there to be any chance of a subsistence harvest opportunity.
3. The importance of continually avoiding and reducing bycatch across all species must be prioritized. Subsistence communities are experiencing stressors across many species. Additionally, it is not acceptable to view the problem using an either/or perspective when it comes to subsistence resources (e.g. decreasing bycatch of one species but allowing it to increase for another to accommodate industry).

Environmental Justice and other cultural and social interests

1. The EIS must equitably address cultural, spiritual and social impacts to subsistence users associated with salmon declines. The closure of subsistence and direct target fisheries in Western Alaska have a devastating effect on communities along the Yukon and Kuskokwim Rivers that depend upon those fish for income, food security, and passing on traditions and cultural practices.
2. While there are economic impacts to communities associated with commercial and subsistence fishery closures, the catastrophic impacts of these closures extend well beyond economics.

Secretary of Commerce Raimondo recently announced Fisheries Disaster Declarations for the Yukon, Kuskokwim, and Norton Sound Fisheries. This acknowledgement is very important. However, even if subsistence communities were to receive some economic relief for the loss of food and livelihood we have suffered, no money can replace the millions of pounds of healthy subsistence salmon we rely on to survive. Nothing can replace the devastating loss of our salmon culture and way of life. All conservation measures are necessary to help rebuild and sustain the salmon population for future generations.

3. The fishing industry has been allowed to waste hundreds of thousands of fish subsistence users depend on. This waste occurs even while *piniagniq* (*subsistence*, in Inupiaq) practitioners of Western and Interior Alaska go without and cannot conduct subsistence fishing. Foregoing this subsistence harvest is done to conserve the resource - the burden of which we, who have the least capacity to do so, bear disproportionately in comparison to the pollock industry. And foregoing this subsistence harvest - a harvest which has nothing to do with the problem - is done in large part per the mandates of the State of Alaska, which has refused to take any reasonable measures to stem the impacts of the directed commercial take of western Alaska salmon in Area M, the incidental take of salmon in the pollock fleet's bycatch, or the production, distribution and consumption of fossil fuels which drive the same climate change which fisheries managers are so fond of focusing on with regard to salmon declines. This has occurred as our salmon resources are depleted to almost nothing and our communities driven to the point of starvation.

3.b.iii. Alaska Natives / Tribes and Communities

General

1. The value of cultural survival and diversity must be considered for the net benefit of the nation and valued for its very character.
2. Providing an alternative that allows for meaningful and effective bycatch avoidance is a great opportunity for NMFS to change the legacy of federal fisheries management in Alaska, which is harming communities and threatening a way of life central to who we are as Native peoples. NOAA says that "Alaska's fisheries are among the best-managed, most sustainable in the world," while western Alaska salmon returns annually weaken. NOAA also states, "Alaska resources provide jobs and a stable food supply for the nation, while supporting a traditional way of life for Alaska Native and local fishing communities." We request that NOAA take meaningful action in regards to chum bycatch to live up to these statements.

Environmental Justice and other cultural and social interests

1. The scope of this EIS must be robust and diverse in its inclusion of Tribes and their knowledge and perspectives.
2. In developing the EIS, NMFS must engage with and consult with affected Tribes in a meaningful way. NMFS should engage with Alaska Native representatives through formal and informal Tribal consultation early on and continue throughout the development of this EIS. This EIS analysis should include early and ongoing Government to Government Consultation with Alaska Native Tribes, and consistent with the Presidential Memorandum on Uniform Standards for Tribal Consultation. All mandates of various kinds must be maximally attended to with regard to Tribal Consultation, Tribal sovereignty, the trust relationship, and human rights.
3. The EIS should include social and environmental impacts of salmon bycatch in the pollock fishery, especially as they relate to Western and Interior Alaska communities, utilizing TK as a key component.

4. The sovereignty of Tribes, their social, cultural and spiritual well-being, their subsistence rights, and the *ella* (environment, in Yup'ik) and resources on which they depend should all be taken into account. The EIS must equitably and robustly address social, cultural, psychological, nutritional, economic, and spiritual impacts to Tribes and subsistence users associated with salmon declines. These impacts have been massive and catastrophic. This includes, but is not limited to, negative impacts to physical, emotional, and mental health; loss of opportunities for intergenerational *apegthuulluku* (*knowledge-sharing*, in St. Lawrence Island Yup'ik); cascading effects and pressures across multiple social and economic structures and subsistence practices; increased vulnerability to changing environmental and economic conditions; negative impacts to Tribal sovereignty.
5. All processes associated with this EIS must involve thorough, systematic, and meaningful two-way engagement and *qanertukut apyutkanek* (*Consultation*, in Yup'ik) with Tribes and Tribal organizations, and ensure equal or greater incorporation of TK in analyses and decision-making. Tribal expertise, social science, and best practices (such as the work products of the Council Local Knowledge, Traditional Knowledge, and Subsistence Taskforce) should be important.
6. The EIS must address how the alternatives would ensure that equity and environmental justice would be achieved.
7. We encourage the Council and NMFS to invite Tribal representatives and Indigenous peoples to be an integral part of development of this EIS analysis. The decision-making of the Council in managing the Bering Sea and Gulf of Alaska pollock fisheries impacts Alaska Native peoples and communities. Alaska Native coastal communities in Western Alaska are bearing the brunt of the burden of conservation measures due to low fish abundance in chum salmon that continue to be bycaught in the Bering Sea and Gulf of Alaska federally managed fisheries.
8. The interests and concerns of Alaska Native coastal communities have been underrepresented in previous NEPA analyses of federal fisheries management in the Bering Sea and Gulf of Alaska. NMFS should correct the historical imbalance and inequitable application of management decisions in the Bering Sea pollock fishery by setting a meaningful chum salmon PSC cap that protects subsistence and direct target chum users and communities.

3.c. Magnuson-Stevens Act National Standards

1. All of the National Standards must be addressed.
2. There are many factors, including the reductions from Maximum Sustainable Yield, which should be taken into account to formulate Optimum Yield and meeting all of the National Standards.

3.d. Climate change / greenhouse gas emissions

1. The EIS must consider managing fisheries in light of climate change and its impacts. Climate change should be considered as a major driver of the salmon decline. Alaska Native Tribes have been pioneers in documenting *silam innigua atʔanuqtuaq* (*climate change*, in Inupiaq) and its impacts on natural resources. But climate change as a driver of the salmon decline should not be used as an excuse to fail to appropriately and decisively act to reduce bycatch. Climate change must also be understood as a context within which fisheries managers are required to manage the fisheries.

Topic 4: Out of the scope of the Purpose and Need for this action

1. Significantly reduce salmon bycatch in the Bering Sea trawl fisheries to below the levels currently authorized by the Council in order to protect this important subsistence food that is critical for our survival and the continuation of our traditional lifestyle. Immediately reduce the Chinook salmon bycatch cap in the BSAI commercial fishery to at most 16,000 fish. These reduced Chinook salmon bycatch caps are reasonably attainable and should be implemented right away. Even lower salmon bycatch caps should be implemented for the longer term in order to support Western Alaska Chinook salmon recovery. The Councils believe that these reduced chum salmon bycatch caps are reasonably attainable and should be implemented right away. Even lower salmon bycatch caps should be implemented for the longer term in order to support Western Alaska Chinook and Chum salmon recovery. Within a year, further reduced to a 10,000 Chinook salmon hard cap limit. These lower limits should remain in place until such time that the Western Alaska salmon fishery rebounds enough to support a healthy salmon population that meets both the needs of subsistence users and escapement goals for future returns.
2. Explicitly considered subsistence needs in the management of Bering Sea commercial fisheries. Subsistence representation is critical to this objective and can be accomplished by adding at least two Alaska subsistence representative seats to the Council. Subsistence fishing communities are equal stakeholders in the management of this shared salmon resource and should have a seat at the decision-making Council table, whose decisions directly affects our lives. LKTK of subsistence fishers is critical to the success of salmon conservation management and will be an asset to the Council. We request two designated Alaska Subsistence or Tribal seats be added to the Council. There is precedence and a pathway for this process in place already for the western coast states; namely Federally Recognized Treaty Tribes hold a seat on the Pacific Fishery Management Council. While Alaska Tribes do not have the same fisheries treaty protections, all federally recognized Tribes have retained government to government authority. Rural subsistence communities do have subsistence priority on Federal lands and waters under Title VIII of ANILCA. That subsistence priority is effectively eliminated when salmon escapement is so low it causes severe restrictions or complete closure to any subsistence harvest. Therefore, we need Alaska Subsistence or Tribal representative seats on the Council to be able to vote on fisheries management actions and conservation measures that impact the continuation of subsistence uses. To maintain objectivity, these subsistence or Tribal representatives should not have any direct personal economic ties to the CDQ fisheries. Subsistence or Tribal representative seats must be included on the Council with amendment to the next reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act.
3. The 2004 Programmatic Supplemental Environmental Impact Statement (PSEIS) for the Bering Sea Aleutian Island and Gulf of Alaska Groundfish Fisheries, including the Bering Sea pollock fishery is outdated. The North Pacific is at the forefront of climate change. The 2004 PSEIS is focused on the economic gains of the trawl fleet, and not responsive to the impacts of the fishery on other fish, fisheries, communities, and the ecosystem, and is no longer reliable to inform the sustainability of the fisheries of the Bering Sea and Gulf of Alaska. Since the publication of the 2004 PSEIS, ocean conditions, habitat, and fish populations have changed dramatically. The Bering Sea and Gulf of Alaska have and are experiencing radical changes. Rising ocean temperatures are altering the marine ecosystem and changing fish species distribution and productivity, leading to a series of cascading impacts to the marine ecosystem and the people who depend on its resources. In the past several years, important fish to Alaska's economy and Alaskan's livelihoods, including halibut, crab, Chinook salmon, and chum salmon, are experiencing steep declines. The 2004 PSEIS and 2015 Supplemental Information Report are inadequate to adapt to current and future ocean conditions, and applies the National Standards in an unbalanced manner, and has aggravated the

severe burdens placed upon Alaska’s most dependent fishing participants, Alaska Native people, and coastal communities. To better inform future federal fisheries management and correct the current management regime failings, NMFS undertake a comprehensive NEPA review of the Bering Sea and Gulf of Alaska ecosystems.

List of Preparers

Bridget Mansfield, NMFS

Persons Consulted:

Kate Haapala, NPFMC

Appendices

Appendix 1. Cooperating Agencies

Appendix 2. NEPA Implementing Regulations on Cooperating Agency requirements 40 CFR § 1501.8.



KUSKOKWIM RIVER

INTER-TRIBAL FISH COMMISSION

OUR RIVER, OUR PEOPLE, OUR FISH

P.O. Box 190 Bethel, AK 99559-0190 | (907) 545-7388 | info@kritfc.org | kuskosalmon.org

September 1, 2023

Mr. Jon Kurland Regional Administrator
Alaska Regional Office, National Marine Fisheries Service
PO Box 21668
709 West 9th Street
Juneau, Alaska 99802

Re: Cooperating Agency Request for EIS for Minimizing Non-Chinook Salmon Bycatch in the Bering Sea Pollock Fishery

Dear Administrator Kurland:

The Kuskokwim River Inter-Tribal Fish Commission (KRITFC) requests designation as a cooperating agency pursuant to the National Environmental Policy Act (NEPA) for the [Minimization of Non-Chinook Salmon Bycatch in the Bering Sea Pollock Fishery](#).

KRITFC is making this request under the Council on Environmental Quality (CEQ)'s regulations implementing NEPA. The CEQ regulations define a cooperating agency as "any Federal agency (and a State, Tribal, or local agency with agreement of the lead agency) other than a lead agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action that may significantly affect the quality of the human environment."

KRITFC qualifies as a cooperating agency under this definition as a Tribal consortium with authorizing resolutions from 27 Federally recognized Member Tribes throughout the Kuskokwim drainage to act on their behalf in fisheries management, research, and monitoring using the best available Indigenous Knowledge and Western science. Additionally, since 2016, via authorization of a formal Memorandum of Understanding (MOU) and Section 804 of the Alaska National Interest Lands Conservation Act (ANILCA), KRITFC and U.S. Fish and Wildlife Service (FWS) at Yukon Delta National Wildlife Refuge (YDNWR) have collaboratively managed Kuskokwim salmon stocks. The 2023 season marks the eighth consecutive season of collaborative management, and the first that spanned the Chinook, chum, and coho salmon runs due to concerns for the protection of all three species and the prioritization of rural subsistence harvests as mandated by Title VIII of ANILCA.

TELIDA | NIKOLAI | TAKOTNA | MCGRATH | LIME VILLAGE | STONY RIVER | SLEETMUTE | RED DEVIL
GEORGETOWN | CROOKED CREEK | NAPAIMUTE | CHUATHBALUK | ANIAK | UPPER KALSKAG | LOWER KALSKAG | TULUKSAK
AKIAK | AKIACHAK | KWETHLUK | BETHEL | OSCARVILLE | NAPASKIAK | NAPAKIAK | KASIGLUK | ATMAUTLUAK
NUNAPITCHUK | TUNTUTULIAK | EEK | QUINHAGAK | KONGIGANAK | KWIGILLINGOK | KIPNUK | CHEFORNAK

KRITFC does not currently have a similar MOU or co-stewardship agreement with NOAA Fisheries, despite its government-to-government relationship with the agency. Nonetheless, KRITFC's role as a cooperative salmon management partner with FWS gives its Executive Council, In-Season Managers, Member Tribes, and staff specific experience in the development of management plans based on precautionary, adaptive, and collaborative management—principles KRITFC hopes to carry into a cooperative agency partnership with NOAA Fisheries.

Minimizing non-Chinook salmon bycatch, over 99% of which is chum salmon, is of utmost importance to KRITFC's Member Tribes. In the past four seasons, Kuskokwim chum salmon stocks have declined up to 97% in some tributaries with devastating effects to salmon-dependent Indigenous communities and ecosystems. While bycatch is one of many factors cumulatively contributing to Kuskokwim and Western Alaskan salmon declines, it is one over which our management bodies, including NOAA Fisheries and the North Pacific Fishery Management Council (Council), have control. Furthermore, the development of non-Chinook salmon bycatch management measures would benefit from the direct engagement, knowledge, expertise, and experience of salmon-dependent Indigenous communities whose well-being and way of life are at stake with proposed Federal action.

As a cooperating agency, KRITFC asks:

- For its appointed staff and/or Executive Council to be involved in all meetings (virtual and in-person), emails, and negotiations about the non-Chinook salmon EIS, including at the agency-level.
- To co-develop timelines and progress goals for the EIS and NEPA process, which should include sufficient time to review any documents developed with its Executive Council and legal team.
- To lead contributions on EIS sections about impacts to salmon-dependent subsistence communities, and to work with regional Tribal partners to develop these for the wider Western Alaska region.
- To coordinate with NOAA Fisheries and Council staff to organize in-region community meetings as a part of the formal scoping process.
- To have dedicated time to present on the Kuskokwim and Western Alaska salmon situation, and developments in this NEPA process, during NOAA Fisheries and Council staff presentations at Council meetings when non-Chinook salmon bycatch management or this EIS is on its agenda.

Thank you for considering this request. Please contact Kevin Whitworth, Executive Director, at 907-524-3088 or kevinwhitworth@kritfc.org if you have any questions. We look forward to your response.

Sincerely,





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, AK 99802-1668

September 20, 2023

Jonathan Samuelson
Kuskokwim River Inter-Tribal Fish Commission
P.O. Box 190
Bethel, Alaska 99559

Dear Mr. Samuelson,

The National Marine Fisheries Service and the North Pacific Fishery Management Council have recently begun preparing an Environmental Impact Statement (EIS), pursuant to the National Environmental Policy Act (NEPA) and implementing regulations (40 C.F.R. § 1501.8), for minimizing non-Chinook salmon bycatch in the Bering Sea/Aleutian Islands Fishery Management Plan area. For this project non-Chinook salmon is understood to be primarily chum salmon.

In response to your September 1, 2023 letter, we accept your request for the Kuskokwim River Inter-Tribal Fish Commission (KRITFC) to participate as a cooperating agency on this project due to KRITFC's special expertise with respect to chum salmon in Western Alaska. We understand that special expertise is related to the subsistence use of chum salmon by federally recognized member Tribes and their salmon-dependent communities throughout the Kuskokwim drainage on whose behalf you act for in-river fisheries management.

Congress has set a statutory timeline of two years for completion of EISs. The July 11, 2023 publication in the Federal Register of the Notice of Intent to develop this EIS began the two-year timeframe for this project, which will end with signing of the Record of Decision for this action. This will entail a tight schedule aligned with the Council's process and schedule.

We would like to meet with you to clarify additional details related to the schedule for the project and specific tasks you would agree to undertake as a cooperating agency. We will reach out to schedule a meeting, and we anticipate confirming an agreement with you regarding your role as a cooperating agency no later than the end of October 2023. We also encourage you to review the Council's preliminary review draft analysis on this topic, posted under Agenda Item C4 for their October 2023 meeting at <https://meetings.npfmc.org/Meeting/Details/3003>, and provide comments to the Council on that document.

Our lead contact for this process will be Bridget Mansfield. Please reach out to her at Bridget.Mansfield@noaa.gov if you have any questions or need additional information. We look forward to meeting with you.

ALASKA REGION – <https://www.fisheries.noaa.gov/region/alaska>



Sincerely,

HARRINGTON.GRETCH
EN.ANNE.1365893833

Digitally signed by
HARRINGTON.GRETCHEN.ANNE.
1365893833
Date: 2023.09.20 13:31:18 -08'00'

Gretchen Harrington
Assistant Regional Administrator
for Sustainable Fisheries

Attachment: CEQ Regulations on Cooperating Agencies (40 C.F.R. § 1501.8)

Appendix 2. NEPA Implementing Regulations on Cooperating Agency requirements 40 CFR § 1501.8.

§ 1501.8 Cooperating agencies.

(a) The purpose of this section is to emphasize agency cooperation early in the NEPA process. Upon request of the lead agency, any Federal agency with jurisdiction by law shall be a cooperating agency. In addition, upon request of the lead agency, any other Federal agency with special expertise with respect to any environmental issue may be a cooperating agency. A State, Tribal, or local agency of similar qualifications may become a cooperating agency by agreement with the lead agency. An agency may request that the lead agency designate it a cooperating agency, and a Federal agency may appeal a denial of its request to the Council, in accordance with [§ 1501.7\(e\)](#).

(b) Each cooperating agency shall:

(1) Participate in the NEPA process at the earliest practicable time.

(2) Participate in the scoping process (described in [§ 1501.9](#)).

(3) On request of the lead agency, assume responsibility for developing information and preparing environmental analyses, including portions of the environmental impact statement or environmental assessment concerning which the cooperating agency has special expertise.

(4) On request of the lead agency, make available staff support to enhance the lead agency's interdisciplinary capability.

(5) Normally use its own funds. To the extent available funds permit, the lead agency shall fund those major activities or analyses it requests from cooperating agencies. Potential lead agencies shall include such funding requirements in their budget requests.

(6) Consult with the lead agency in developing the schedule ([§ 1501.7\(i\)](#)), meet the schedule, and elevate, as soon as practicable, to the senior agency official of the lead agency any issues relating to purpose and need, alternatives, or other issues that may affect any agencies' ability to meet the schedule.

(7) Meet the lead agency's schedule for providing comments and limit its comments to those matters for which it has jurisdiction by law or special expertise with respect to any environmental issue consistent with [§ 1503.2 of this chapter](#).

(8) To the maximum extent practicable, jointly issue environmental documents with the lead agency.

(c) In response to a lead agency's request for assistance in preparing the environmental documents (described in [paragraph \(b\)\(3\)](#), [\(4\)](#), or [\(5\)](#) of this section), a cooperating agency may reply that other program commitments preclude any involvement or the degree of involvement requested in the action that is the subject of the environmental impact statement or environmental assessment. The cooperating agency shall submit a copy of this reply to the Council and the senior agency official of the lead agency.

Appendix 2: Alternative 5 Inseason Corridor Boundary

Alternative 5 would implement an inseason corridor with closure provisions. Three different options for the inseason corridor are being considered. A more detailed description of this alternative is available in Section 2.7 and not repeated here. The purpose of this appendix is to highlight a potential issue for the Council's consideration in regard to the boundary of the inseason corridor.

Issue Being Raised

The inseason corridor encompasses 40 ADF&G groundfish statistical areas (stat areas), as specified in the Council's [February 2025 motion](#).¹ Among all three options, the inseason corridor, the range of PSC limits (50,000–350,000 chum salmon), apportionment options, and closure window of June 10 – August 31 are the same. All or part of the corridor would be closed to the sector or cooperative that attained the PSC limit during the closure window. The three inseason corridor options differ from one another based on the number and location of stat areas inside that would close and the entity that would implement the closure.

- Option 1 would close all 40 stat areas
- Suboption 1 would close 29 stat areas
- Option 2 would require between 19 and 29 stat areas

In preparing the impact analysis for Alternative 5, it became apparent that there are 10 stat areas located in State waters (0 to 3 nautical miles from shore)² that are not included in the inseason corridor, as it is currently specified. These 10 stat areas are near the Aleutian Peninsula and the corridor's southern perimeter (see Figures A2-1 and A2-2).

If a cooperative or sector is prohibited from fishing inside the corridor because the PSC limit is met, Alternative 5 would allow fishing to continue in a limited number of stat areas inside the corridor that would be exempt from closure (Suboption 1, Option 2) or in areas outside the corridor (all three options). The current language of Alternative 5 would allow directed fishing inside these 10 State waters stat areas after the corridor closed.

Main Considerations

The primary question that needs to be considered is whether or not allowing directed fishing for pollock to continue inside State waters is consistent with the Council's intent for Alternative 5.

There are a couple of different ways to consider this issue which are discussed directly below.

First, because the 10 State waters stat areas are outside of the corridor, allowing directed fishing to continue inside them if the corridor is closed under any option is consistent with the closure provisions of Alternative 5. There has also been relatively little pollock catch and chum salmon PSC encountered in these 10 stat areas (see Table A2-1), likely due to logistical reasons that have made it impractical for fishermen to target pollock in these areas. While fishing in these areas has been uncommon, the risk of being closed out of historically important fishing grounds and being required to fish further from port northwest of the corridor, may create an incentive for fishermen to move into these 10 areas if they are able to do so. Related, cooperatives may intentionally send some vessels to harvest a limited amount of

¹ 685730, 685700, 685630, 685600, 685530, 685500, 675700, 675630, 675600, 675530, 675500, 675430, 665630, 665600, 665530, 665500, 665430, 665401, 655630, 655600, 655530, 655500, 655430, 655409, 655410, 655412, 645700, 645630, 645600, 645530, 645501, 645434, 635700, 635630, 635600, 635530, 635504, 625630, 625600, and 625531.

² The 10 state-waters stat areas are 635501, 655407, 665335, 665336, 665403, 665404, 645502, 655406, 655408, and 645433.

quota in these areas because any chum salmon caught inside these 10 stat areas would not count against the corridor PSC limit.

Table A2-1 Summary of the maximum pollock catch (mt) in any week and the number of weeks with recorded pollock catch inside the 10 state-waters stat areas, 2011–2023

State Waters Stat Area	Sector	Max Weekly Pollock Catch (mt)	Number of Weeks with Recorded Catch
635501	Inshore	236	6
645433	Inshore	38	1
645502	Inshore	160	4
655406	Inshore	44	2
655407	Mothership	27	1
655407	Inshore	34	1
655408	Inshore	47	2
665335	Inshore	681	7
665336	Inshore	83	6
665403	Inshore	804	24

Source: NMFS Alaska Region CAS.

Key Questions for Consideration

Does the Council want to modify the inseason corridor such that the 10 proximate State waters stat areas identified in this appendix are included? This would increase the number of stat areas from 40 to 50 (see Figure A2-1). All chum salmon PSC caught inside these 50 stat areas would accrue to the inseason corridor PSC limit.

If the Council does not wish to modify the inseason corridor, there are no additional points for consideration.

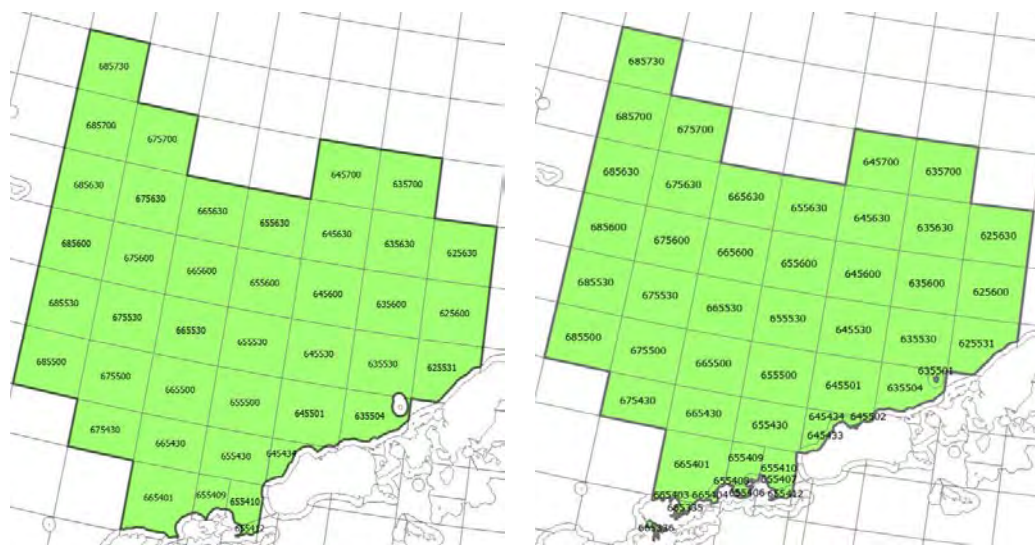


Figure A2-1 Comparison of the stat areas that would close to directed pollock fishing if the inseason corridor PSC limit was met under Option 1 as currently specified (left) to the stat areas that would close if the 10 state-waters areas were included in the inseason corridor (right)

If the Council does wish to modify the inseason corridor, there are several additional considerations specific to each option listed below.

- Under Option 1, all chum salmon PSC caught inside all 50 stat areas would accrue to the corridor PSC limit and all 50 stat areas would close to a cooperative or sector that attained the PSC limit.

- Under Suboption 1, all chum salmon caught as bycatch inside the 50 stat areas would accrue towards the corridor PSC limit. The Council would then need to decide whether:
 - **the 10 State waters stat areas would be exempt from closure if the corridor PSC limit is met;** while chum salmon PSC caught inside all 50 (modified) corridor stat areas would accrue to the limit, the 29 stat areas currently listed in the Council’s motion would close. This would essentially only change the “base number” of areas that chum salmon PSC would accrue from.
 - **the 10 State waters stat areas would close when the corridor PSC limit is met;** this would change the “base number” of stat areas from which chum salmon caught as bycatch would accrue from towards the PSC limit, and it would represent a further restriction (i.e., 39 of 50 areas would close).
- Under Option 2, all chum salmon PSC caught inside all 50 stat areas would accrue to the corridor PSC limit. The IPAs would then determine whether or not some or all of these stat areas would be eligible for closure.

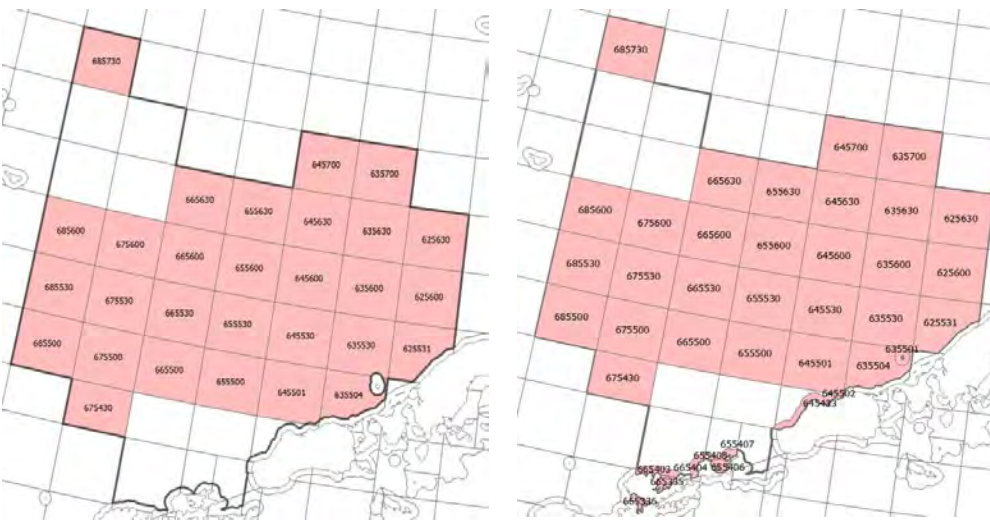


Figure A2-2 Comparison of the stat areas that would close to directed pollock fishing if the inseason corridor PSC limit was met under Suboption 1 as currently specified (left) to the stat areas that would close if the 10 state-waters areas were included in the inseason corridor (right)

Supplemental Information for Apportionments

The Council may modify the inseason corridor at final action, but it is not required to do so. To aid the Council and the public in its consideration of this issue, this section provides information on the apportionment amounts as if these 10 state-waters stat areas were included in the corridor. This is necessary because some pollock catch and chum salmon PSC was taken inside these areas since 2018 which could affect the apportionments of the inseason corridor cap among the pollock sectors.

- Table A1 below can be compared to Table 2-16 in the draft EIS
- Table A2 below can be compared with Table 2-17 of the draft EIS
- Table A3 below can be compared with Table 2-18 of the draft EIS.
- Table 4A shows the difference in the number of chum salmon that would be apportioned to each sector under all cap amounts under Alternative 5. It subtracts the values in Table A3 from those presented in Table 2-18 of the draft EIS.

The differences in the apportionment percentages are marginal, and the primary effect of including these stat areas would be to increase the inshore sector's apportionments under Options 1–3.

Apportionment Option 4 would not be affected because it is based upon each sector's AFA pollock allocation. Note, the apportionment percentages for all other sectors in Table A2 are the same as Table 2-17 of the draft EIS. This is due to rounding apportionment percentages.

Table A2-2 Chum salmon PSC amounts used to calculate inseason corridor apportionment percentages when the 10 State waters stat areas are included

Year	CDQ	CP	Mothership	Inshore	Total
2011	829	4,826	9,552	83,998	99,205
2012	18	619	828	8,337	9,802
2013	1	3,033	2,779	80,718	86,531
2014	458	5,411	1,667	103,027	110,563
2015	242	5,114	1,296	118,047	124,699
2016	14,875	74,314	28,943	103,813	221,945
2017	84,800	150,480	15,026	144,459	394,765
2018	13,547	33,739	13,080	130,306	190,672
2019	76	25,917	1,811	91,154	118,958
2020	0	4,821	298	53,355	58,474
2021	49,407	54,498	50,268	332,377	486,550
2022	2,529	24,705	24,037	128,756	180,027
3-yr avg.	17,312	28,008	24,868	171,496	241,684
3-yr avg. as %	7.2%	11.6%	10.3%	71.0%	100.0%
5-yr avg.	13,112	28,736	17,899	147,190	206,936
5-yr avg. as %	6.3%	13.9%	8.6%	71.1%	100.0%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table A2-3 Summary of inseason corridor apportionment percentages when the 10 State waters stat areas are included

Apportionment Option	CDQ	CP	Mothership	Inshore
Option 1: 3-yr average	7.2%	11.6%	10.3%	71.0%
Option 2: 5-yr average	6.3%	13.9%	8.6%	71.1%
Option 3: Pro Rata	7.9%	17.7%	10.0%	64.5%
Option 4: AFA	10.0%	36.0%	9.0%	45.0%

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table A2-4 Number of chum salmon apportioned to each pollock fishing sector under all inseason corridor PSC limit amounts when the 10 State waters stat areas are included under Alternative 5

PSC Limit	Apportionment	CDQ	CP	Mothership	Inshore
50,000	3-year avg.	3,582	5,794	5,145	35,479
	5-year avg.	3,168	6,943	4,325	35,564
	Pro-rata	3,937	8,847	4,984	32,232
	AFA	5,000	18,000	4,500	22,500
100,000	3-year avg.	7,163	11,589	10,289	70,959
	5-year avg.	6,336	13,886	8,649	71,128
	Pro-rata	7,874	17,694	9,969	64,464
	AFA	10,000	36,000	9,000	45,000
150,000	3-year avg.	10,745	17,383	15,434	106,438
	5-year avg.	9,504	20,830	12,974	106,692
	Pro-rata	11,810	26,540	14,953	96,696
	AFA	15,000	54,000	13,500	67,500
200,000	3-year avg.	14,326	23,177	20,579	141,918
	5-year avg.	12,672	27,773	17,299	142,256
	Pro-rata	15,747	35,387	19,938	128,928
	AFA	20,000	72,000	18,000	90,000
250,000	3-year avg.	17,908	28,972	25,723	177,397
	5-year avg.	15,840	34,716	21,624	177,820
	Pro-rata	19,684	44,234	24,922	161,160
	AFA	25,000	90,000	22,500	112,500
300,000	3-year avg.	21,489	34,766	30,868	212,877
	5-year avg.	19,008	41,659	25,948	213,384
	Pro-rata	23,621	53,081	29,906	193,392
	AFA	30,000	108,000	27,000	135,000
350,000	3-year avg.	25,071	40,560	36,013	248,356
	5-year avg.	22,177	48,602	30,273	248,948
	Pro-rata	27,557	61,927	34,891	225,624
	AFA	35,000	126,000	31,500	157,500

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Table A2-5 Difference in the number of chum salmon apportioned to each pollock fishing sector under all inseason corridor PSC limit amounts when the 10 State waters stat areas are included compared to the number of chum salmon apportioned to each pollock fishing sector under Alternative 5 as currently specified

PSC Limit	Apportionment	CDQ	CP	Mothership	Inshore
50,000	3-year avg.	-18	-29	-26	73
	5-year avg.	-12	-26	-16	54
	Pro-rata	-13	-22	-19	55
	AFA	0	0	0	0
100,000	3-year avg.	-36	-58	-52	146
	5-year avg.	-24	-52	-33	109
	Pro-rata	-27	-44	-39	109
	AFA	0	0	0	0
150,000	3-year avg.	-54	-87	-78	219
	5-year avg.	-36	-78	-49	163
	Pro-rata	-40	-66	-58	164
	AFA	0	0	0	0
200,000	3-year avg.	-72	-116	-103	292
	5-year avg.	-48	-104	-65	217
	Pro-rata	-54	-87	-78	219
	AFA	0	0	0	0
250,000	3-year avg.	-90	-145	-129	365
	5-year avg.	-60	-131	-81	271
	Pro-rata	-67	-109	-97	274
	AFA	0	0	0	0
300,000	3-year avg.	-108	-175	-155	438
	5-year avg.	-71	-157	-98	326
	Pro-rata	-81	-131	-116	328
	AFA	0	0	0	0
350,000	3-year avg.	-126	-204	-181	510
	5-year avg.	-83	-183	-114	380
	Pro-rata	-94	-153	-136	383
	AFA	0	0	0	0

Source: NMFS Alaska Region CAS, data compiled by AKFIN.

Appendix 3: Adult equivalent (AEQ) model and impact rate analysis of Coastal Western Alaska and Yukon River – Fall genetic groups

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Summary

In April 2024 the Scientific and Statistical Committee (SSC) and the Council requested that a simplified adult equivalent model (AEQ) for chum salmon be performed to evaluate the potential impact of bycatch occurring in the Bering Sea pollock fishery on Western Alaska chum salmon stocks. The purpose of this appendix is to outline the approach taken to produce the simplified AEQ estimates for the Western Alaska chum salmon, composed of the Coastal Western Alaska (predominantly summer run populations), and Yukon River - Fall run genetic groups.

The simplified AEQ, herein referred to as the AEQ, is similar to the AEQ approach that was taken for Chinook salmon and chum salmon in the 2012 analysis (NPFMC 2012), but there are several key differences. The 2024/2025 AEQ: (1) uses estimates of age specific stock compositions for the most frequent age classes (3-, 4-, and 5-year-old) instead of applying the B season bycatch genetic composition, (2) estimates the bycatch age distribution directly from the scale sample proportions instead of an age-length key, and (3) compared to the Chinook salmon AEQ has substantially more uncertainty underlying the parameters within the model (*e.g.*, natural mortality and maturity). The 2024/2025 AEQ estimates were compared with the estimates of each genetic groups overall B-season bycatch from 2011 through 2022 and an impact rate for the Yukon River – Fall run stock was calculated. This appendix explains the method, the major differences between the 2012 AEQ and the simplified approach taken here, estimates the AEQ for the Coastal Western Alaska and the Yukon River - Fall run stocks, and estimates the impact rate for the Yukon River - Fall run. Additionally, management measures being considered were evaluated for their effect on the AEQ and impact rate.

Methods

2012 AEQ

We describe the chum salmon AEQ approach taken in the 2012 Chum Salmon PSC Management Measures Environmental Assessment (NPFMC 2012) to help the reader compare and contrast differences between the approaches.

Estimates of chum salmon catch-at-age were calculated by constructing age-length keys for each sex in three time-area strata. The three strata were: (1) EBS-wide for the early period (June-July), (2) west of 170°W late period (August-October) and (3) east of 170°W late period (August-October). Managed under the North Pacific Observer Program (herein referred to as the Observer Program) Fisheries observers took length and weight measurements for more samples than were sampled for genetics and scales. The keys were then applied to randomly sampled catch-at-length frequency data from the stratum specific bycatch. Age-composition data, specific to sex and sampling stratum, were then weighted by the stratum catch to produce an annual age composition of the bycatch. This provided an estimate of the total number of chum salmon caught of each age.

The AEQ was then computed as

$$AEQ_t = \sum_{a=2}^7 C_{t,a} \gamma_a + \sum_{j=2}^6 \sum_{a=j+1}^7 [\gamma_a C_{t-(a-j),j} \prod_{i=j}^{a-1} (1 - \gamma_i) s_a],$$

where $C_{t,a}$ is the bycatch of age a chum salmon in year t , s_a is the proportion of salmon surviving from age a to $a + 1$, and γ_a is the proportion of salmon at sea that would have returned to spawn at age a . The 2012 AEQ was computed as the aggregate AEQ of all genetic groups. Genetic stock identification (GSI) data were applied to disaggregate the annual AEQ and produce stock specific AEQ estimates. This was done using stratum specific GSI results and a parametric bootstrap approach while modeling the annual stock proportion for a given stratum with a beta distribution.

2024/2025 Simplified AEQ

Since 2012, age-specific stock composition estimates have shown substantial differences in the stocks comprising the most common chum salmon ages encountered in the bycatch (total ages 3, 4, and 5). Additionally, preliminary analyses suggest that age-length keys differ by genetic group, in addition to sampling stratum and sex. Finally, the sampling strategy for chum salmon bycatch changed with Amendment 91 to the BSAI Groundfish Fishery Management Plan, which implemented a hard cap for Chinook salmon bycatch in the pollock fishery, such that sampling is representative of the overall bycatch with a systematic random sample of 1 in 30 chum salmon encountered.

The simplified method for this analysis forgoes the use of age-length keys for estimating the age composition of the bycatch in a given year. The age composition is instead estimated from the random sample of scales. The estimated number of chum salmon of each age is then a product of the total B season bycatch and the annual age composition. Age-specific GSI results are then applied to the number of fish of each age to estimate the number of chum salmon of a given age and genetic group. The stock specific estimate for each age can then be used along with some assumptions about natural mortality, oceanic maturity to calculate the AEQ as:

$$AEQ_{r,t} = \sum_{a=2}^7 C_{r,t,a} \gamma_{r,a} + \sum_{j=2}^6 \sum_{a=j+1}^7 [\gamma_{r,a} C_{r,t-(a-j),j} \prod_{i=j}^{a-1} (1 - \gamma_{r,i}) s_a],$$

where $C_{r,t,a}$ is the bycatch of stock group r , age a in year t , s_a is the proportion of salmon surviving from age a to $a + 1$, and $\gamma_{r,a}$ is the proportion of salmon of stock group r at sea that would have returned to spawn at age a . The estimation of $C_{r,t,a}$ and its 95% credible intervals uses stock specific composition

estimates from mixtures of the most frequent age classes caught in the bycatch, as discussed above. The other parameters in this model are either taken from prior work (s_a) or estimated from additional data $\gamma_{r,a}$. Estimates of survival were taken from the prior analysis of chum salmon adult equivalents in 2012. We focused on the scenario 2 from the 2012 analysis with mortality varying from 0.4 for age 1 to 0.0 to age 7 (but see the Sensitivity to Natural mortality section). Estimates of maturity ($\gamma_{r,a}$) for each reporting group were inferred from the age composition of fish on the spawning grounds.

In order to produce an AEQ for the 2011–2022 time period the age-specific stock compositions from 2006 to 2010 need to be included in the analysis. Individuals caught as age-2 fish in 2006 could have matured as age-7 fish in 2011. Prior to 2011, sampling was not conducted with the systematic random sampling protocol such that biases in the spatiotemporal extent of those samples exists. We know from prior work that the stock composition of the bycatch varies in both space and time. The bias introduced by using estimates from the 2006–2010 data will likely be less than using the long-term average over the dataset for each age class as there is interannual variability in the estimates that would be lost. Efforts could be made to correct for the sampling design with catch data; however, corrections were not made for this simplified analysis.

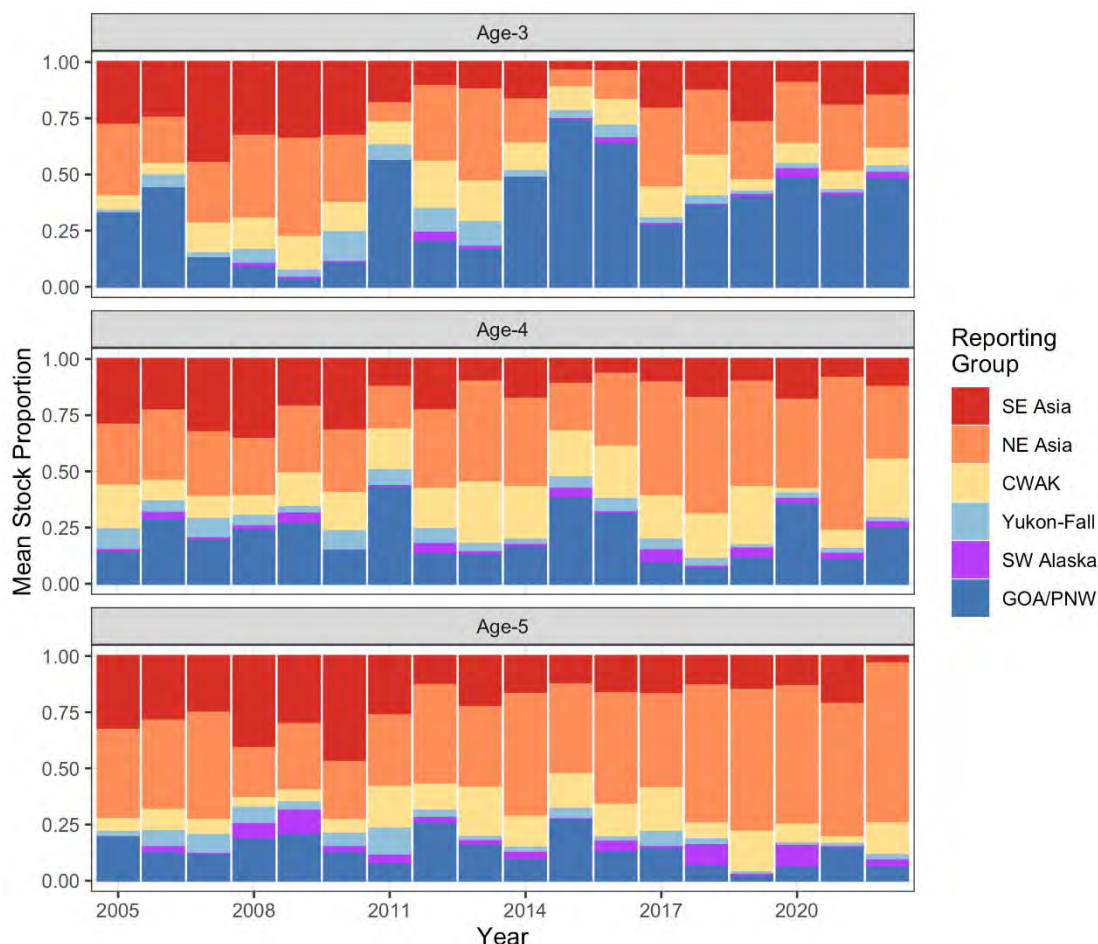
Additionally, the genetics collections only contain sufficient samples to estimate the age-specific stock compositions for the dominant age classes (3, 4, and 5 year olds). There are individuals that are age-2, 6, and 7 caught in the bycatch. While relatively infrequent they must be accounted for in the AEQ. Applying the stock composition of the reporting group lagged a year to account for cohort dynamics was considered, but there was little relationship between the lagged age proportions (*e.g.*, 3 year old proportion in 2011 and 4 year old proportion in 2012) for the Coastal Western Alaska - Summer Run group. We chose to apply the stock composition of the most similar age class for these fish with the understanding that this simplifying assumption does not account for changes in regional productivity that likely vary annually.

Results

Age Specific Stock Comps

Genetic samples were reanalyzed for the most up to date genetic baseline arrangement used by the U.S. Fish and Wildlife Service and the Alaska Department of Fish & Game to estimate Coastal Western Alaska and Yukon River - Fall run proportions. The Yukon River - Fall run closely aligns with the Upper/Middle Yukon genetic group that the Alaska Fisheries Science Center's (AFSC) genetics program estimates annually for the chum salmon bycatch (Barry et al. 2022; Appendix Table B-1). The only difference is that five summer run populations in the mid-river (Henshaw Creek Late, South Fork Koyukuk River, Jim River, Salcha River, and Chena River) were grouped into the Coastal Western Alaska genetic group instead of the Yukon River - Fall Run. For a discussion of spawn timing for populations in this reporting group please refer to the *Assumption of equal maturation probability across B season* section. Estimates for the predominant age classes (3, 4, and 5) demonstrate both age-specific differences as well as interannual variability. Age-3 mixtures are composed of a large proportion Gulf of Alaska / Pacific Northwest chum salmon. In some years accounting for as much as 75%, but also as little as 4.2%. Alternatively, The Northeast Asia group comprises a larger proportion of the older age classes.

Figure A3-1: Annual age-specific stock composition of chum salmon bycatch for the three most common ages (3-, 4-



Southeast Asia (SE Asia), Northeast Asia (NE Asia), Coastal Western Alaska (CWAK), Yukon-Fall, Southwest Alaska (SW Alaska), and Gulf of Alaska/Pacific Northwest (GOA/PNW).

The Coastal Western Alaska and Yukon River-Fall run stocks are minor contributors to all age classes from 2005–2022 with Coastal Western Alaska representing a larger proportion than Yukon River-Fall run throughout the time series. This is not surprising based on prior GSI results for the Coastal Western Alaska and Upper/Middle Yukon age-specific analyses.

The marked decrease in Southeast Asia pre/post 2011 may be a result of non-systematic sampling of the bycatch, or it could be linked to decreases in hatchery releases across the time period. Data on hatchery releases were obtained from the North Pacific Anadromous Fish Commission (NPAFC) and plotted to evaluate changes in hatchery production across the time period. From 1991–2021, hatchery releases in Japan (Southeast Asia reporting group) have decreased while hatchery releases in Russia (Northeast Asia reporting group) have increased. While we cannot discount biases in stock composition estimates from the sampling design; changes in hatchery production could also account for some of the shift in stock group proportions between the two time periods. For the simplified AEQ approach taken here, and sample sizes precluding the estimation of age-specific stock comps for multiple spatiotemporal strata, we used the pre-2011 estimates without adjustment. Annual estimates of the age composition of the chum salmon bycatch were made from scales collected by the Observer Program (Table A3-1). Age estimates were produced by NOAA Auke Bay Laboratory prior to 2020 and by the Alaska Department of Fish & Game's Mark Tag and Age lab from 2020–2022.

Table A3-1: Annual chum salmon scale ages inferred from scale pattern analysis from 2005–2022.

Year	Age						Year	Age					
	2	3	4	5	6	7		2	3	4	5	6	7
2005	5	196	834	163	9	2	2014	3	342	806	131	6	2
2006	0	219	580	338	16	7	2015	3	745	657	147	25	0
2007	3	156	742	259	35	4	2016	2	370	1228	268	12	0
2008	0	50	373	157	20	2	2017	1	384	1015	207	15	0
2009	38	469	635	184	17	3	2018	3	303	1180	236	9	0
2010	3	139	474	253	28	1	2019	30	610	679	144	2	0
2011	0	130	788	217	9	2	2020	78	770	586	72	2	0
2012	0	79	299	112	5	0	2021	2	928	1946	148	2	2
2013	8	327	1914	421	38	0	2022	0	680	1731	241	2	0

A total of 27,518 chum salmon were successfully aged between 2005 and 2022. An average of 1529 chum salmon were aged annually. Four year old chum salmon made up the majority of the bycatch in all but two years (Figure A3-2), averaging 58.8% of the total. Throughout the time period there was a marked reduction in the age-5 fish and corresponding increase in age-3 fish (Figure A3-2). Very few samples were estimated to be age-2, 6 and 7; never more than ~5% of the overall bycatch in any given year.

An annual estimate of the total number of each age class was produced by multiplying the age composition estimates by the total bycatch (Table A3-2). The total chum bycatch ranged from 13,243 in 2010 to 545,901 in 2021. In consideration of the AEQ, it is notable that years 2008–2010 were characterized by very low bycatch of chum salmon. Not all fish in Table A3-2 would contribute to the AEQ from 2011–2022. For instance, in 2007 only age-2 and 3 fish would contribute to the AEQ in year 2011 (*e.g.*, age-2 survive 4 years and mature at age-6 and age-3 fish survive 3 years and mature at age-7). Fish aged 3-7 in 2006 would not contribute to the AEQ in years 2011–2022. Again, we see that ages 2, 6 and 7 are infrequent. However, while only ~5% of the bycatch in 2020 was age 2, that represents over 17,000 chum salmon (Table A3-2).

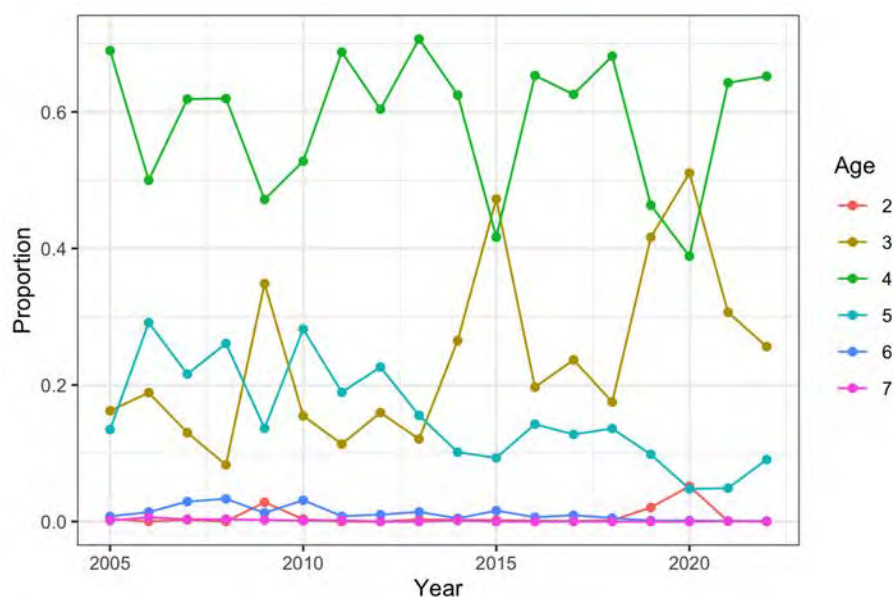


Figure A3-2: Proportion of each age in the total (all genetic groups) chum salmon bycatch from 2005–2022.

Table A3-2: Total annual bycatch from 2006–2022 and estimated number of chum salmon of six possible total ages (2– to 7-year-olds) from 2006–2022.

Year	Age						Total Bycatch
	2	3	4	5	6	7	
2006	0	57,485	152,244	88,721	4,200	1,837	304,487
2007	198	10,283	48,911	17,073	2,307	264	79,036
2008	0	1,224	9,128	3,842	489	49	14,732
2009	1,281	15,810	21,406	6,203	573	101	45,374
2010	44	2,050	6,990	3,731	413	15	13,243
2011	0	21,703	131,551	36,227	1,502	334	191,317
2012	0	3,539	13,393	5,017	224	0	22,173
2013	370	15,108	88,430	19,451	1,756	0	125,115
2014	509	58,030	136,761	22,228	1,018	339	218,885
2015	443	110,113	97,106	21,727	3,695	0	233,084
2016	361	66,765	221,586	48,359	2,165	0	339,236
2017	287	110,287	291,514	59,452	4,308	0	465,848
2018	511	51,586	200,897	40,179	1,532	0	294,705
2019	7,102	144,406	160,741	34,089	473	0	346,811
2020	17,746	175,188	133,325	16,381	455	0	343,095
2021	361	167,304	350,833	26,682	361	361	545,902
2022	0	62,084	158,040	22,003	183	0	242,310

Estimates of the number of Coastal Western Alaska and Yukon River - Fall run are the product of the estimated number of chum salmon of each age (Table A3-2) and the age-specific stock composition (Figure A3-1). To be clear, age-specific stock composition estimates for the relatively infrequent age classes (2, 6, and 7 years total age) do not exist. Because they are infrequent with the 1 in 30 sampling, and subsampling within the genetics lab in years of high bycatch, samples were insufficient to analyze these age classes. As such, we applied the most similar age class stock composition to those age classes (*e.g.*, use age-3 stock composition to estimate the number of Coastal Western Alaska and Yukon River - Fall run age-2 fish).

There was substantial interannual variability in the number of chum salmon originating from the CWAK and Yukon River - Fall run stocks (Figure A3-3). Values found in Table A4-3 are the $C_{r,a}$ values applied in the AEQ model and represent the mean value without associated uncertainty. The amount of uncertainty in the number of fish of a given age can be quite large in some years (Figure A3-3). For instance, the estimate of age-4 Yukon River - Fall run chum salmon in 2017 was 11,074, but the 95% credible interval ranges from 6,863 to 15,978.

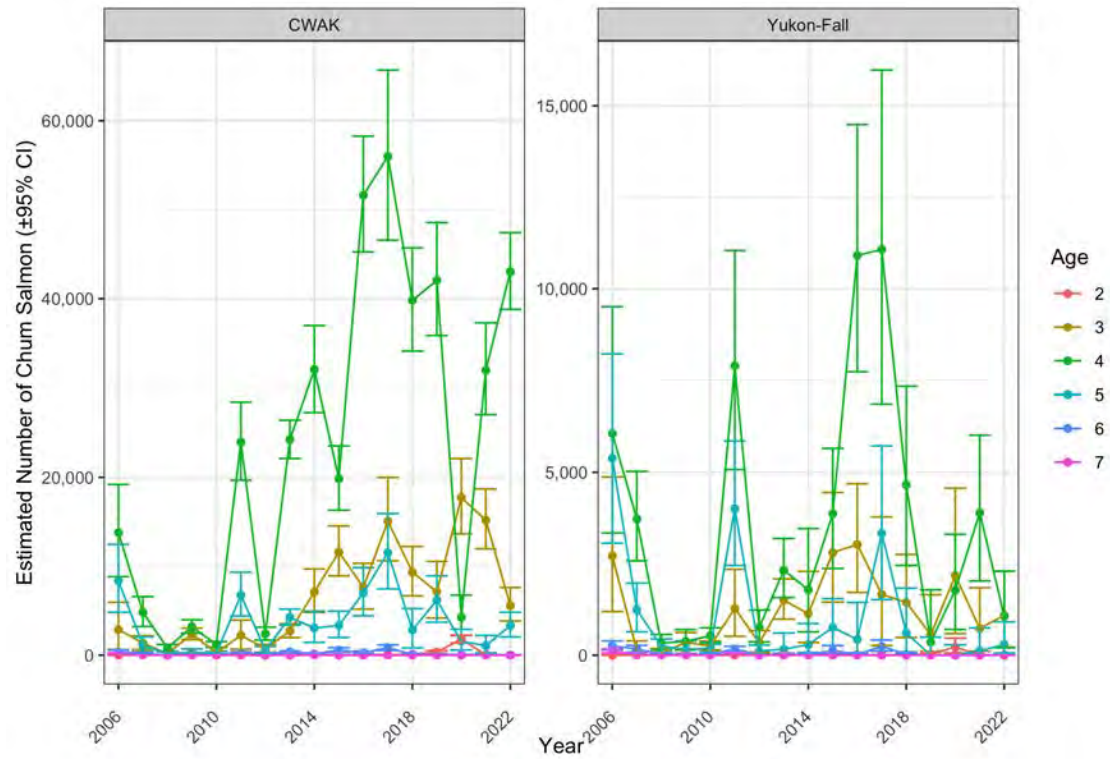


Figure A3-3: Estimated number of age 2–7 Coastal Western Alaska (CWAK) run and Yukon River - Fall run chum salmon caught in the pollock trawl fishery B season with 95% credible intervals.

Table A3-3: Estimated number of chum salmon of Coastal Western Alaska (CWAK) and Yukon River – Fall run origin by age from 2006–2002.

Stock	Year	Age					
		2	3	4	5	6	7
CWAK	2006	0	2,871	13,778	8,362	396	173
	2007	26	1,365	4,818	1,132	153	17
	2008	0	170	808	161	20	2
	2009	192	2,375	3,200	330	30	5
	2010	6	266	1,191	228	25	1
	2011	0	2,227	23,953	6,751	280	62
	2012	0	744	2,396	580	26	0
	2013	66	2,717	24,236	4,248	383	0
	2014	62	7,110	32,050	3,057	140	47
	2015	47	11,599	19,830	3,346	569	0
	2016	41	7,622	51,637	6,994	313	0
	2017	39	15,062	56,001	11,521	835	0
	2018	92	9,323	39,808	2,824	108	0
	2019	350	7,124	42,058	6,172	86	0
	2020	1,794	17,711	4,250	1,560	43	0
	2021	33	15,166	31,970	1,068	14	14
	2022	0	5,590	43,042	3,334	28	0
Yukon-Fall	2006	0	2,710	6,056	5,382	255	111
	2007	2	128	3,725	1,244	168	19
	2008	0	63	332	246	31	3
	2009	28	348	377	161	15	3
	2010	5	254	532	179	20	1
	2011	0	1,278	7,895	4,010	166	37
	2012	0	337	757	111	5	0
	2013	37	1,504	2,325	165	15	0
	2014	10	1,131	1,788	289	13	4
	2015	11	2,804	3,871	757	129	0
	2016	16	3,028	10,910	433	19	0
	2017	4	1,661	11,074	3,331	241	0
	2018	14	1,443	4,654	604	23	0
	2019	28	562	357	0	0	0
	2020	221	2,178	1,777	0	0	0
	2021	2	730	3,895	120	2	2
	2022	0	1,093	1,062	292	2	0

Of the estimated 17,746 age-2 chum salmon in 2020, 1,794 were of Coastal Western Alaska origin and 221 were of Yukon River - Fall run origin. The largest number of age-7 fish occurred in 2006 for both the genetic groups, which would not be included in the 2011–2022 AEQ.

In River Age Composition

The in-river age composition data were compiled from prior work (Berry and Larson 2021, Yukon JTC 2024). These data consist of 6 systems within the Kuskokwim for Coastal Western Alaska fish and a time series from 2014–2018 for Yukon River - Fall run chum salmon.

Table A3-4: In-river age composition data were compiled from prior work for the Coastal Western Alaska (CWAK) and Yukon River - Fall run (Berry and Larson 2021, Yukon JTC 2024).

System	Source	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
CWAK	Goodnews (middle fork) 2014-2018	0.0	5.1	64.5	28.3	2.2	0.0
	Kanektok 2002-2015	0.0	1.3	57.7	38.8	2.1	0.0
	Salmon River Aniak 2014-2018	0.0	2.0	57.6	38.7	1.8	0.0
	George River 2014-2018	0.0	3.1	64.7	29.8	2.3	0.1
	Tatlawiksuk 2014-2018	0.2	3.6	59.0	34.0	3.2	0.1
	Kogrukluuk 2014-2018	0.0	3.0	56.8	38.2	2.0	0.0
	Avg.	0.0	3.0	60.0	34.6	2.3	0.0
Yukon - Fall	2014	0.0	6.1	80.2	13.4	0.3	0.0
	2015	0.0	3.8	85.0	11.1	0.1	0.0
	2016	0.0	7.7	85.6	6.2	0.6	0.0
	2017	0.0	3.8	59.1	36.0	1.2	0.0
	2018	0.0	0.4	75.3	23.0	1.3	0.0
	Avg.	0.0	4.3	77.0	17.9	0.7	0.0

Variation among systems in Coastal Western Alaska and among years for the Yukon River - Fall run was noted (Table A3-4). Only one source reported age-2 spawners (0.2% in Tatlawiksuk), and only two sources reported age-7 spawners both of which were in Coastal Western Alaska. Age-4 was the predominant age class across all systems, followed by age-5. The in-river age composition of each stock combined with estimates of natural mortality, assumed equal between genetic groups, can be used to estimate the oceanic maturity at age γ_a .

Oceanic maturity γ_a was estimated to match the in-river age composition given the mortality vector (Figure A3-4). In the 2012 analysis, the analysts accounted for the age-specific AEQ of the bycatch (NPFMC 2012). Here, we found the equilibrium $\gamma_{CWAK,a}$, without accounting for the chum salmon AEQ. With $\gamma_{CWAK,1-7} = 0,0,0.023,0.581,0.931,0.991,1.0$ there was a difference of 0.001 between the expected equilibrium age composition on the spawning grounds and the in-river estimates. The same approach was applied to the Yukon River Fall run group; apply the in-river age composition of the Yukon-Fall run stocks and estimates of natural mortality to estimate the oceanic maturity $\gamma_{YukonFall,a}$. With $\gamma_{YukonFall,1-7} = 0,0,0.035,0.780,0.959,0.999,1.0$ a difference of 0.002 between the expected equilibrium age composition on the spawning grounds and the in-river estimates.

The Yukon River - Fall run matures at an earlier age on average yielding larger γ_a value for ages 3 through 6. Both genetic groups have $\gamma_7 = 1$ as this is the oldest age group observed in the bycatch and in-river age composition data suggest that fish this old are rare.

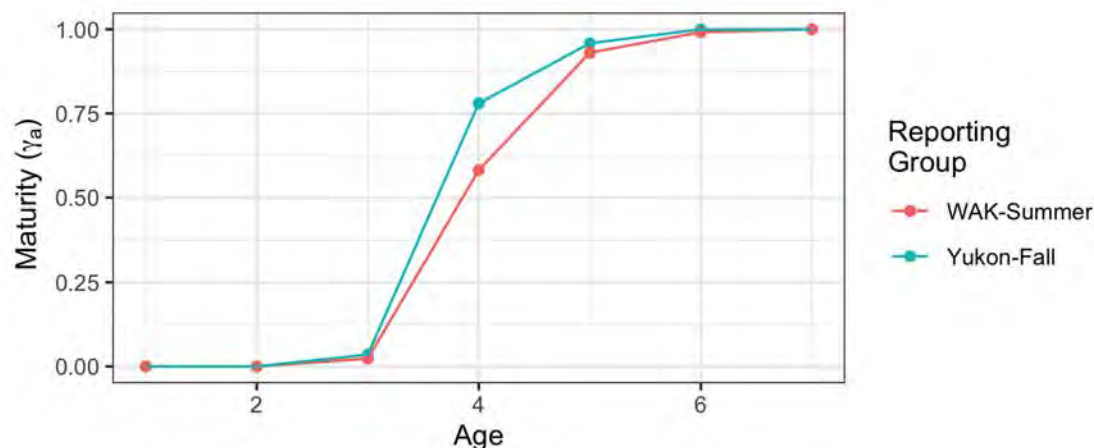


Figure A3-4: Estimates of maturity at age for the Coastal Western Alaska (CWAK) and Yukon River – Fall run genetic groups inferred from in-river age composition data and assumed natural mortality.

It should be noted that estimates of γ_a are slightly lower than those used in the 2012 analysis, especially for the younger aged maturing chum salmon (age-3 and 4) and would effectively subject chum salmon bycatch to additional mortality in future years before maturing (NPFMC 2012; Table A3-6). However, that analysis and sensitivity analyses showed that the AEQ is relatively insensitive to mortality assumptions. Differences in γ_a would then shift AEQ bycatch among years.

Table A3-5: Estimates of maturity (γ_a), mortality (M_a), and survival (S_a) at age a for the WAK-Summer and Yukon-Fall run chum salmon stocks.

Stock	Age	γ_a	M_a	S_a	Stock	Age	γ_a	M_a	S_a
Yukon-Fall	1	0.000	0.40	0.670	CWAK	1	0.000	0.40	0.670
	2	0.000	0.30	0.741		2	0.000	0.30	0.741
	3	0.035	0.20	0.819		3	0.023	0.20	0.819
	4	0.780	0.15	0.861		4	0.581	0.15	0.861
	5	0.959	0.10	0.905		5	0.931	0.10	0.905
	6	1.000	0.05	0.951		6	0.991	0.05	0.951
	7	1.000	0.00	1.000		7	1.000	0.00	1.000

With annual age-specific estimates of the number of chum salmon for each reporting group, natural mortality, and oceanic maturity the AEQ can be calculated for CWAK and Yukon River - Fall run chum salmon.

AEQ comparison with B season bycatch levels

The AEQ for the Coastal Western Alaska genetic group ranged from 11,608 in 2012 to 69,445 in 2017 and averaged 38,162 over the 12 years analyzed. While the AEQ is often lower than the overall bycatch level, in 2 of the 12 years the AEQ exceeded the point estimate for the B season bycatch. In 2012 this was because of the substantial drop in bycatch from 2011 to 2012. Bycatch of fish that would have matured in 2012, but caught in previous years, contributed to the AEQ in 2012. In 2018 we also see an instance where the AEQ exceeded the bycatch. Again this is because of the large catches of chum salmon in 2016 and 2017 of fish that would have likely matured in 2018 combined with a large overall reduction in the bycatch between 2017 and 2018.

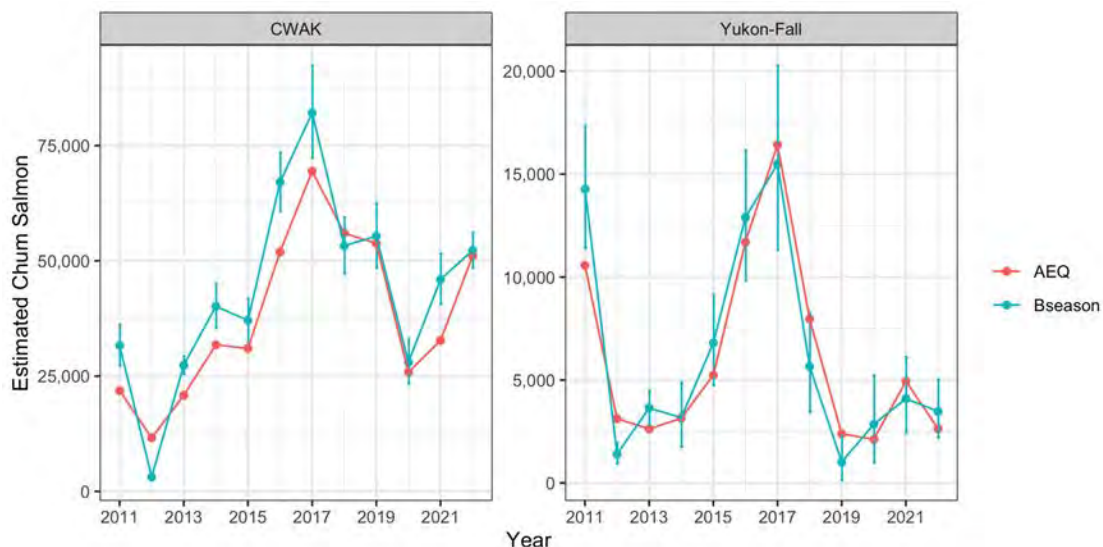


Figure A3-5: Estimated number of CWAK (left) and Yukon River – Fall run (right) chum salmon caught in the B season of the pollock trawl fishery (blue) and adult equivalents (red; number of chum salmon that would have returned had bycatch not occurred). AEQ estimates represent point estimates for genetic stock group bycatch numbers, maturity and survival (uncertainty in these estimates is addressed below).

The AEQ for the Yukon – Fall run group ranged from 2,124 in 2020 to 16,429 in 2017 and averaging 6,074 over the 12 years analyzed. In contrast to the AEQ of the Coastal Western Alaska stock, the AEQ of the Yukon River – Fall run group exceeded the overall bycatch in 5 of 12 years. This is about the frequency with which the 2012 chum salmon AEQ exceeded a single year's bycatch (NPFMC 2012: Table 35-7).

Table A3-6: Annual adult equivalent (AEQ) and B season chum salmon bycatch estimates for the Coastal Western Alaska (CWAK) and Yukon River – Fall genetic groups from 2011–2022. Total bycatch is the census of the bycatch, including all genetic groups.

Year	Total Bycatch	CWAK		Yukon - Fall	
		AEQ	B season	AEQ	B season
2011	191,317	21,848	31,624	10,565	14,276
2012	22,172	11,608	3,152	3,126	1,407
2013	125,114	20,815	27,364	2,629	3,643
2014	218,886	31,784	40,137	3,145	3,171
2015	233,085	31,011	37,090	5,239	6,805
2016	339,236	51,950	67,062	11,695	12,892
2017	465,848	69,445	82,103	16,429	15,495
2018	294,705	56,017	53,251	7,967	5,657
2019	346,812	53,753	55,361	2,387	1,022
2020	343,095	25,857	28,001	2,124	2,854
2021	545,901	32,751	45,976	4,939	4,093
2022	242,309	51,101	52,280	2,638	3,482

Sensitivity to Natural Mortality

Natural mortality within the AEQ discounts chum salmon caught as bycatch that would have otherwise died at sea from other causes. Natural mortality estimates were taken from the 2012 AEQ analysis, which suggested that the model was relatively insensitive to changes in the parameter values. We reevaluated the 2012 natural mortality estimates by recalculating the AEQ under the assumption of no natural mortality ($M = 0$), which means that all chum salmon bycatch would have survived ($S = 1$). In this case only the maturity schedule γ_a changes how bycatch salmon are accounted for in the AEQ. We did not update the maturity schedule by recalculating γ_a values assuming no natural mortality.

If we assume that all fish survive from year to year (natural mortality in the ocean is 0), the AEQ and impact rate (estimated below) for Yukon River - Fall group is affected very little. The AEQ increases an average of 412 chum salmon, but ranges from a low of 73 in 2011 to a high of 914 in 2017. Similarly, the impact rate increases by an average of 0.083%, but ranges from a low of 0.006 in 2011 to a high of 0.372% in 2021. The values for age specific mortality (M_a) and their corresponding survival (S_a) may represent conservative values; however the AEQ and impact rate for the Yukon River - Fall run genetic group is relatively insensitive to increases in survival. It does not appear that assumptions of age specific survival are leading to unrealistically low estimates of impact or AEQ for the Fall Run Yukon River genetic group. Uncertainty in this parameter was included in a stochastic version of the AEQ (see the *Uncertainty in AEQ* section below).

Assumption of equal maturation probability across B season

At the February 2025 NPFMC meeting, the SSC noted¹ that the B season of the BSAI pollock fishery starts 10 June and ends 1 November and that chum salmon caught late in the season may not be maturing within the year they were caught as bycatch and potentially subjected to additional oceanic mortality (*i.e.*, it would be unlikely an age-4 fish caught as bycatch in late September would return as a spawner in that year). This would induce an upward bias in estimates of the AEQ and the impact rate. Additionally, it would shift the bycatch AEQ accumulated through time, because bycatch late in a given year would now accumulate in future years. For example, a large bycatch of age-5 chum salmon in October, after which

¹ See page 8 of the SSC's February 2025 Minutes.

most chum would have left the pollock fishing grounds for their natal streams, would likely add to the AEQ estimate in the subsequent year because age-5 fish have both a high survival rate and probability of maturing. This section evaluates the assumption of equal maturation probability throughout the B season for Western Alaska chum salmon.

Within Western Alaska, summer run chum salmon typically return to freshwater in June and July with peak spawning occurring in July and August. Fall run chum salmon, alternatively, typically return to freshwater in late July and September and can spawn into mid-November (Salo 1991, Barton 1992). Return and spawn timing can, however, vary greatly over the large geographical extent that encompasses the Coastal Western Alaska and Yukon - Fall run genetic reporting groups. Within the Kotzebue Sound region spawning can occur from late July to October. Spawning in the Noatak River occurs from mid August to mid October (peaking in mid- to late September) in the lower river (Merritt and Raymond 1983). In the Kobuk River spawning occurs from late July to late August in the lower tributaries but continues into October in the upper tributaries (Bigler and Burwen 1984). On the Yukon River, salmon management considers any chum salmon that passes Pilot station after 19 July a fall run fish; however, 18% (~ 45,000 fish) of the chum salmon passing Pilot station in 2024 between 19 July and 7 September were summer run fish (ADFG 2025a, ADFG 2025b). While the sonar counts ends on 7 September each year, occasionally large numbers of fall run fish are passing through (*e.g.*, 9,995 chum salmon were counted on 9/7/2018:

https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareayukon.salmon_escapement). Within the Kuskokwim River drainage the majority of chum salmon are summer run; however, a small number of fall run spawning populations exist in the upper basin (South Fork Kuskokwim, Windy Fork and Big Rivers; Gilk et al. 2005). In the Bristol Bay region, chum salmon spawn in the summer with peak passage of chum salmon at the Nushagak River sonar site in mid-June to early July (<https://www.adfg.alaska.gov/sf/FishCounts/>).

There is some transit time involved in fish leaving the pollock fishing grounds to arrive at their natal rivers in time to spawn. Tagging studies suggest a migration speed between 20-80 km/day (Salo 1991). We can back calculate how many days would be required to transit from the average chum salmon location of bycatch and the major Western Alaska drainages with chum salmon populations, assuming these swimming speeds. We did this by calculating the average distance from the bycatch location (centroid of each ADF&G groundfish statistical area) to the major drainages of Kotzebue Sound, Norton Sound, Yukon River, Kuskokwim River, and Nushagak River (where the number of chum salmon caught as bycatch was used to weight the distance).

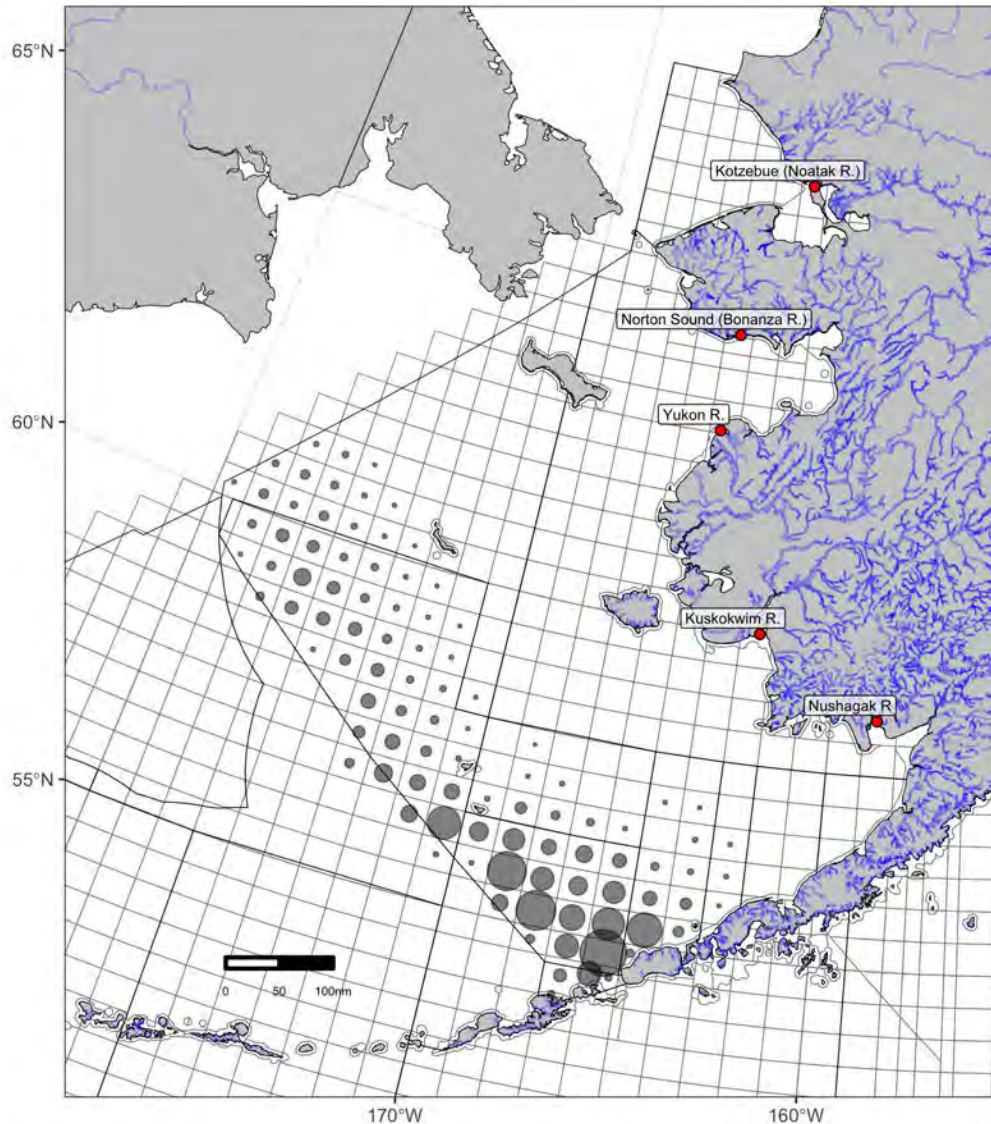


Figure A3-6: Map of the distribution of chum salmon bycatch caught within the eastern Bering Sea pollock fishery and distance needed to travel back to natal systems. Blue lines represent anadromous waters with five Coastal Western Alaska drainages with major chum runs: Kotzebue Sound, Norton Sound, Yukon River, Kuskokwim River, and the Nushagak River indicated with red points. Relative catches of chum salmon bycatch are represented by circles with diameter proportional to the number of fish caught within each ADF&G groundfish statistical area.

The majority of the bycatch occurs in the southeast portion of the Eastern Bering Sea (Figure A3-6). Assuming an average oceanic swimming rate of 35 km/day, it would take approximately 19–36 days for chum salmon to transit between where the bycatch is caught and the Alaska coastline (Kuskokwim to Kotzebue). If fish need to enter estuaries before the second week of September to have a chance to spawn, assuming an average transit time of ~24 days, fish that are on the pollock fishing grounds after 14 August probably do not have enough time to make it back to their natal system and be successful spawners. The statistical week of 14 August is 33 or 34 depending on the year. This cutoff aligns with the ‘late’ time period that is evaluated annually for the genetic stock composition. Any chum salmon of Coastal Western Alaska or Yukon River - Fall run origin would likely not be returning to their natal system in the given year and would incur an additional year of oceanic mortality (effectively decreasing the estimated AEQ in the year it would be projected to mature).

Both the total number of chum salmon and the Coastal Western Alaska stock proportions (stock group for which annual bycatch estimates are made by AFSC's Genetics Program) often decrease through the B-season. If the majority of the Coastal Western Alaska and Yukon River - Fall run are caught prior to the late time period, the issue of equal maturation probability across the B season is diminished. We can evaluate the number of Western Alaska fish caught through the season (in each statistical week) by multiplying the number of bycaught chum salmon by the early (statistical weeks [SW] 24–29), middle (SW 30–34), late (SW 35–40) genetic estimates. Note that these estimates are made with the stock composition estimates for the Western Alaska and Upper/Middle Yukon reporting groups from prior analyses by AFSC's Genetics Program which as mentioned above generally align with the Coastal Western Alaska and Yukon River - Fall groups analyzed for the AEQ. This will provide a sense of the magnitude of the issue.

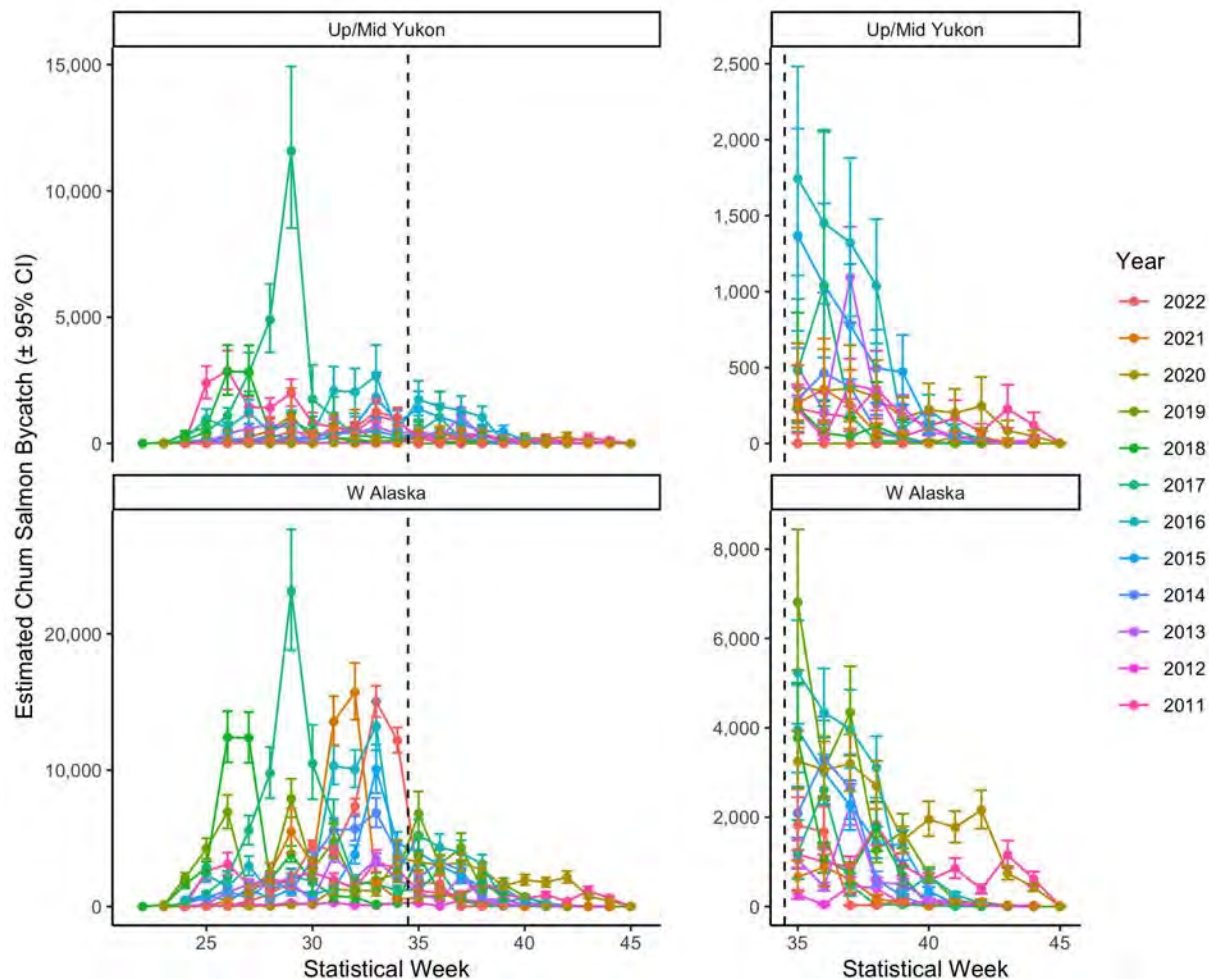


Figure A3-7: Estimated Western Alaska chum salmon, Upper/Middle Yukon (top) and Coastal Western Alaska (bottom) genetic groups, bycatch by statistical week for the B season (left) and for the late period (right). The late period includes all statistical weeks after week 34.

While there is some variation among years in the total number and relative proportion of fish of each genetic group that are caught after statistical week 34, on average 74% of the bycatch of both genetic groups occurs prior to this week. Given the high survival assumed across age classes (Table A3-5), it appears that not accounting for varying maturation probabilities, or delayed maturation and the opportunity for subsequent oceanic mortality, on fish caught after week 34 induces minimal bias into the estimates of the AEQ and impact rate. Nevertheless, while the bias is minimal, it would lead us to

overestimate both the number of fish that might have returned to river systems and the impact of bycatch on the Yukon River - Fall run. Additionally, the lack of adequate sample sizes to stratify the age-specific genetic samples into maturation probability groups based on catch date precludes easily integrating this into the analyses. Given the number of assumptions and uncertainties underlying the current simplified AEQ model (discussed below), no further attempts were made to address the assumption of variable maturation probabilities by catch date.

Uncertainty in the AEQ

There are numerous sources of uncertainty in the AEQ model (oceanic maturity, survival, in-river age composition, estimates of stock of origin, etc.). The vast amount of uncertainty in these parameter estimates is reviewed in the main text and not reiterated here. To account for some uncertainty a stochastic version of the AEQ was created which simulates values for each of the main parameters within the model. Many of these approaches were used in the 2012 analysis. We conducted 1000 simulations, sampling each parameter value from their respective distributions described below, and calculated the mean and median as well as the 5th and 95th percentile (pth) to convey uncertainty in the estimates. The mean and median did not differ substantially for either the AEQ or the impact rate.

- 1) **Number of chum salmon of each age:** Estimates of each age class in the total bycatch were estimated as the product of the age proportions inferred from the annual scale samples and the total bycatch. Stochastic estimates for each age class can be simulated from the multinomial:

$$\hat{c}_{a,y} \sim \text{Mult}(n_y, \pi)$$

where n_y is the annual bycatch number and π is the age composition inferred from scale samples.

- 2) **Stock of origin:** The uncertainty in annual age-specific reporting group proportion is quantified with 95% credible intervals; however in the above analysis we used the mean value. In the stochastic version of the AEQ we simulated the age-specific stock proportions the normal distribution:

$$\hat{m}_{r,a,y} \sim N(m_{r,a,y}, \sigma_{r,a,y}^2)$$

where the proportion of fish of age a in a given year t of stock origin r is normally distributed with the mean and variance equal to the posterior estimate from the GSI analysis.

- 2) **Survival:** Survival estimates were taken from the 2012 chum salmon EIS where the chum salmon AEQ was introduced. Stochastic survival rates were simulated as:

$$\hat{S}_a = \exp(-M_a + \delta), \quad \delta \sim N(0, 0.1^2)$$

with the assumption that survival is not reporting group specific and temporally invariant.

- 3) **Maturity:** Maturity in a given year was drawn from a beta-distribution:

$$\hat{\gamma}_{a,R} \sim B(\alpha_{a,R}, \beta_{a,R})$$

with parameters $\alpha_{a,R}, \beta_{a,R}$ made to satisfy the expected value of maturity from the in-river age composition data.

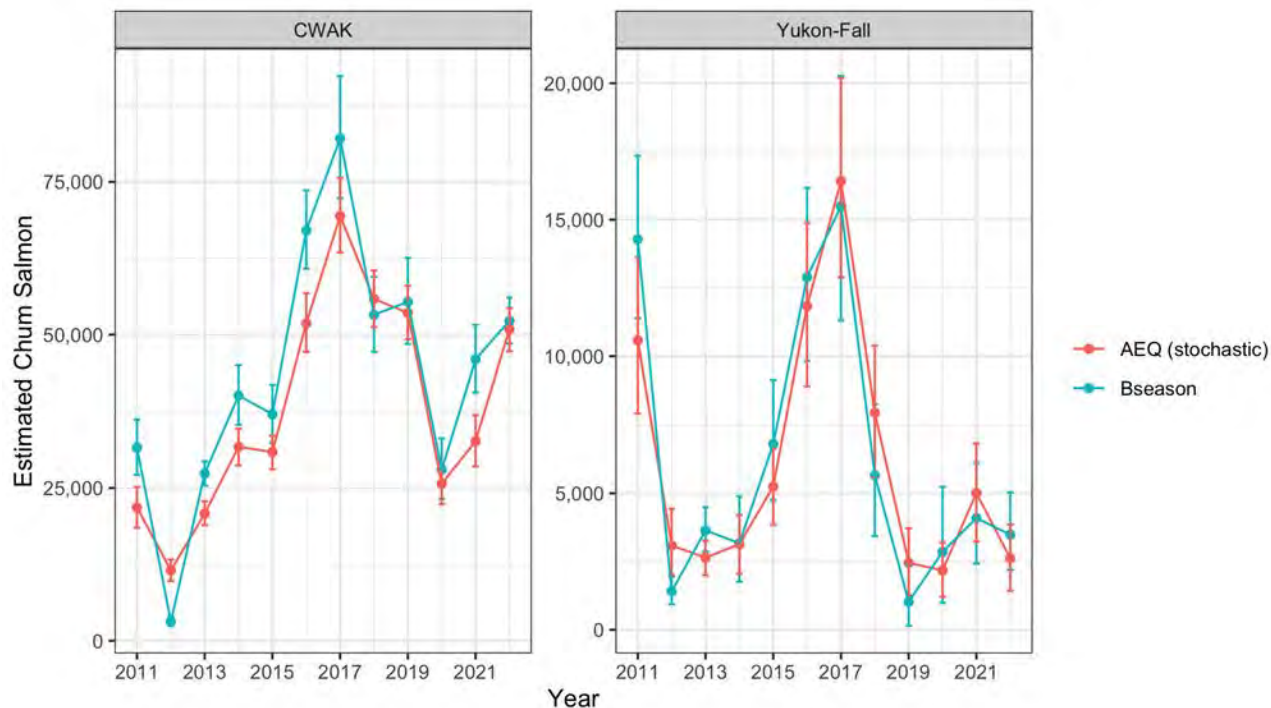


Figure A3-8: Stochastic version of the chum salmon adult equivalent (AEQ stochastic) model (mean, 5th and 95th percentile) with uncertainty in age composition of the bycatch, stock of origin, survival, and maturity compared to estimated stock specific bycatch ($\pm 95\%CI$).

The mean AEQ estimates for the stochastic model overlap with the non-stochastic model and display identical patterns for each genetic group through time. Incorporating some uncertainty in the parameterization of the AEQ model results in overlap between the range of uncertainty of the AEQ and the 95% credible intervals from the B season analysis in some years. In just over half of the years, the AEQ (and its percentiles) is lower than the B season bycatch for the Coastal Western Alaska genetic group. In only 2012 was the AEQ larger than the bycatch, stemming from the large reduction in bycatch and lagged effect of prior years contributing to the AEQ in that year.

Table A3-7: Stochastic version of the chum salmon adult equivalent (AEQ) model with mean, 5th, and 95th percentile (pth) for the Coastal Western Alaska (CWAK) and Yukon River – Fall run genetic groups.

Year	CWAK		Yukon - Fall	
	Mean	5-95th pth	Mean	5-95th pth
2011	21,815	18,512-25,166	10,585	7,930-13,609
2012	11,539	9,797-13,293	3,088	1,998-4,434
2013	20,812	18,947-22,841	2,641	2,000-3,260
2014	31,754	28,715-34,717	3,134	2,065-4,195
2015	30,896	28,080-33,599	5,247	3,854-6,634
2016	51,841	47,183-56,762	11,834	8,919-14,885
2017	69,403	63,428-75,601	16,415	12,881-20,198
2018	55,845	51,222-60,490	7,946	5,583-10,387
2019	53,554	49,243-58,000	2,452	1,261-3,717
2020	25,702	22,366-29,105	2,175	1,199-3,206
2021	32,675	28,534-36,963	5,006	3,229-6,823
2022	50,885	47,308-54,302	2,615	1,424-3,853

Impact Rate for Yukon Fall

The impact of bycatch on salmon populations, in this case aggregated to the genetic reporting group, measures the historical bycatch levels relative to the subsequent returning salmon run. The impact rate is calculated as: $AEQ_{r,y} / (AEQ_{r,y} + S_{r,y})$ where $AEQ_{r,y}$ is the adult equivalent bycatch for stock r in year y and $S_{r,y}$ is the size of stock r in year y .

The Coastal Western Alaska stock group is comprised of hundreds, if not thousands, of streams ranging from Kotzebue Sound in the North to the Nushagak in the South. A composite estimate of $S_{r,y}$ for that genetic group is not available and so an impact rate for the Coastal Western Alaska stock group is not possible. The Yukon River - Fall run, however, has a run reconstruction from a Bayesian state-space escapement model and annual harvest estimates (Fleischam & Borba 2009, YUKON JTC 2025) which provides annual estimates of $S_{r,y}$ for this group (Figure A3-9 top panel).

To incorporate uncertainty from the Bayesian escapement model into the impact rate, escapement values were simulated from the posterior quantiles (provided by Zachary Liller and Bonnie Borba, ADF&G) with the Johnson Quantile-Parameterised Distribution implemented in the rjqp package in R. This was done because the full posterior distribution of the escapement model could not be sampled.

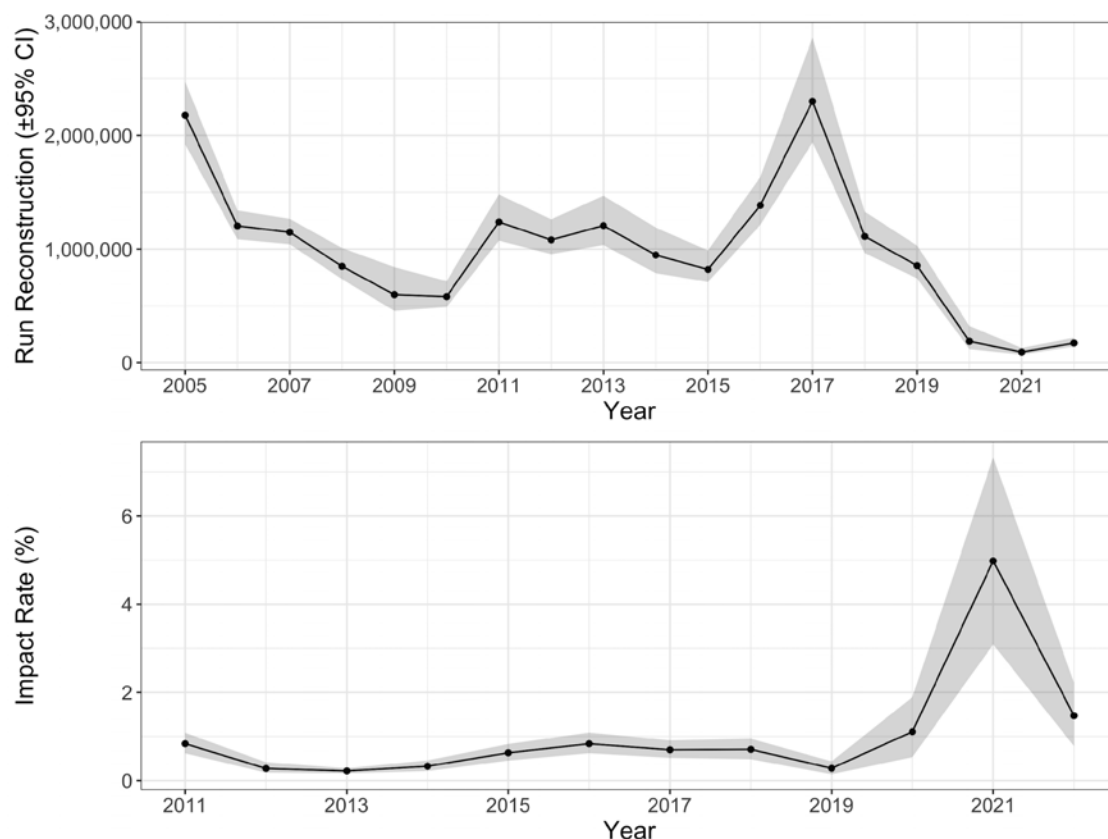


Figure A3-9: Run reconstruction (top) and the estimated impact rate (median and 5th-95th percentiles) of bycatch (bottom) from stochastic AEQ of the Yukon River – Fall run genetic group. Run reconstruction estimates were derived from Bayesian state-space model escapement estimates and total annual harvest (data provided by ADF&G, YJTC 2025 Table 14).

The impact rate of bycatch on the Yukon River - Fall run group fluctuated annually from 2011–2022 averaging 1.03% over the time period. Impact was lowest in 2013 (0.22%) and 2019 (0.28%). In both years, overall bycatch was low (and was preceded by low bycatch years) resulting in lower than average AEQ estimates. Combined with the average escapements for the Yukon River - Fall run resulted in low impact rates for both years. In 2020, the AEQ was the smallest; however, escapement estimate was the second lowest of the time period which resulted in a higher impact rate on the Yukon River - Fall run chum salmon. The largest impact rate (4.98% 3.09–7.33 5th-95th percentile) was observed in 2021, the year of lowest escapement, highest overall bycatch, and a slightly below average Yukon River - Fall run AEQ.

Effect of proposed PSC limits and apportionments on AEQ and Impact Rate

The effects of Alternatives 2 and 3, which include an overall chum salmon PSC limit that would close the pollock B season early if it were met (i.e., a hard cap) on the AEQ were evaluated by calculating the number of chum salmon that would have been taken as bycatch before a cap was reached, then calculating an AEQ based on that value. AEQ savings estimates were produced by subtracting the AEQ under each cap alternative (which estimates the AEQ up until the fishery would have been closed) from the AEQ under no cap (the estimated number of adult equivalents removed from a genetic group). This approach was taken for caps of: 100,000, 325,000, and 550,000 chum salmon and for each apportionment option. The apportionment options are as follows: Option 1 (3-year average, “K3”), Option 2 (5-year

average, “K5”), Option 3 (pro rata, “KP”), and Option 4 (AFA, “K4”). The overall PSC limit amounts and apportionment options are discussed in Chapter 2 of the DEIS and not repeated here.

An overall chum salmon PSC limit of 550,000 fish was predicted to yield an AEQ estimate that resembles the status quo AEQ; however, depending on the apportionment option used, there were estimated savings in years with very large bycatch (*e.g.*, in 2017 for the Coastal Western Alaska group using the K3 apportionment; Figure A3-11). PSC limits evaluated at the mid-point and lower end of the range were predicted to lower AEQ estimates for both genetic groups compared to status quo. The seemingly minor differences in AEQ between the status quo and the 325,000 chum salmon PSC limit stem from the fact that bycatch only exceeded that limit in 5 of the 12 years.

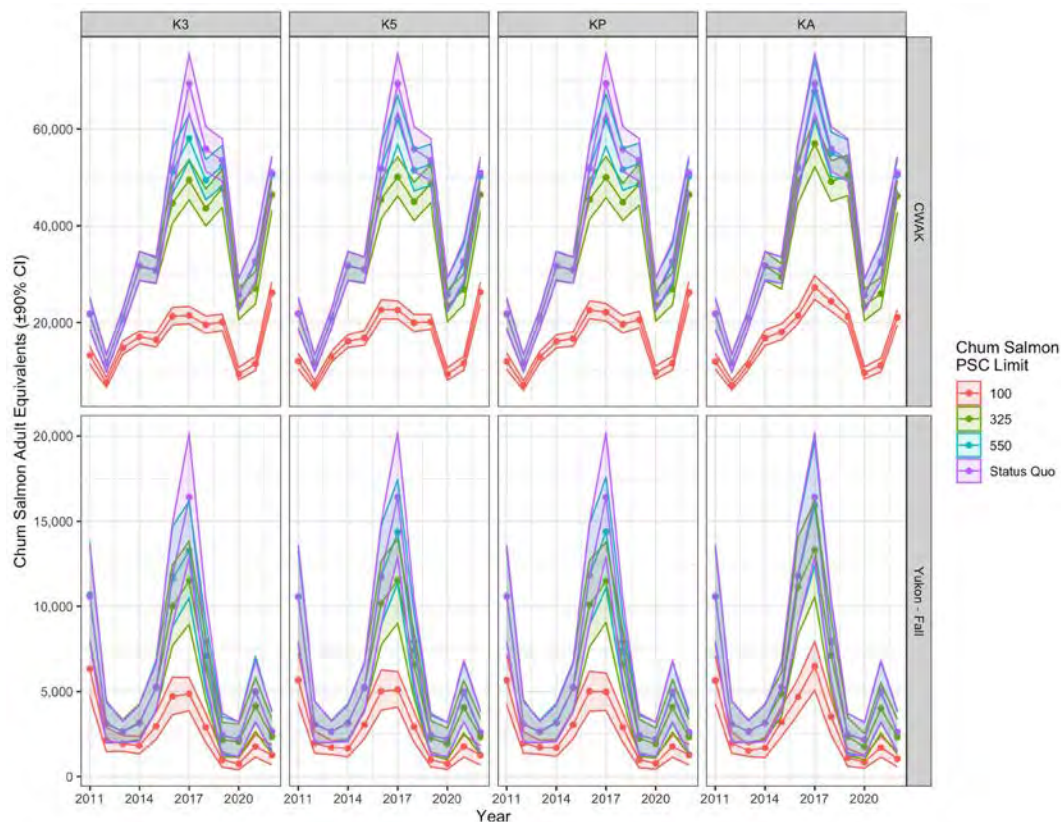


Figure A3-10: Chum salmon adult equivalent (AEQ) for the WAK-Summer and Yukon River – Fall stock groups under the status quo (no overall PSC limit) and under all analyzed PSC limits (100,000 to 550,000 chum salmon) and apportionment options (K3, K5, KP, and KA) for Alternative 2 and Alternative 3.

The estimates for the AEQ bycatch reductions varied across time (Figure A3-11). The savings would have been largest for the smallest cap (100,000) as fewer fish would have been taken as bycatch. The average savings under a 100,000 PSC limit for Coastal Western Alaska varied between 21,303 and 21,652 fish depending on the apportionment option. The lowest AEQ reduction was estimated at 4,366 fish in 2012 while the highest estimate was 46,060 fish in 2017. Similarly, the average savings at the 100,000 PSC limit for Yukon River - Fall run ranged between 3,308 and 3,448 fish, and from a low of 922 in 2013 to a high of 11,051 fish in 2017. The credible intervals (5th-95th pth) for the savings estimated at two larger limits, 325,000 and 550,000 chum salmon, often included zero (Figure A3-11).

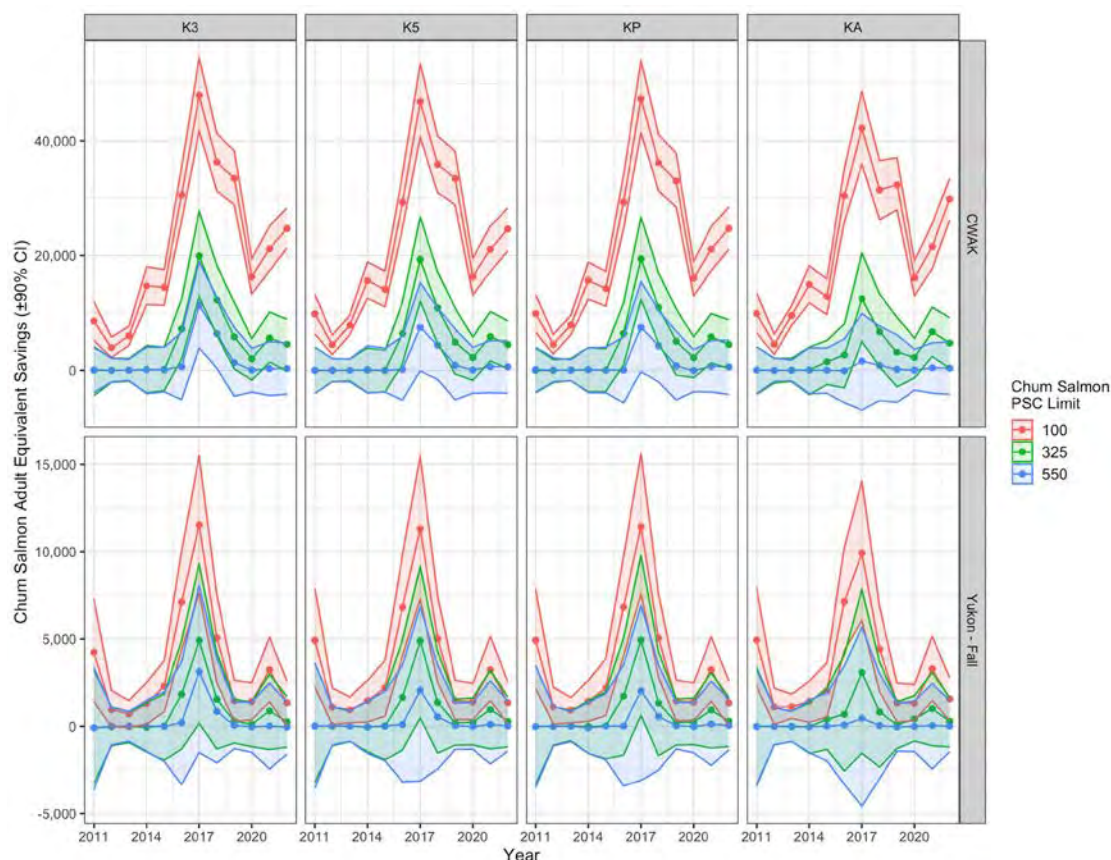


Figure A3-11: Chum salmon adult equivalent (AEQ) savings for the Coastal Western Alaska (CWAK) and Yukon River – Fall stock groups under all analyzed PSC limits (100,000 to 550,000 chum salmon) and apportionment options (K3, K5, KA, and KP) for Alternative 2 and Alternative 3.

The bycatch management alternatives were also evaluated for their effect on the impact rate on Yukon River - Fall run chum salmon. Similar to above, the impact rate was calculated assuming a PSC limit was in effect each year between 2006 and 2022. The total number of chum salmon that would have been taken as bycatch under a given PSC limit and apportionment were used to compute the AEQ model (as above) and an impact rate was calculated. As one would expect, the impact rate was minimized under the lowest PSC limit, leading to reductions in impact of up to 3.27% (1.42–5.28 5th–95th percentile). There was large uncertainty around the impact rate reductions for larger PSC limits (Figure A3-12 lower panels). Under PSC limits of 325,000 and 500,000 chum salmon, the 5th–95th percentile range for the impact rate reduction included 0 under all apportionment options.

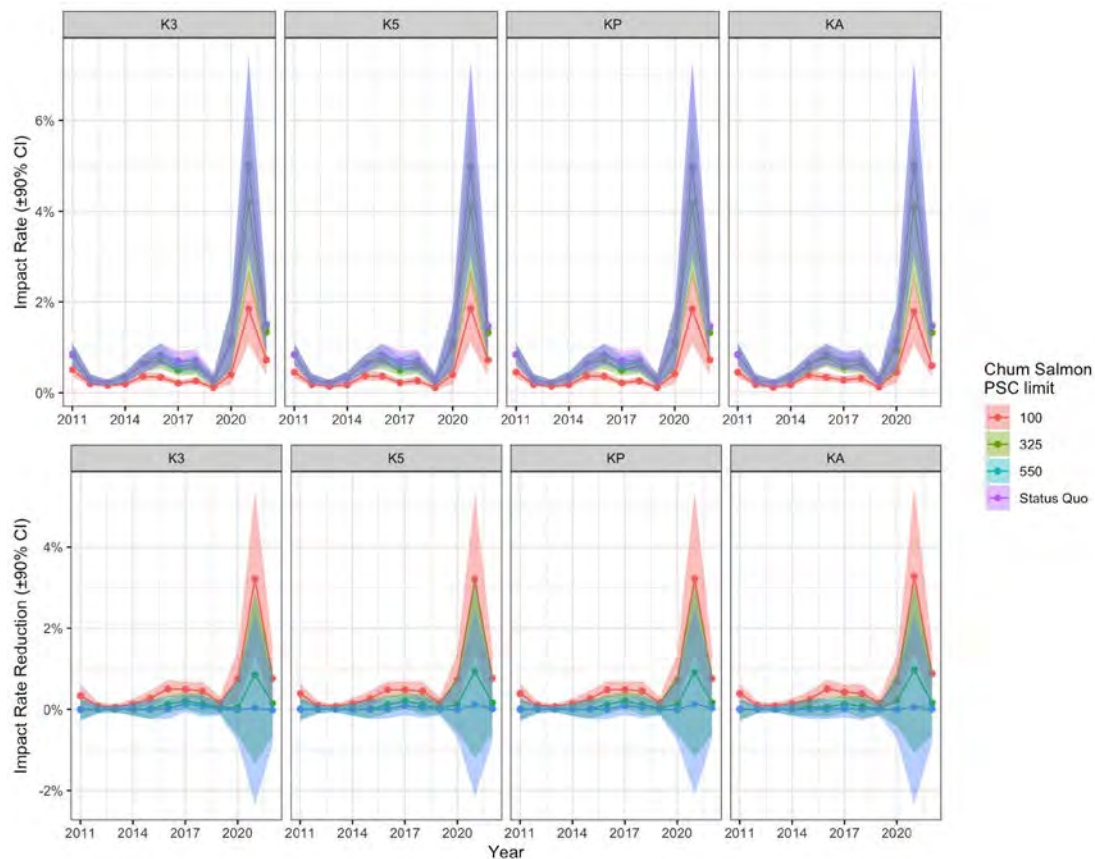


Figure A3-12: Impact rate (top) and impact rate reduction (bottom) for the Yukon River - Fall run genetic group under all analyzed PSC limits (100,000 to 550,000 chum salmon) and apportionment options (K3, K5, KA, and KP) for Alternative 2 and Alternative 3. The impact rate reduction is calculated as the impact rate under a given management scenario (PSC limit and apportionment) subtracted from the status quo.

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Appendix 4: Chinook Salmon Bycatch Adult Equivalents Analysis

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September 23, 2024

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Background

The previous analysis was conducted in 2022 but the age data and extent of genetic stock identification (to reporting groups) was lower. The following analyses updates that work with the latest available information. Data details are highlighted and shown in subsequent sections.

Chinook salmon bycatch data

The Chinook salmon bycatch estimates are mainly derived from census counts by plant and at-sea scientifically trained NMFS observers. As noted the above the “strata” are defined

1. “A” season (all areas)
2. “B” season west of 170°W
3. “B” season east of 170°W

The age, length, and total catch of Chinook salmon was acquired through the AKFIN database using a web services script created by Matt Callahan.

The bycatch PSC results were compiled a number of ways including by stratum as shown in Figure 1 and season (Figure 2)) and by sector (Figure 3)). The values for PSC are provided in Table 1.

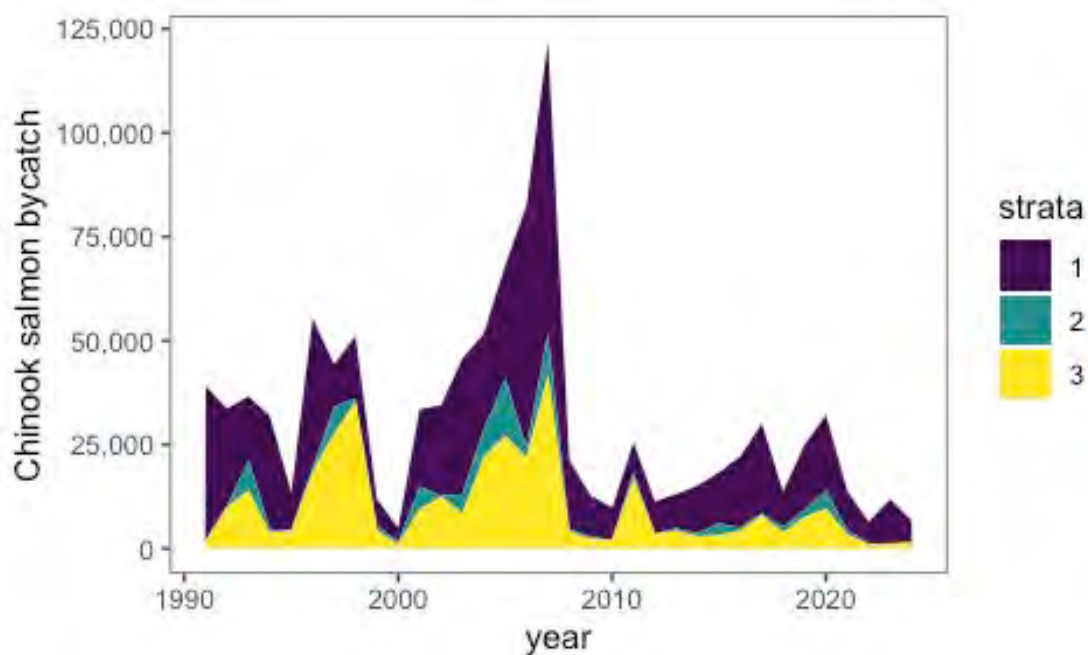


Figure 1: Chinook salmon bycatch by year and strata.

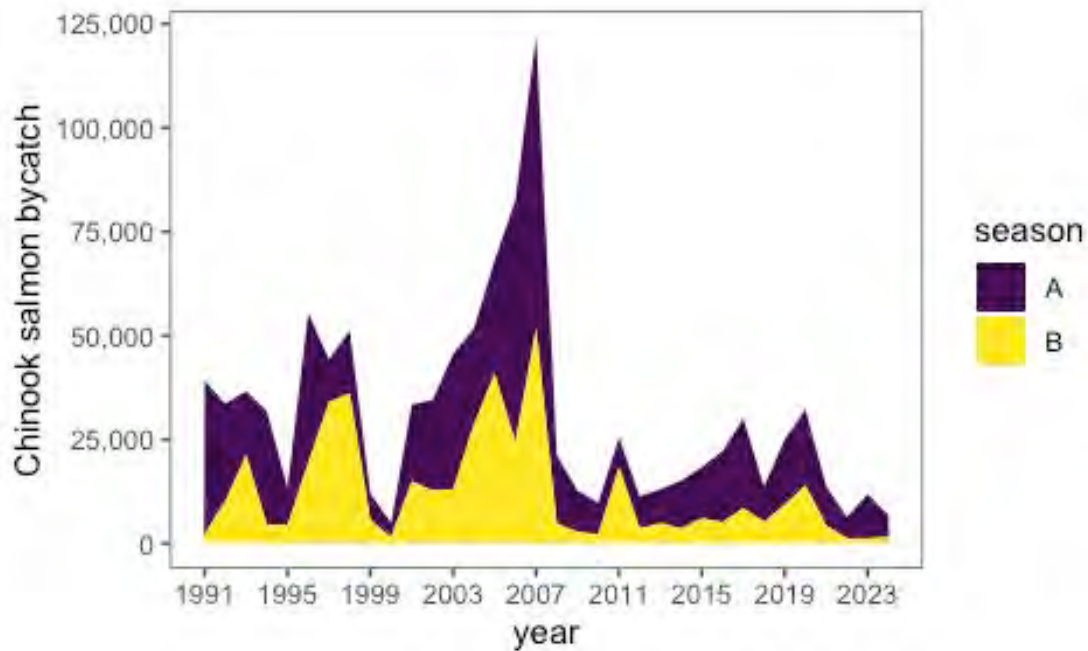


Figure 2: Chinook salmon bycatch by year and season

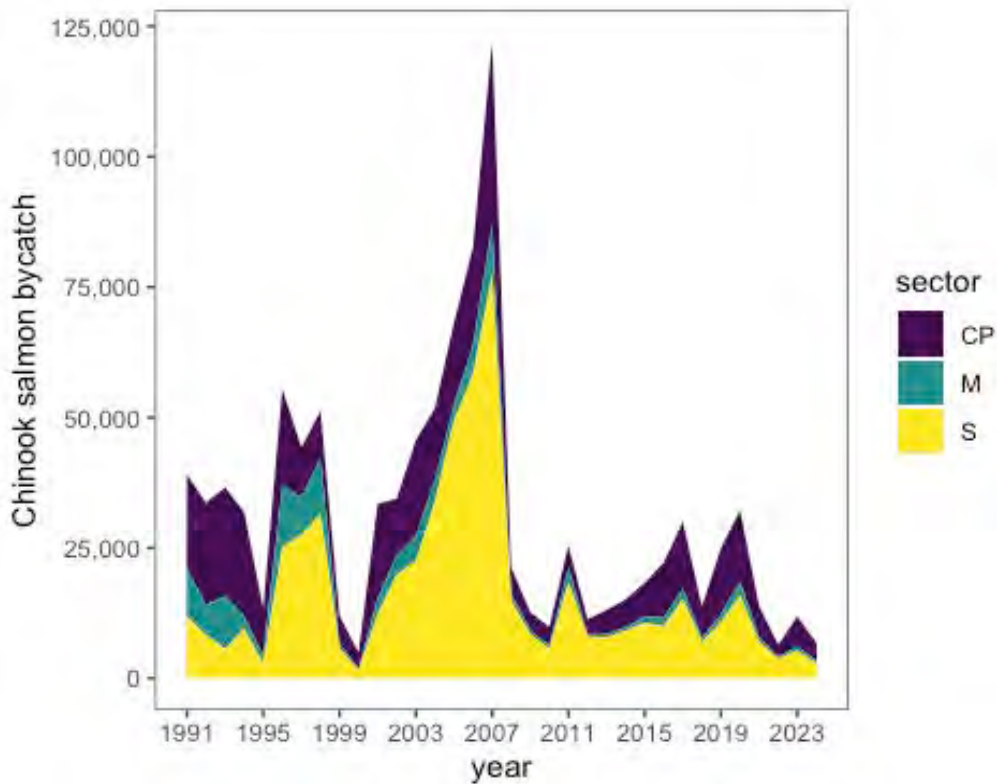


Figure 3: Chinook salmon bycatch by year and sector.

Table 1: Chinook salmon bycatch in the pollock fishery by season and sector. A_CP, A_M, A_S represents catcher-processors, motherships, and shorebased sectors during the A-season (those prefixed with B are for the B-season).

Year	Total	A_CP	A_M	A_S	B_CP	B_M	B_S
1991	39,054	17,645	9,001	10,192	397	152	1,667
1992	33,672	12,631	4,057	6,725	6,889	1,766	1,604
1993	36,619	8,869	3,529	3,017	11,932	6,657	2,615
1994	31,890	17,149	1,790	8,346	2,826	572	1,207
1995	13,403	5,971	971	2,040	2,973	667	781
1996	55,472	15,276	5,481	15,228	3,222	6,322	9,944
1997	44,320	3,832	1,561	4,954	5,721	5,702	22,550
1998	51,245	6,500	4,284	4,334	2,548	6,361	27,218
1999	11,978	2,694	554	3,103	2,590	374	2,662
2000	4,961	2,525	19	878	568	253	717
2001	33,444	8,264	1,664	8,555	9,863	1,318	3,779
2002	34,495	9,481	1,976	10,336	1,386	1,755	9,560
2003	45,661	14,361	2,880	15,365	4,039	1,940	7,075
2004	51,751	9,438	2,068	11,571	4,295	2,078	22,301
2005	68,126	11,384	2,107	13,792	4,319	887	35,637
2006	82,653	17,256	5,394	35,642	1,531	200	22,630
2007	121,956	27,894	5,861	36,410	7,147	3,542	41,102
2008	21,242	4,552	1,272	10,607	412	175	4,224
2009	12,731	3,130	601	6,235	402	152	2,212
2010	9,835	3,401	493	3,778	144	84	1,934
2011	25,499	2,236	459	4,441	1,986	2,426	13,951
2012	11,343	2,828	312	4,624	97	49	3,433
2013	13,091	4,038	557	3,622	571	48	4,255
2014	15,135	4,653	463	6,420	701	180	2,718
2015	18,329	3,820	689	7,789	2,624	559	2,848
2016	22,204	7,978	1,078	8,040	2,544	577	1,987
2017	30,079	11,016	1,530	9,060	1,863	476	6,134
2018	13,726	4,344	375	3,816	1,617	361	3,213
2019	25,038	8,857	927	5,954	3,899	538	4,863
2020	32,204	8,934	1,242	8,044	4,705	1,472	7,807
2021	13,852	4,368	700	4,407	1,584	222	2,571
2022	6,415	1,911	243	3,031	369	74	787
2023	11,874	5,515	735	4,359	200	183	882
2024	6,842	3,090	350	1,848	385	132	1,037

The number of samples that have been aged by year and season are shown in Table 2. while the number collected that have yet to be are provided in Table 3. The aged samples are used in combination with the length and stratified-catch to estimate the age composition. Comparisons of location of age samples occurred by season and year are shown in Figure 4.

Table 2: Number of Chinook salmon aged by year and season.

Year	A	B	Total
1997	842	756	1,598
1998	873	826	1,699
1999	645	566	1,211
2011	409	1,084	1,493
2012	461	222	683
2013	496	273	769
2017	1,159	466	1,625
2018	511	302	813
2019	790	361	1,151
2020	1,005	769	1,774
2021	419	192	611
2022	212	7	21

Table 3: Number of Chinook salmon age samples but without age determinations by year and season

Year	A	B	Total
2011	295	725	1,020
2012	303	136	439
2013	312	200	512
2014	1,132	344	1,476
2015	1,222	588	1,810
2016	1,665	495	2,160
2017	990	354	1,344
2018	332	195	527
2019	751	509	1,260
2020	863	623	1,486
2021	519	228	747
2022	313	112	425
2023	1,051	120	1,171
2024	291		

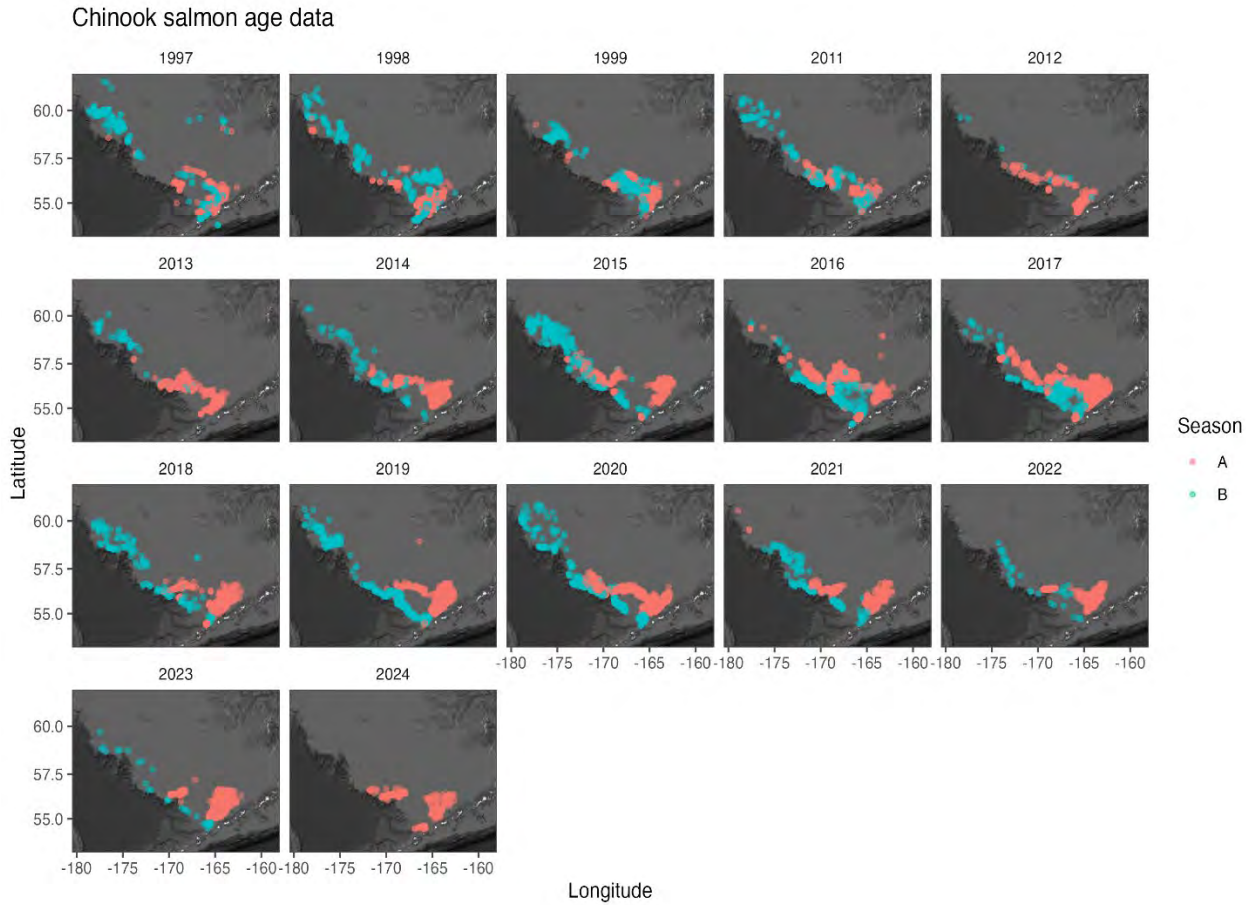


Figure 4: Map of locales where age samples from Chinook salmon were collected.

To evaluate how length-at-age of Chinook salmon in the bycatch may have changed over time, the raw data were broken out by season and plotted spatially (Figure 4). Most of the Chinook salmon occurring in the bycatch appear to be age 4 and 5 years old. To examine for trends over time, the length of these ages are shown below. This figure suggests that the mean lengths at age have been fairly consistent during the “A” season but that there is a decline observed in the “B” season, particularly for age 5 year old Chinook salmon (Figure 5).

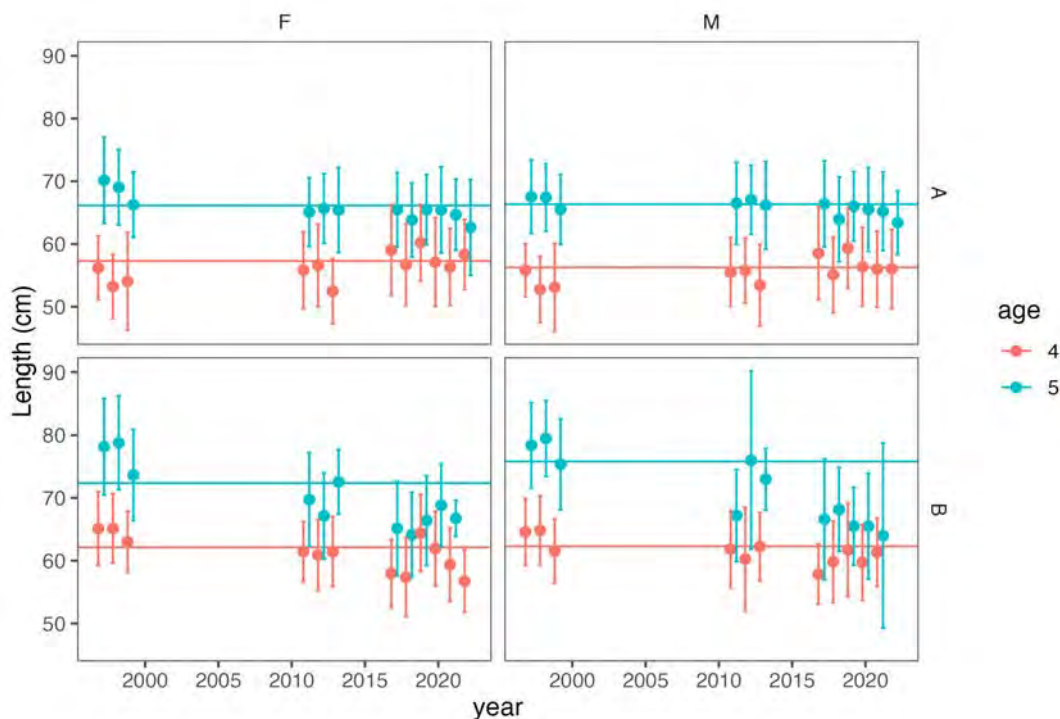


Figure 5: Mean length-at-age for Chinook salmon in the bycatch based on the available age data.

Age data

The following figures represent the available raw age data used for the analysis. Note that these data are used in conjunction with the length data using methods shown in the subsequent section. The age composition by strata is shown in Figure 6. whereas those broken out by season and year are shown in Figure 7 and Figure 8.

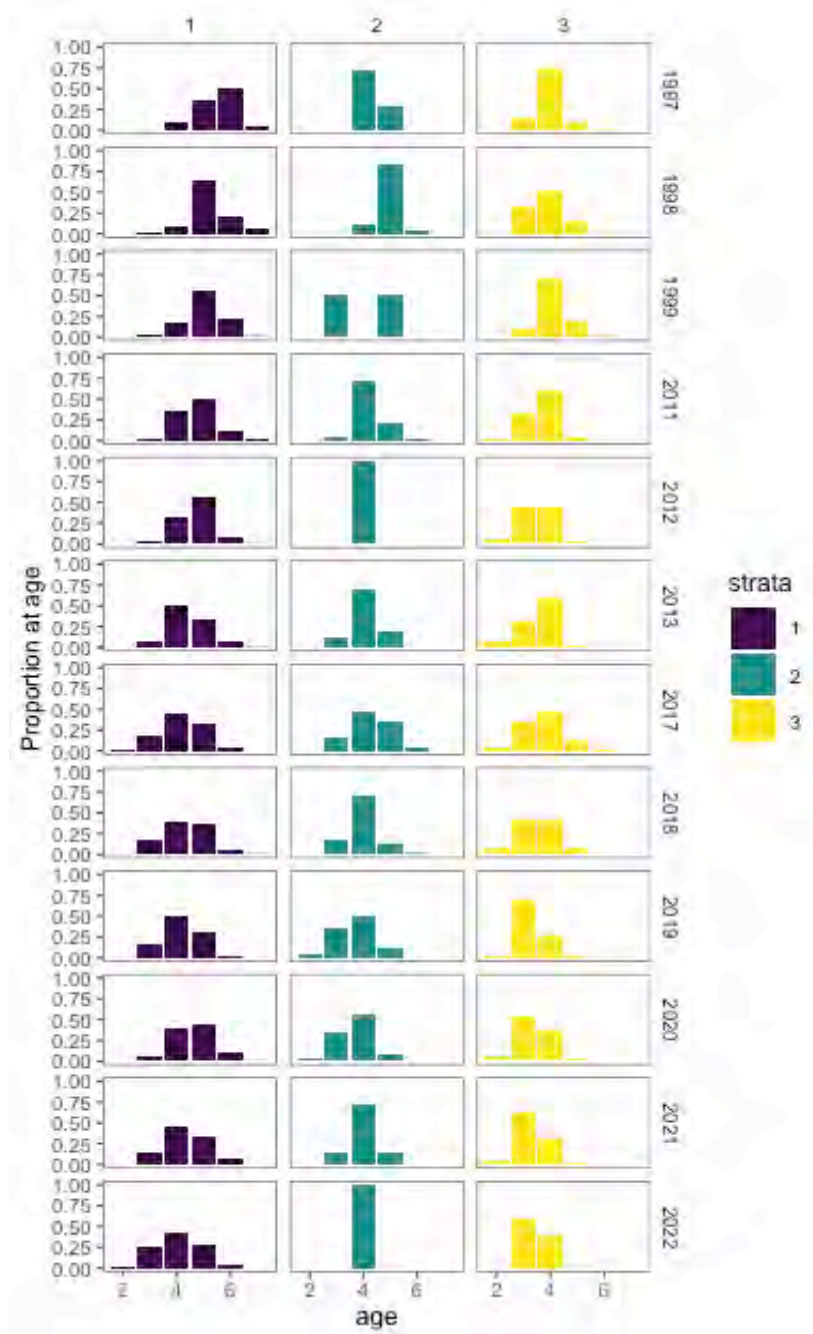


Figure 6: Raw Chinook salmon age frequency in the bycatch data by strata and year. Note that data for 2014-2016 are unavailable.

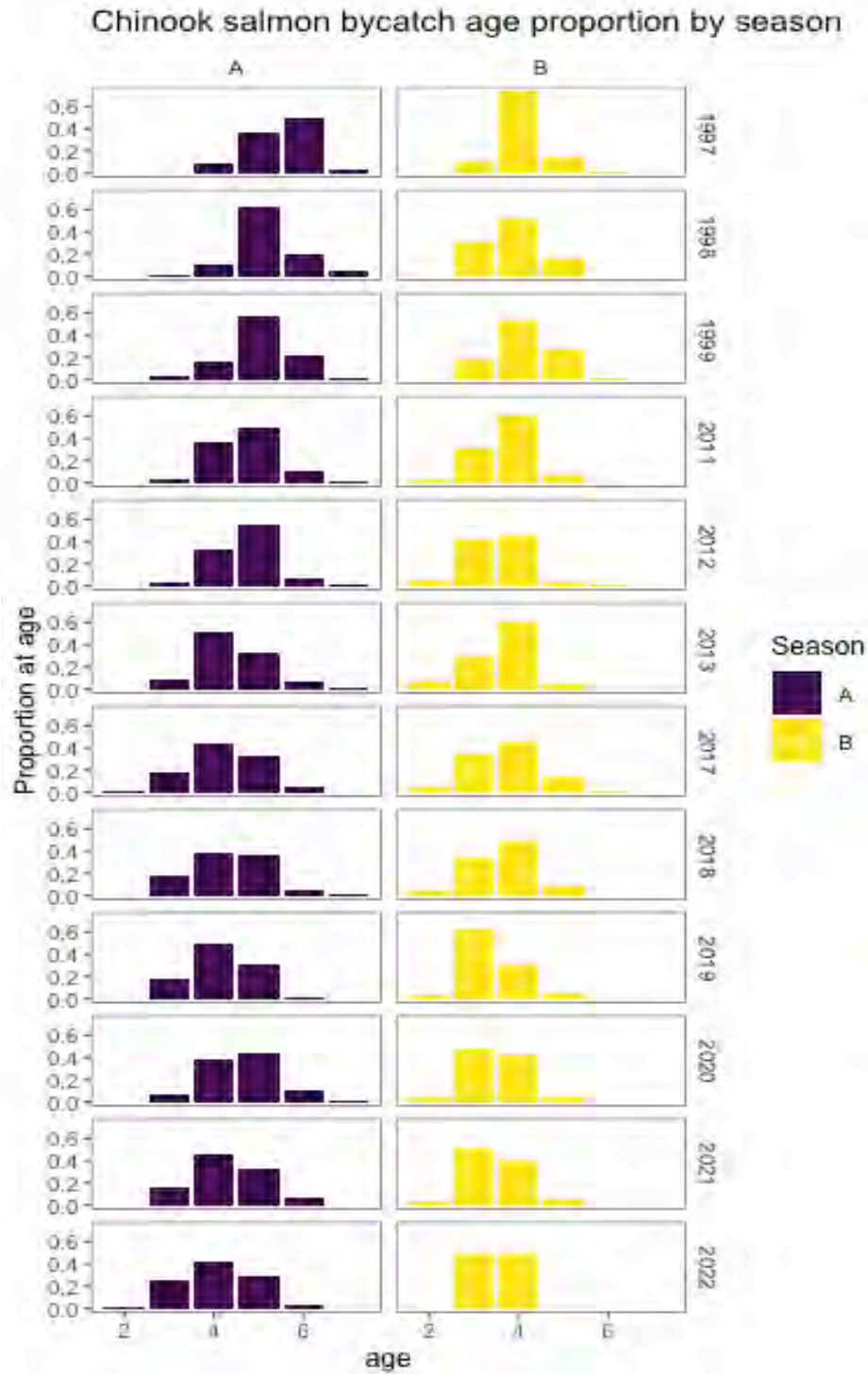


Figure 7: Raw Chinook salmon age frequency in the bycatch data by season and year.

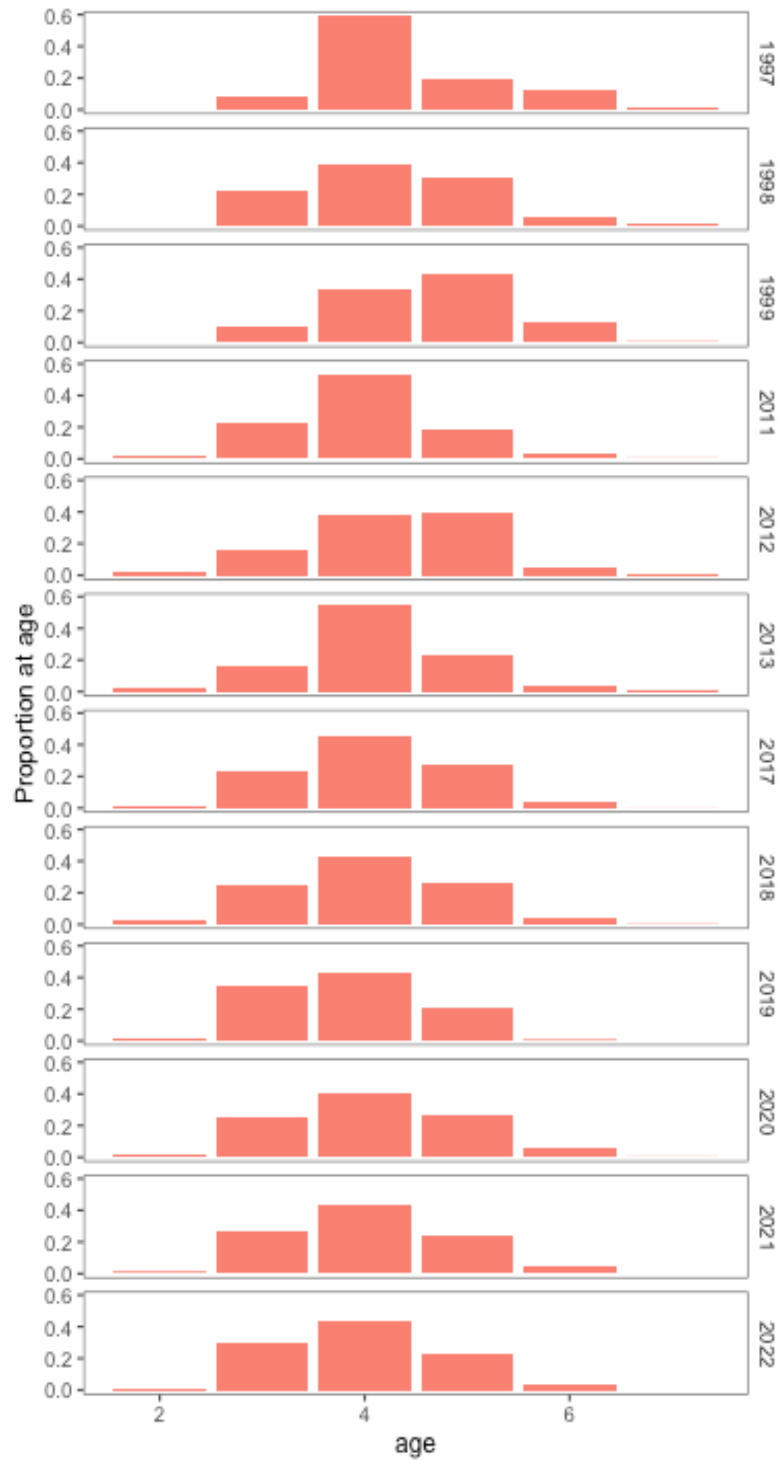


Figure 8: Raw Chinook salmon age frequency in the bycatch data by year.

Length

Length frequency data are generally more numerous than ages, so accounting for the annual stratum-specific age-length key to come up with the annual age compositions is a standard approach. The length data presently available for Chinook salmon are shown in the next sections. Length frequencies are shown in Figure 9 by season with sample size values provided in Table 4.

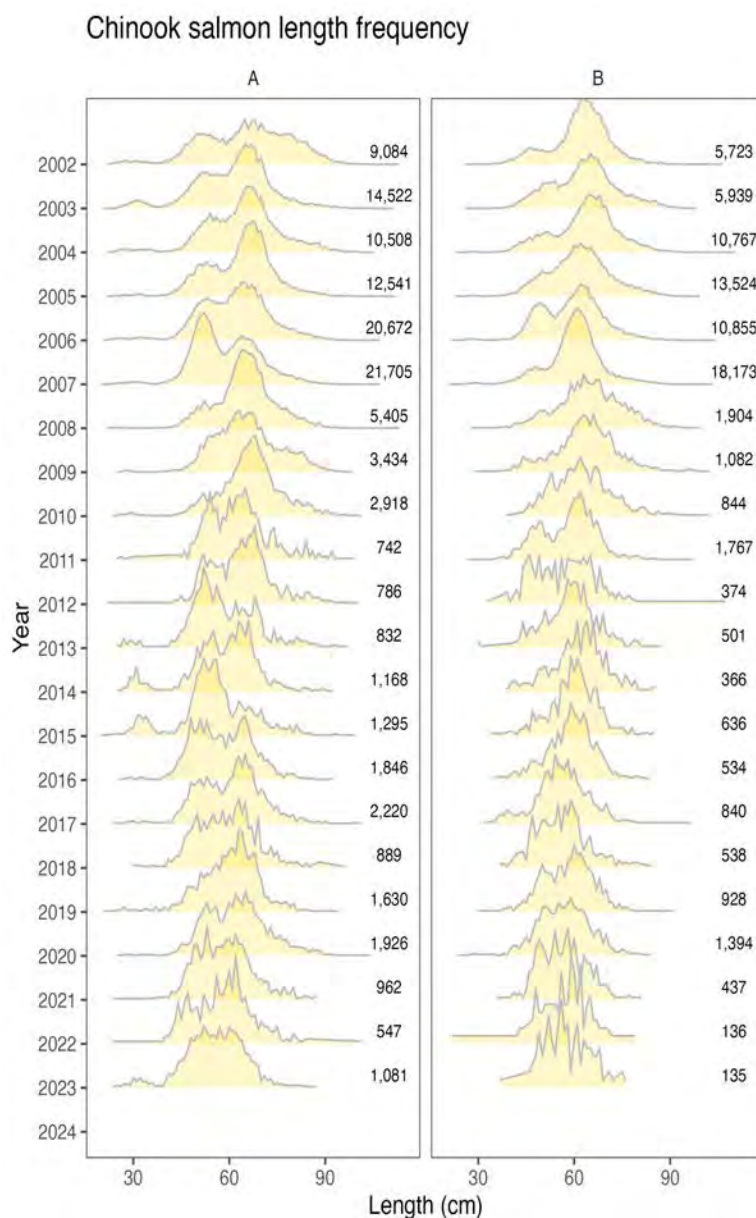


Figure 9: Length frequency of Chinook salmon bycatch by season.

Table 4: Number of Chinook salmon lengths by season and year.

Year	A	B	Total
2002	9084	5723	14807
2003	14522	5939	20461
2004	10508	10767	21275
2005	12541	13524	26065
2006	20672	10855	31527
2007	21705	18173	39878
2008	5405	1904	7309
2009	3434	1082	4516
2010	2918	844	3762
2011	742	1767	2509
2012	786	374	1160
2013	832	501	1333
2014	1168	366	1534
2015	1295	636	1931
2016	1846	534	2380
2017	2220	840	3060
2018	889	538	1427
2019	1630	928	2558
2020	1926	1394	3320
2021	962	437	1399
2022	547	136	683
2023	1081	135	1216
2024	16	NA	NA

The data collection locales by season and year are shown in Figure 10.

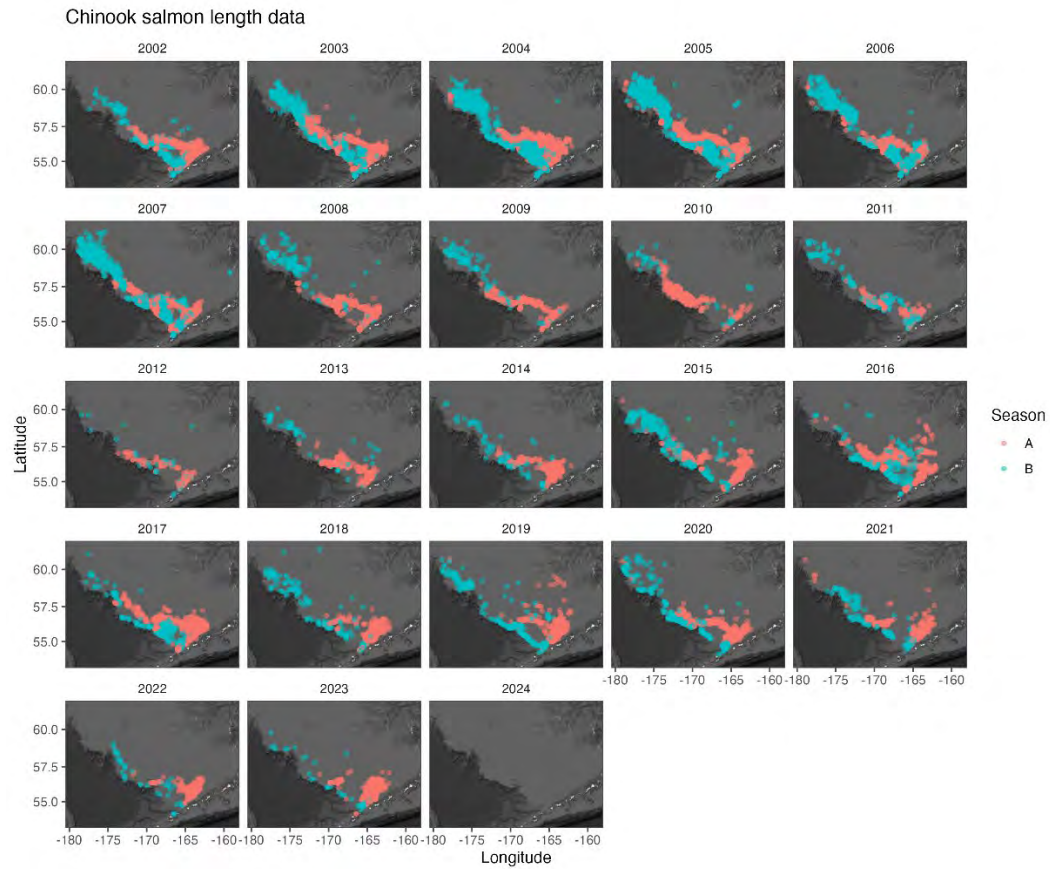


Figure 10: Chinook salmon length sample locales by season and year.

Estimating age composition

To estimate age compositions including information on the length frequency data

The catch-at-age estimates apply observer-collected length frequency and length-at-age data using the method of Kimura (1989) and modified by Dorn (1992). Age-length keys for each time-area stratum and sex are constructed and applied to randomly sampled catch-at-length frequency data. The stratum-specific age composition estimates are then weighted by the catch within each stratum to arrive at an overall age composition for each year. The length frequency data on Chinook salmon from the NMFS observer database were used to estimate the overall length and age composition of the bycatch for each season. The age data were used to construct annual stratified age-length keys when sample sizes were appropriate and stratified combined-year age-length keys for years where age samples were limited.

To the extent possible, sex-specific age-length keys within each stratum were created and where cells were missing, a “global” sex-specific age-length key was used. The global key was computed over all strata within the same season. For years where age data were unavailable, a combined-year age-length key (based on data spanning all years) was applied to observed catch length frequencies. Applying the available length frequencies with stratified catch and age data resulted in age composition estimates in the bycatch that were predominately age 4 (Figure 8). Generally, it is inappropriate to use the same age-length key over multiple years because the proportions at age for given lengths can be influenced by variability in relative year-class strengths. Combining age data over all the years averages the year-class effects to some degree but may mask the actual variability in age compositions in individual years. This practice was evaluated and, given the relatively distinct length frequency modes corresponding to age, the results were found to be relatively insensitive (NPFMC/NMFS, 2018). The estimates of uncertainty in the age composition due to sampling have increased substantially due to the lower number of Chinook salmon sampled for lengths since 2008. Note that estimates of age composition were computed using a two-stage bootstrap application in which the first stage was resampling from a population of observed hauls (with replacement), then resampling individual fish within those hauls (also with replacement). Under the sampling protocol implemented in 2011 fewer Chinook salmon are being measured due to effort being shifted towards collecting genetic tissue for stock identification studies.

Compiling data

The code below sets up the main control files given that the age and length data have been collated and put in the raw data subdirectory.

Running sampler

The steps to run a specific year can be looped through and results appear in the folder ‘results’.

Sampler results

Bycatch-at-age

Below shows a sample of Chinook salmon bycatch age composition by year and relative age with older (top) and younger (bottom) by estimated age. Vertical spread of blobs represent uncertainty as estimated from the two-stage bootstrap re-sampling procedure.

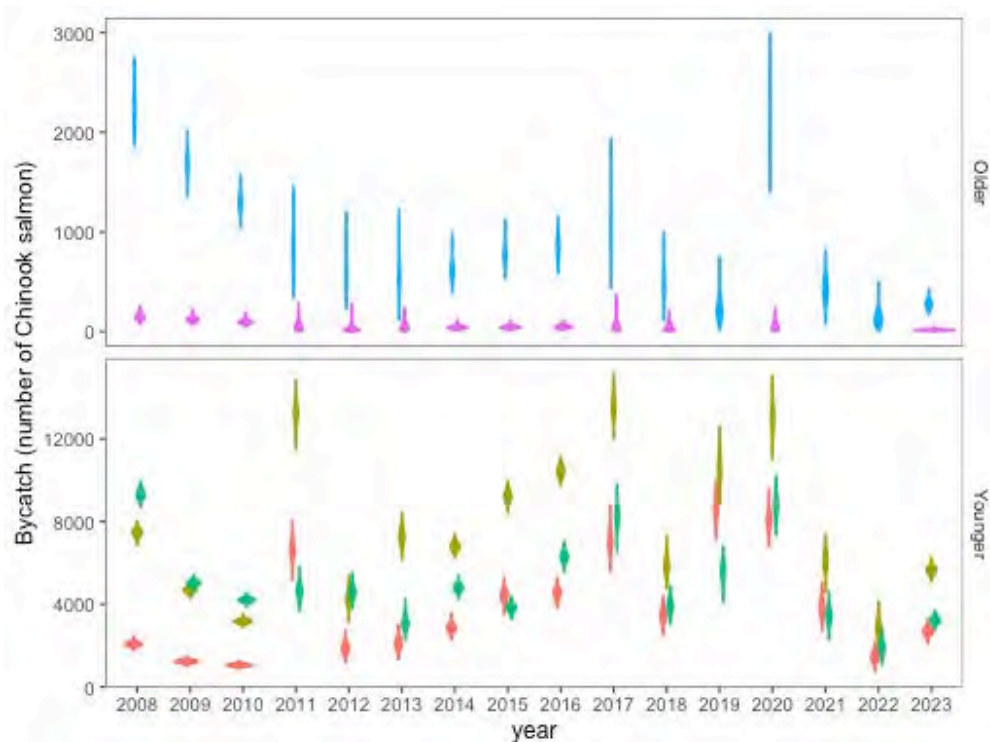


Table 5 shows the results of the bycatch-at-age estimates. Age specific Chinook salmon mean bycatch estimates by season and calendar age based on the mean of 1,000 bootstrap samples of available length and age data, 1991-2021. Note that totals may differ from official totals due to random variability of the bootstrap sampling procedure.

Table 5: Catch-at-age estimates by year and season for Chinook salmon in the EBS pollock fishery.

Year	Season	Age					Year	Season	Age				
		3	4	5	6	7			3	4	5	6	7
1991	A	7,213	15,243	10,675	3,355	334	2008	A	1,005	4,774	8,379	2,128	144
1991	B	363	1,035	609	174	35	2008	B	1,071	2,698	927	109	6
1991	All	7,577	16,278	11,284	3,529	369	2008	All	2,076	7,472	9,305	2,237	151
1992	A	1,550	6,842	11,349	3,363	304	2009	A	575	3,083	4,566	1,623	117
1992	B	4,365	4,914	881	88	9	2009	B	662	1,606	439	55	5
1992	All	5,914	11,756	12,231	3,451	313	2009	All	1,237	4,688	5,005	1,678	122
1993	A	1,273	4,425	6,872	2,598	246	2010	A	429	1,915	3,960	1,272	95
1993	B	3,239	12,657	4,301	899	98	2010	B	630	1,262	244	23	3
1993	All	4,512	17,082	11,172	3,497	344	2010	All	1,059	3,177	4,204	1,295	98
1994	A	1,190	7,291	15,033	3,459	308	2011	A	304	2,732	3,417	646	36
1994	B	491	1,960	1,727	383	43	2011	B	6,350	10,538	1,226	158	14
1994	All	1,681	9,251	16,760	3,842	351	2011	All	6,654	13,270	4,643	804	49
1995	A	414	1,461	3,550	3,229	328	2012	A	394	2,596	4,199	555	20
1995	B	674	2,692	861	160	33	2012	B	1,476	1,651	381	67	0
1995	All	1,088	4,153	4,412	3,389	360	2012	All	1,870	4,247	4,579	622	20
1996	A	2,058	10,957	18,473	4,134	360	2013	A	710	4,325	2,656	475	40
1996	B	5,620	10,742	2,722	356	45	2013	B	1,389	2,959	420	79	9
1996	All	7,679	21,699	21,195	4,490	405	2013	All	2,099	7,284	3,076	554	48
1997	A	323	1,525	4,014	4,135	350	2014	A	1,901	4,628	4,367	579	43
1997	B	6,083	22,668	2,987	2,093	142	2014	B	974	2,158	421	45	1
1997	All	6,406	24,193	7,001	6,229	492	2014	All	2,875	6,786	4,788	625	44
1998	A	855	2,236	9,117	2,410	500	2015	A	2,681	5,578	3,237	734	45
1998	B	18,359	14,627	2,508	497	137	2015	B	1,761	3,645	584	37	2
1998	All	19,214	16,863	11,624	2,907	636	2015	All	4,442	9,223	3,821	771	46
1999	A	415	1,575	3,322	1,016	24	2016	A	2,822	7,427	5,951	845	49
1999	B	427	3,663	1,219	314	4	2016	B	1,721	3,016	352	18	0
1999	All	842	5,238	4,541	1,330	28	2016	All	4,543	10,443	6,303	863	49
2000	A	532	1,258	1,166	431	35	2017	A	3,955	9,512	7,074	968	42
2000	B	361	737	371	62	7	2017	B	3,055	4,048	1,209	59	3
2000	All	893	1,995	1,537	493	43	2017	All	7,010	13,560	8,283	1,027	45
2001	A	3,158	5,535	7,974	1,666	121	2018	A	1,427	3,393	3,257	414	30
2001	B	4,990	7,968	1,781	199	20	2018	B	2,000	2,444	672	55	3
2001	All	8,148	13,503	9,754	1,865	141	2018	All	3,426	5,837	3,928	469	33
2002	A	2,404	5,931	8,182	4,853	416	2019	A	2,767	7,766	4,894	222	0
2002	B	3,297	7,879	1,436	78	9	2019	B	5,841	2,762	664	11	0
2002	All	5,701	13,810	9,617	4,931	424	2019	All	8,608	10,529	5,557	232	0
2003	A	4,186	11,095	14,003	3,063	240	2020	A	1,151	6,938	7,997	2,049	54
2003	B	3,235	7,057	2,330	399	32	2020	B	6,920	6,057	795	113	1
2003	All	7,421	18,152	16,333	3,462	272	2020	All	8,071	12,995	8,792	2,161	55
2004	A	1,951	6,982	10,506	3,335	291	2021	A	1,745	4,408	2,915	402	0
2004	B	6,966	16,446	4,709	508	41	2021	B	2,085	1,738	514	30	0
2004	All	8,917	23,429	15,216	3,844	331	2021	All	3,830	6,146	3,429	431	0
2005	A	2,479	8,537	13,134	2,943	185	2022	A	1,213	2,264	1,570	132	0
2005	B	11,829	22,552	5,654	752	52	2022	B	241	637	342	4	0
2005	All	14,308	31,089	18,788	3,695	236	2022	All	1,453	2,901	1,913	137	0
2006	A	6,515	20,734	24,540	6,078	402	2023	A	2,159	4,978	3,174	274	17
2006	B	8,923	12,909	2,277	227	23	2023	B	536	663	64	2	0
2006	All	15,438	33,643	26,817	6,305	425	2023	All	2,694	5,642	3,238	276	17
2007	A	10,520	30,036	24,282	5,003	314							
2007	B	15,366	31,150	4,780	460	28							
2007	All	25,886	61,185	29,062	5,464	342							

Genetics data

The genetics data available for this analysis were aggregated by season. The proportions to reporting group over time are shown in Figure 11 while when scaled to total PSC Chinook salmon bycatch across years shows the influence of higher levels in the B-season of 2011 (Figure 12). Table 6 contains the bycatch and proportional assignments to reporting groups.

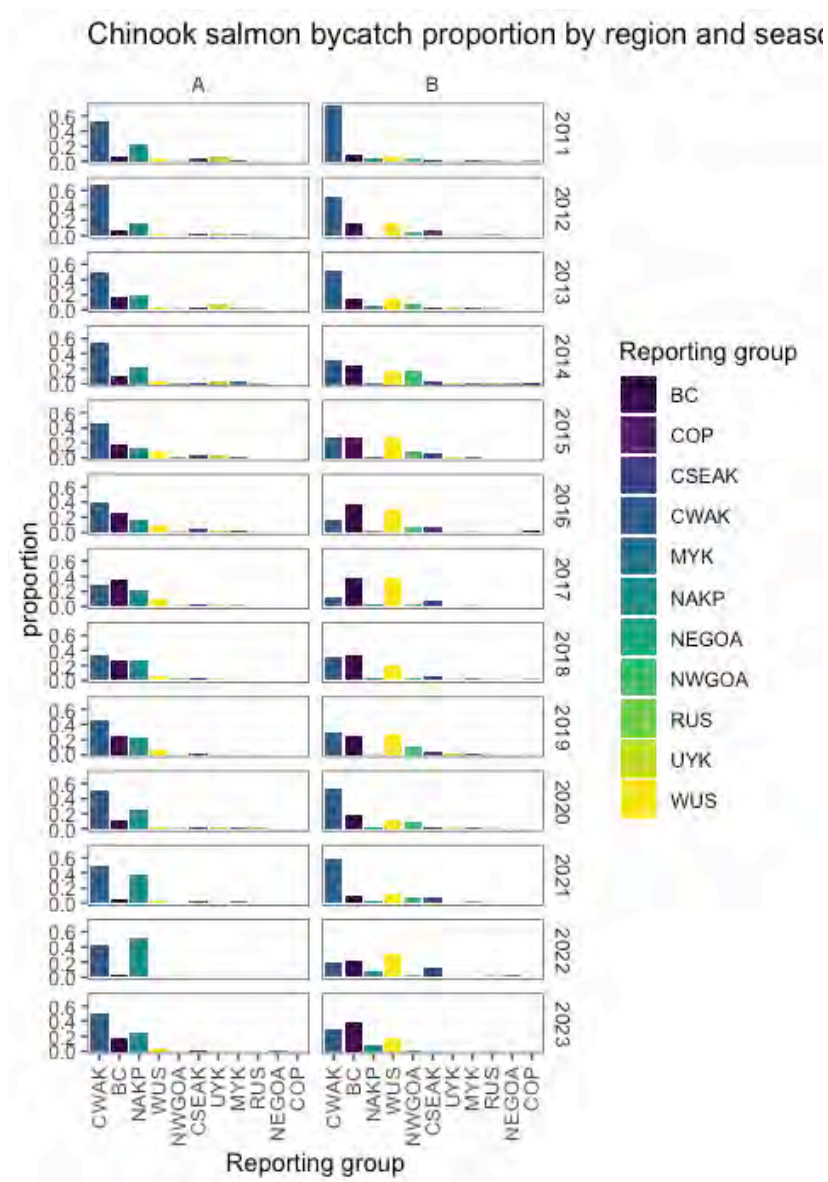


Figure 11: Chinook salmon bycatch proportions to reporting groups by year and season.

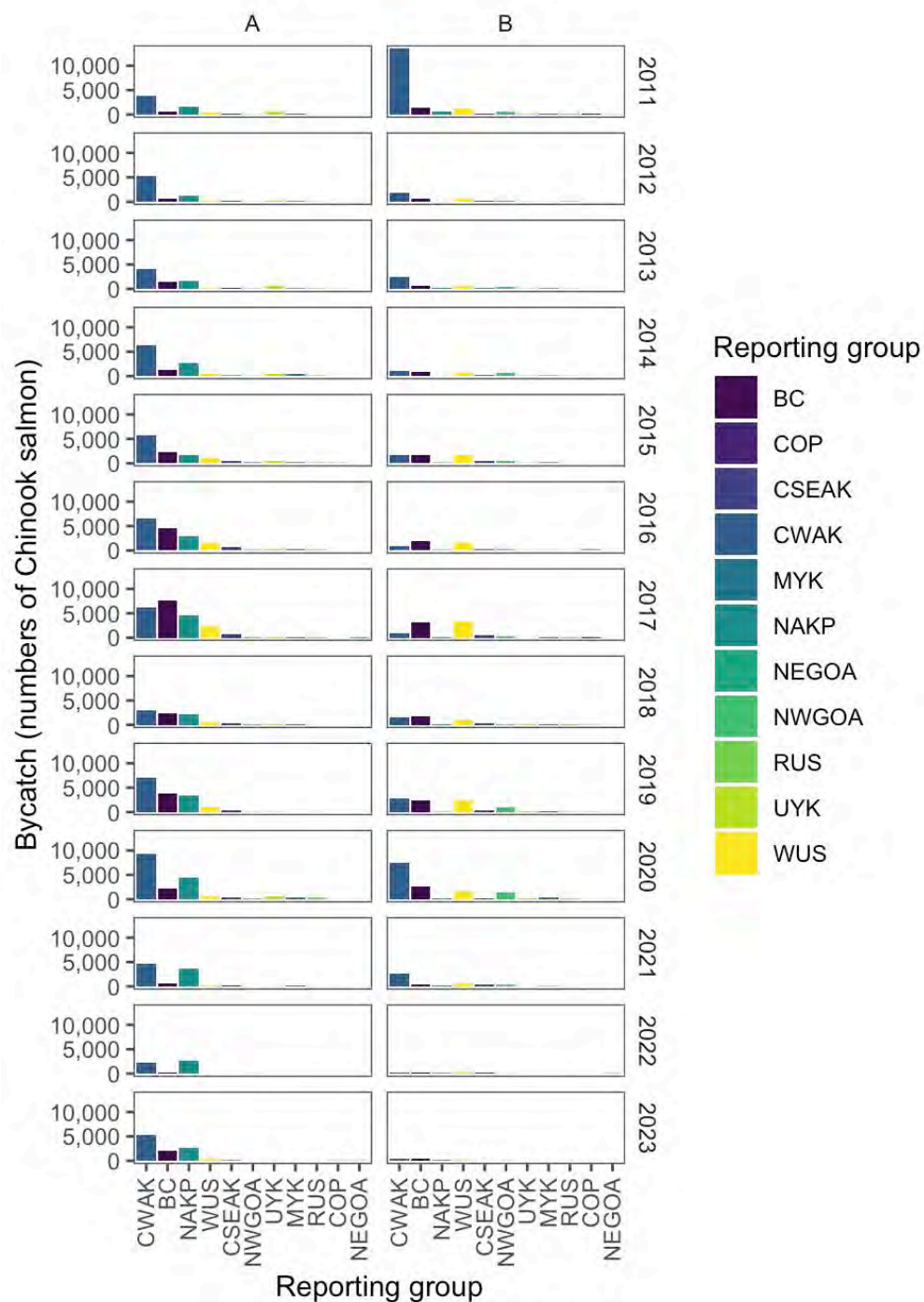


Figure 12: Chinook salmon PSC apportioned to reporting groups and scaled to totals by year and season.

The expanded bycatch estimates to reporting groups is shown in Tables 6a and 6b.

Table 6a: Expanded table of bycatch estimates to reporting groups based on genetic analysis along with upper and lower credible intervals. Catch (lb-ub) columns are catch estimates and upper and lower bound (lb-ub), A-season.

Source	Year	proportion	Catch (lb-ub)	Year	proportion	Catch (lb-ub)
RUS	2011	0.002	14 (0-43)	2018	0.000	0 (0-9)
CWAK	2011	0.540	3,853 (3,539-4,175)	2018	0.348	2,970 (2,646-3,312)
MYK	2011	0.018	128 (43-257)	2018	0.004	34 (0-145)
UYK	2011	0.074	528 (378-692)	2018	0.008	68 (17-145)
NAKP	2011	0.218	1,556 (1,292-1,834)	2018	0.256	2,185 (1,886-2,501)
NWGOA	2011	0.006	43 (0-157)	2018	0.015	128 (9-282)
COP	2011	0.000	0 (0-14)	2018	0.000	0 (0-17)
NEGOA	2011	0.000	0 (0-14)	2018	0.001	9 (0-51)
CSEAK	2011	0.031	221 (114-350)	2018	0.033	282 (162-427)
BC	2011	0.072	514 (364-685)	2018	0.273	2,330 (2,065-2,612)
WUS	2011	0.040	285 (186-400)	2018	0.062	529 (384-683)
RUS	2012	0.005	39 (16-93)	2019	0.001	16 (0-47)
CWAK	2012	0.678	5,264 (4,922-5,598)	2019	0.448	7,051 (6,531-7,570)
MYK	2012	0.012	93 (0-241)	2019	0.000	0 (0-63)
UYK	2012	0.031	241 (124-373)	2019	0.003	47 (0-110)
NAKP	2012	0.162	1,258 (986-1,553)	2019	0.217	3,415 (2,959-3,887)
NWGOA	2012	0.002	16 (0-93)	2019	0.002	31 (0-205)
COP	2012	0.000	0 (0-23)	2019	0.000	0 (0-31)
NEGOA	2012	0.001	8 (0-70)	2019	0.000	0 (0-16)
CSEAK	2012	0.017	132 (23-264)	2019	0.020	315 (157-504)
BC	2012	0.073	567 (404-745)	2019	0.243	3,824 (3,462-4,202)
WUS	2012	0.019	148 (78-233)	2019	0.065	1,023 (834-1,243)
RUS	2013	0.009	74 (33-140)	2020	0.024	432 (275-617)
CWAK	2013	0.502	4,125 (3,780-4,478)	2020	0.515	9,392 (8,803-9,972)
MYK	2013	0.011	90 (0-214)	2020	0.015	279 (128-477)
UYK	2013	0.072	592 (419-772)	2020	0.030	552 (374-759)
NAKP	2013	0.191	1,569 (1,290-1,873)	2020	0.248	4,516 (4,022-5,029)
NWGOA	2013	0.005	41 (0-197)	2020	0.008	142 (57-387)
COP	2013	0.001	8 (0-41)	2020	0.000	0 (0-70)
NEGOA	2013	0.000	0 (0-33)	2020	0.000	3 (0-54)
CSEAK	2013	0.019	156 (66-279)	2020	0.016	294 (121-513)
BC	2013	0.170	1,397 (1,167-1,627)	2020	0.116	2,121 (1,768-2,484)
WUS	2013	0.020	164 (82-271)	2020	0.027	490 (342-674)
RUS	2014	0.006	69 (23-138)	2021	0.059	558 (390-752)
CWAK	2014	0.546	6,299 (5,814-6,783)	2021	0.021	200 (74-349)
MYK	2014	0.033	381 (138-681)	2021	0.496	4,702 (4,288-5,121)
UYK	2014	0.041	473 (311-669)	2021	0.000	5 (0-52)
NAKP	2014	0.227	2,619 (2,273-2,988)	2021	0.024	231 (0-433)
NWGOA	2014	0.001	12 (0-127)	2021	0.378	3,583 (3,223-3,948)
COP	2014	0.000	0 (0-12)	2021	0.000	1 (0-31)
NEGOA	2014	0.000	0 (0-12)	2021	0.000	0 (0-130)
CSEAK	2014	0.006	69 (0-162)	2021	0.001	9 (0-52)
BC	2014	0.102	1,177 (957-1,407)	2021	0.001	14 (0-68)
WUS	2014	0.037	427 (288-577)	2021	0.018	173 (81-289)
RUS	2015	0.006	74 (25-160)	2022	0.000	0 (0-15)
CWAK	2015	0.459	5,645 (5,190-6,088)	2022	0.436	2,261 (1,964-2,561)
MYK	2015	0.010	123 (0-332)	2022	0.000	0 (0-28)
UYK	2015	0.036	443 (295-627)	2022	0.001	4 (0-35)
NAKP	2015	0.145	1,783 (1,476-2,115)	2022	0.522	2,709 (2,405-3,010)
NWGOA	2015	0.028	344 (172-566)	2022	0.003	15 (0-143)
COP	2015	0.002	25 (0-160)	2022	0.000	0 (0-16)
NEGOA	2015	0.000	0 (0-25)	2022	0.000	0 (0-28)
CSEAK	2015	0.039	480 (320-664)	2022	0.000	0 (0-17)
BC	2015	0.191	2,349 (2,066-2,656)	2022	0.036	184 (99-294)
WUS	2015	0.084	1,033 (836-1,242)	2022	0.002	13 (0-54)
RUS	2016	0.006	103 (34-205)	2023	0.188	1,995 (1,715-2,285)
CWAK	2016	0.390	6,668 (6,189-7,163)	2023	0.006	69 (0-211)
MYK	2016	0.017	291 (171-427)	2023	0.500	5,303 (4,917-5,689)
UYK	2016	0.022	376 (239-530)	2023	0.002	21 (0-84)
NAKP	2016	0.169	2,889 (2,496-3,283)	2023	0.000	0 (0-31)
NWGOA	2016	0.006	103 (0-274)	2023	0.256	2,711 (2,369-3,065)
COP	2016	0.000	0 (0-34)	2023	0.004	41 (4-104)
NEGOA	2016	0.000	0 (0-34)	2023	0.000	0 (0-164)
CSEAK	2016	0.039	667 (445-923)	2023	0.000	0 (0-11)
BC	2016	0.261	4,462 (4,052-4,890)	2023	0.003	28 (8-79)
WUS	2016	0.090	1,539 (1,265-1,812)	2023	0.042	442 (306-597)
RUS	2017	0.002	43 (0-108)			
CWAK	2017	0.283	6,114 (5,596-6,655)			
MYK	2017	0.006	130 (43-259)			
UYK	2017	0.007	151 (65-281)			
NAKP	2017	0.207	4,472 (3,997-4,969)			
NWGOA	2017	0.004	86 (0-302)			
COP	2017	0.000	0 (0-22)			
NEGOA	2017	0.001	22 (0-86)			
CSEAK	2017	0.032	691 (475-929)			
BC	2017	0.352	7,605 (7,108-8,124)			
WUS	2017	0.107	2,312 (1,988-2,636)			

Table 6b: Expanded table of bycatch estimates to reporting groups based on genetic analysis along with upper and lower credible intervals. Catch (lb-ub) columns are catch estimates and upper and lower bound (lb-ub), B-season.

source	Year	proportion	Catch (lb-ub)	Year	proportion	Catch (lb-ub)
RUS	2011	0.010	184 (110-294)	2018	0.008	42 (5-99)
CWAK	2011	0.738	13,552 (13,093-13,993)	2018	0.311	0.311
MYK	2011	0.013	239 (92-404)	2018	0.013	67 (0-197)
UYK	2011	0.007	129 (18-257)	2018	0.011	57 (0-145)
NAKP	2011	0.034	624 (404-881)	2018	0.029	151 (62-270)
NWGOA	2011	0.036	661 (367-1,010)	2018	0.040	208 (93-363)
COP	2011	0.006	110 (0-220)	2018	0.005	26 (0-73)
NEGOA	2011	0.001	18 (0-147)	2018	0.000	0 (0-26)
CSEAK	2011	0.014	257 (110-441)	2018	0.053	275 (114-452)
BC	2011	0.078	1,432 (1,175-1,689)	2018	0.330	1,713 (1,459-1,978)
WUS	2011	0.064	1,175 (973-1,414)	2018	0.200	1,038 (851-1,241)
RUS	2012	0.024	86 (39-154)	2019	0.005	47 (9-102)
CWAK	2012	0.521	1,865 (1,657-2,065)	2019	0.304	2,827 (2,492-3,171)
MYK	2012	0.002	7 (0-39)	2019	0.014	130 (47-242)
UYK	2012	0.010	36 (4-89)	2019	0.006	56 (0-130)
NAKP	2012	0.001	4 (0-29)	2019	0.004	37 (0-149)
NWGOA	2012	0.038	136 (47-247)	2019	0.112	1,042 (791-1,311)
COP	2012	0.001	4 (0-18)	2019	0.002	19 (0-84)
NEGOA	2012	0.001	4 (0-21)	2019	0.001	9 (0-65)
CSEAK	2012	0.082	293 (161-426)	2019	0.029	270 (140-409)
BC	2012	0.153	548 (401-716)	2019	0.259	2,409 (2,120-2,706)
WUS	2012	0.170	608 (469-762)	2019	0.266	2,474 (2,186-2,771)
RUS	2013	0.009	44 (10-97)	2020	0.009	123 (59-210)
CWAK	2013	0.519	2,530 (2,262-2,793)	2020	0.536	7,499 (7,037-7,956)
MYK	2013	0.019	93 (19-205)	2020	0.023	320 (140-528)
UYK	2013	0.014	68 (0-166)	2020	0.009	130 (37-257)
NAKP	2013	0.059	288 (166-439)	2020	0.015	208 (93-354)
NWGOA	2013	0.069	336 (171-522)	2020	0.093	1,301 (1,004-1,621)
COP	2013	0.001	5 (0-44)	2020	0.000	7 (2-40)
NEGOA	2013	0.000	0 (0-19)	2020	0.001	12 (3-72)
CSEAK	2013	0.019	93 (5-219)	2020	0.018	250 (67-466)
BC	2013	0.143	697 (526-887)	2020	0.183	2,559 (2,222-2,911)
WUS	2013	0.148	721 (565-887)	2020	0.113	1,576 (1,324-1,846)
RUS	2014	0.004	14 (0-61)	2021	0.102	445 (299-633)
CWAK	2014	0.318	1,144 (929-1,364)	2021	0.068	297 (135-454)
MYK	2014	0.017	61 (4-140)	2021	0.584	2,556 (2,289-2,808)
UYK	2014	0.016	58 (11-130)	2021	0.000	1 (0-38)
NAKP	2014	0.001	4 (0-36)	2021	0.011	48 (11-112)
NWGOA	2014	0.184	662 (482-860)	2021	0.029	125 (36-249)
COP	2014	0.001	4 (0-47)	2021	0.000	0 (0-37)
NEGOA	2014	0.001	4 (0-40)	2021	0.078	340 (182-526)
CSEAK	2014	0.036	130 (47-241)	2021	0.002	10 (0-53)
BC	2014	0.245	882 (705-1,069)	2021	0.000	2 (0-36)
WUS	2014	0.179	644 (497-806)	2021	0.126	553 (405-719)
RUS	2015	0.001	6 (0-42)	2022	0.006	8 (1-46)
CWAK	2015	0.274	1,652 (1,381-1,936)	2022	0.201	247 (132-380)
MYK	2015	0.016	96 (36-193)	2022	0.000	0 (0-15)
UYK	2015	0.011	66 (12-139)	2022	0.000	0 (0-17)
NAKP	2015	0.010	60 (0-181)	2022	0.083	102 (33-200)
NWGOA	2015	0.082	495 (277-742)	2022	0.013	17 (1-102)
COP	2015	0.001	6 (0-24)	2022	0.000	0 (0-40)
NEGOA	2015	0.001	6 (0-42)	2022	0.039	48 (9-142)
CSEAK	2015	0.063	380 (229-561)	2022	0.126	155 (63-268)
BC	2015	0.266	1,604 (1,363-1,852)	2022	0.221	272 (160-405)
WUS	2015	0.275	1,659 (1,435-1,894)	2022	0.310	381 (261-516)
RUS	2016	0.002	10 (0-46)	2023	0.387	489 (357-624)
CWAK	2016	0.165	843 (638-1,062)	2023	0.002	3 (0-83)
MYK	2016	0.004	20 (0-102)	2023	0.304	385 (262-514)
UYK	2016	0.007	36 (0-92)	2023	0.004	5 (0-39)
NAKP	2016	0.011	56 (0-143)	2023	0.000	0 (0-12)
NWGOA	2016	0.059	301 (158-465)	2023	0.089	112 (45-204)
COP	2016	0.018	92 (31-174)	2023	0.000	0 (0-15)
NEGOA	2016	0.000	0 (0-15)	2023	0.016	20 (5-88)
CSEAK	2016	0.065	332 (184-521)	2023	0.009	11 (0-50)
BC	2016	0.370	1,890 (1,624-2,161)	2023	0.000	0 (0-18)
WUS	2016	0.299	1,527 (1,297-1,762)	2023	0.189	239 (144-350)
RUS	2017	0.002	17 (0-59)			
CWAK	2017	0.120	1,017 (805-1,246)			
MYK	2017	0.003	25 (0-93)			
UYK	2017	0.000	0 (0-8)			
NAKP	2017	0.018	153 (68-263)			
NWGOA	2017	0.027	229 (110-373)			
COP	2017	0.001	8 (0-51)			
NEGOA	2017	0.000	0 (0-17)			
CSEAK	2017	0.068	576 (381-788)			
BC	2017	0.371	3,143 (2,813-3,474)			
WUS	2017	0.388	3,288 (2,982-3,601)			

The stock-proportions table of the bycatch in the A and B season is provided in Table 7.

Table 7: Estimated reporting-groups proportions of Chinook salmon PSC bycatch by season.

Year	season	RUS	CWAK	MYK	UYK	NAKP	NWGOA	COP	NEGOA	CSEAK	BC	W.US
2011	A	0.20%	54.00%	1.80%	7.40%	21.80%	0.60%	0.00%	0.00%	3.10%	7.20%	4.00%
2012	A	0.50%	67.80%	1.20%	3.10%	16.20%	0.20%	0.00%	0.10%	1.70%	7.30%	1.90%
2013	A	0.90%	50.20%	1.10%	7.20%	19.10%	0.50%	0.10%	0.00%	1.90%	17.00%	2.00%
2014	A	0.60%	54.60%	3.30%	4.10%	22.70%	0.10%	0.00%	0.00%	0.60%	10.20%	3.70%
2015	A	0.60%	45.90%	1.00%	3.60%	14.50%	2.80%	0.20%	0.00%	3.90%	19.10%	8.40%
2016	A	0.60%	39.00%	1.70%	2.20%	16.90%	0.60%	0.00%	0.00%	3.90%	26.10%	9.00%
2017	A	0.20%	28.30%	0.60%	0.70%	20.70%	0.40%	0.00%	0.10%	3.20%	35.20%	10.70%
2018	A	0.00%	34.80%	0.40%	0.80%	25.60%	1.50%	0.00%	0.10%	3.30%	27.30%	6.20%
2019	A	0.10%	44.80%	0.00%	0.30%	21.70%	0.20%	0.00%	0.00%	2.00%	24.30%	6.50%
2020	A	2.40%	51.50%	1.50%	3.00%	24.80%	0.80%	0.00%	0.00%	1.60%	11.60%	2.70%
2021	A	0.10%	49.60%	2.40%	0.10%	37.80%	0.00%	0.00%	0.00%	2.10%	5.90%	1.80%
2022	A	0.00%	43.60%	0.00%	0.10%	52.20%	0.30%	0.00%	0.00%	0.00%	3.60%	0.20%
2023	A	0.00%	50.00%	0.00%	0.30%	25.60%	0.00%	0.20%	0.40%	0.60%	18.80%	4.20%
2011	B	1.00%	73.80%	1.30%	0.70%	3.40%	3.60%	0.60%	0.10%	1.40%	7.80%	6.40%
2012	B	2.40%	52.10%	0.20%	1.00%	0.10%	3.80%	0.10%	0.10%	8.20%	15.30%	17.00%
2013	B	0.90%	51.90%	1.90%	1.40%	5.90%	6.90%	0.10%	0.00%	1.90%	14.30%	14.80%
2014	B	0.40%	31.80%	1.70%	1.60%	0.10%	18.40%	0.10%	0.10%	3.60%	24.50%	17.90%
2015	B	0.10%	27.40%	1.60%	1.10%	1.00%	8.20%	0.10%	0.10%	6.30%	26.60%	27.50%
2016	B	0.20%	16.50%	0.40%	0.70%	1.10%	5.90%	1.80%	0.00%	6.50%	37.00%	29.90%
2017	B	0.20%	12.00%	0.30%	0.00%	1.80%	2.70%	0.10%	0.00%	6.80%	37.10%	38.80%
2018	B	0.80%	31.10%	1.30%	1.10%	2.90%	4.00%	0.50%	0.00%	5.30%	33.00%	20.00%
2019	B	0.50%	30.40%	1.40%	0.60%	0.40%	11.20%	0.20%	0.10%	2.90%	25.90%	26.60%
2020	B	0.90%	53.60%	2.30%	0.90%	1.50%	9.30%	0.00%	0.10%	1.80%	18.30%	11.30%
2021	B	0.20%	58.40%	1.10%	0.00%	2.90%	7.80%	0.00%	0.00%	6.80%	10.20%	12.60%
2022	B	0.60%	20.10%	0.00%	0.00%	8.30%	1.30%	0.00%	3.90%	12.60%	22.10%	31.00%
2023	B	0.90%	30.40%	0.00%	0.00%	8.90%	1.60%	0.40%	0.00%	0.20%	38.70%	18.90%

Chinook salmon run sizes

Run-size data provided by ADF&G were converted into a uniform and machine-readable format. Details on each of the runs were provided in the previous analyses. These estimates use a 5 year average for subsistence and sport harvest above and below the sonar project. In-river age compositions are shown in Table 8 by year (since 2011). The mean in-river age compositions (most recent 10-years) among systems is shown in Table 9.

Table 8: In-river age composition estimates by year for the Coastal west Alaska Chinook salmon stocks

Year	Run	Age 3	Age 4	Age 5	Age 6	Age 7
2011	Kuskokwim Bay	0.70%	47.90%	30.50%	20.50%	0.40%
2011	Kuskokwim River	0.20%	25.40%	40.10%	32.80%	1.50%
2011	Lower Yukon	0.00%	32.10%	50.50%	17.00%	0.40%
2011	Middle Yukon	0.20%	16.10%	45.20%	37.00%	1.60%
2011	Norton Sound and Point Clarence	2.00%	60.50%	25.80%	11.70%	0.00%
2011	Nushagak	0.80%	39.20%	38.60%	21.30%	0.10%
2011	Upper Yukon	0.00%	4.30%	36.00%	53.20%	6.40%
2012	Kuskokwim Bay	0.60%	24.20%	44.40%	29.90%	0.90%
2012	Kuskokwim River	0.10%	12.80%	54.60%	31.40%	1.10%
2012	Lower Yukon	0.10%	12.30%	60.00%	27.20%	0.40%
2012	Middle Yukon	0.20%	8.60%	45.80%	44.50%	1.00%
2012	Norton Sound and Point Clarence	0.00%	20.90%	56.90%	22.00%	0.20%
2012	Nushagak	0.70%	27.00%	52.10%	20.00%	0.20%
2012	Upper Yukon	0.30%	6.90%	38.60%	50.80%	3.30%
2013	Kuskokwim Bay	0.30%	28.70%	27.30%	42.90%	0.90%
2013	Kuskokwim River	0.10%	14.00%	30.70%	54.00%	1.10%
2013	Lower Yukon	0.20%	35.50%	28.20%	35.30%	0.80%
2013	Middle Yukon	0.90%	21.70%	26.60%	49.40%	1.40%
2013	Norton Sound and Point Clarence	1.90%	26.80%	34.60%	35.70%	1.10%
2013	Nushagak	0.80%	32.10%	45.90%	21.20%	0.00%
2013	Upper Yukon	0.00%	7.40%	31.20%	57.50%	3.80%
2014	Kuskokwim Bay	3.50%	23.00%	29.50%	42.30%	1.70%
2014	Kuskokwim River	3.40%	17.60%	40.70%	37.30%	1.00%
2014	Lower Yukon	1.50%	12.20%	74.10%	11.70%	0.50%
2014	Middle Yukon	1.40%	10.10%	69.00%	18.40%	1.00%
2014	Norton Sound and Point Clarence	0.80%	8.00%	74.00%	16.00%	1.10%
2014	Nushagak	3.70%	26.60%	48.30%	21.30%	0.00%
2014	Upper Yukon	0.20%	7.10%	50.20%	39.90%	2.60%
2015	Kuskokwim Bay	7.40%	53.90%	22.00%	16.30%	0.30%
2015	Kuskokwim River	0.70%	43.70%	35.80%	19.40%	0.40%
2015	Lower Yukon	0.20%	34.50%	22.20%	43.00%	0.00%
2015	Middle Yukon	0.40%	23.90%	29.80%	45.60%	0.30%
2015	Norton Sound and Point Clarence	0.50%	22.50%	38.50%	34.30%	4.20%
2015	Nushagak	1.30%	56.00%	30.10%	12.50%	0.10%
2015	Upper Yukon	0.30%	13.10%	33.70%	50.90%	2.10%
2016	Kuskokwim Bay	5.60%	58.40%	30.30%	5.60%	0.00%
2016	Kuskokwim River	1.50%	27.90%	57.30%	13.20%	0.00%
2016	Lower Yukon	1.20%	31.50%	52.60%	14.40%	0.30%
2016	Middle Yukon	0.30%	32.10%	50.30%	16.90%	0.40%
2016	Norton Sound and Point Clarence	0.00%	12.50%	62.50%	20.80%	4.20%
2016	Nushagak	0.80%	29.50%	60.60%	9.20%	0.00%
2016	Upper Yukon	0.10%	12.50%	63.40%	23.50%	0.60%
2017	Kuskokwim Bay	9.80%	20.90%	65.40%	3.80%	0.00%
2017	Kuskokwim River	0.80%	31.40%	45.70%	22.00%	0.10%
2017	Lower Yukon	0.00%	44.00%	42.50%	13.40%	0.00%
2017	Middle Yukon	0.00%	13.80%	58.50%	27.60%	0.10%
2017	Norton Sound and Point Clarence	1.90%	30.80%	48.40%	13.80%	5.00%
2017	Nushagak	1.60%	38.80%	42.60%	16.80%	0.20%
2017	Upper Yukon	0.10%	6.00%	48.50%	44.50%	0.90%
2018	Kuskokwim Bay	4.20%	33.20%	36.40%	25.30%	0.90%

2018	Kuskokwim River	2.30%	37.40%	43.70%	16.50%	0.10%
2018	Lower Yukon	0.80%	35.40%	60.00%	3.70%	0.10%
2018	Middle Yukon	0.00%	11.20%	41.70%	46.30%	0.80%
2018	Norton Sound and Point Clarence	0.60%	21.90%	62.90%	14.00%	0.60%
2018	Nushagak	0.20%	43.10%	45.00%	10.90%	0.80%
2018	Upper Yukon	0.00%	13.00%	44.20%	41.30%	1.60%
2019	Kuskokwim Bay	15.80%	29.30%	37.60%	17.30%	0.00%
2019	Kuskokwim River	5.50%	46.60%	33.70%	14.00%	0.20%
2019	Lower Yukon	1.00%	40.70%	42.30%	15.90%	0.10%
2019	Middle Yukon	0.00%	20.90%	45.40%	33.20%	0.40%
2019	Norton Sound and Point Clarence	0.90%	36.80%	46.90%	15.30%	0.00%
2019	Nushagak	1.60%	36.70%	44.60%	16.80%	0.30%
2019	Upper Yukon	0.00%	9.90%	48.30%	40.60%	1.20%
2020	Kuskokwim Bay	4.20%	33.20%	36.40%	25.30%	0.90%
2020	Kuskokwim River	1.00%	33.90%	41.70%	22.60%	0.80%
2020	Lower Yukon	0.00%	8.10%	60.40%	31.30%	0.20%
2020	Middle Yukon	0.00%	14.60%	51.00%	33.40%	1.00%
2020	Norton Sound and Point Clarence	0.00%	7.80%	68.60%	23.50%	0.00%
2020	Nushagak	0.50%	48.90%	38.70%	11.80%	0.10%
2020	Upper Yukon	0.20%	8.10%	41.10%	47.40%	3.10%
2021	Kuskokwim Bay	4.20%	33.20%	36.40%	25.30%	0.90%
2021	Kuskokwim River	1.30%	39.70%	37.90%	20.50%	0.60%
2021	Lower Yukon	0.00%	46.20%	37.10%	16.70%	0.00%
2021	Middle Yukon	0.00%	7.90%	65.60%	26.50%	0.10%
2021	Norton Sound and Point Clarence	3.80%	7.60%	43.00%	38.00%	7.60%
2021	Nushagak	0.80%	43.10%	47.60%	8.50%	0.00%
2021	Upper Yukon	0.00%	2.20%	45.30%	48.40%	4.00%
2022	Kuskokwim Bay	4.20%	33.20%	36.40%	25.30%	0.90%
2022	Kuskokwim River	1.30%	53.00%	38.00%	7.50%	0.10%
2022	Lower Yukon	2.10%	31.70%	56.80%	9.20%	0.20%
2022	Middle Yukon	0.00%	16.00%	50.40%	33.30%	0.20%
2022	Norton Sound and Point Clarence	0.00%	51.50%	35.30%	11.80%	1.50%
2022	Nushagak	2.30%	50.80%	38.80%	8.10%	0.10%
2022	Upper Yukon	0.00%	7.10%	41.60%	47.00%	4.20%
2023	Kuskokwim Bay	4.20%	33.20%	36.40%	25.30%	0.90%
2023	Kuskokwim River	0.50%	33.40%	55.20%	10.60%	0.30%
2023	Lower Yukon	1.80%	35.90%	52.90%	9.30%	0.10%
2023	Middle Yukon	0.00%	1.40%	74.80%	22.70%	1.10%
2023	Norton Sound and Point Clarence	0.00%	25.00%	66.70%	8.30%	0.00%
2023	Nushagak	1.60%	60.10%	34.80%	3.60%	0.00%
2023	Upper Yukon	0.00%	3.60%	53.60%	37.20%	5.60%

Table 9: Mean in-river age composition estimates for the Coastal west Alaska Chinook salmon stocks.

Run	Age 3	Age 4	Age 5	Age 6	Age 7
Kuskokwim Bay	5.0%	34.8%	36.1%	23.5%	0.7%
Kuskokwim River	1.4%	32.1%	42.7%	23.2%	0.6%
Lower Yukon	0.7%	30.8%	49.2%	19.1%	0.2%
Middle Yukon	0.3%	15.2%	50.3%	33.4%	0.7%
Norton Sound and Point Clarence	1.0%	25.6%	51.1%	20.4%	2.0%
Nushagak	1.3%	40.9%	43.7%	14.0%	0.1%
Upper Yukon	0.1%	7.8%	44.3%	44.8%	3.0%

The table below shows the weights given to each river systems' estimate of in-river age composition and the natural mortality assumption to derive the estimate of age-specific oceanic maturation rate (i.e., for a given age, what proportion of Chinook salmon are expected to return to spawn). Note that this "Oceanic maturity" is based on the observed mean in-river age composition of spawners and the assumed oceanic natural mortality.

Proportions at age by river system and resulting oceanic maturity based on the weighted mean run size.

	Age					Mean run size	Weighting factor
	3	4	5	6	7		
Kuskokwim Bay	5.10%	35.10%	36.00%	23.10%	0.60%	40,709	0.077
Kuskokwim River	1.30%	30.00%	42.00%	26.00%	0.60%	124,100	0.2346
Lower Yukon	0.00%	31.70%	48.00%	20.00%	0.30%	57,554	0.1088
Middle Yukon	0.00%	18.20%	45.70%	35.30%	0.80%	46,245	0.0874
Norton Sound and Point Clarence	1.10%	23.30%	51.10%	22.30%	2.20%	9,417	0.0178
Nushagak	1.20%	37.60%	44.70%	16.30%	0.20%	178,144	0.3368
Upper Yukon	0.00%	8.60%	43.40%	45.40%	2.60%	72,836	0.1377
Weighted mean in-river age composition	1.10%	29.10%	43.80%	25.30%	0.70%		
Oceanic natural mortality	0.3	0.2	0.1	0.1	0		
Oceanic maturity γ_a	3%	23%	75%	97%	100%		

Table 10 shows the extent of available data for Chinook salmon run strengths and Table 11 and Figure 13 shows the time series of available run size estimates. For the past impact analyses, an aggregated run size estimate for coastal western Alaska is provided along with estimates from the Upper Yukon (Figure 14). For this analysis, we only present the AEQ and forego an evaluation of impacts to Chinook salmon runs due to uncertainties and availability of updated runsize estimates.

Table 10: Chinook salmon run-strength estimate most recent year data available.

Run	Most recent year estimate available
Kuskokwim Bay	2023
Kuskokwim River	2023
Lower Yukon	2023
Middle Yukon	2023
Norton Sound and Point Clarence	2023
Nushagak	2023
Upper Yukon	2023

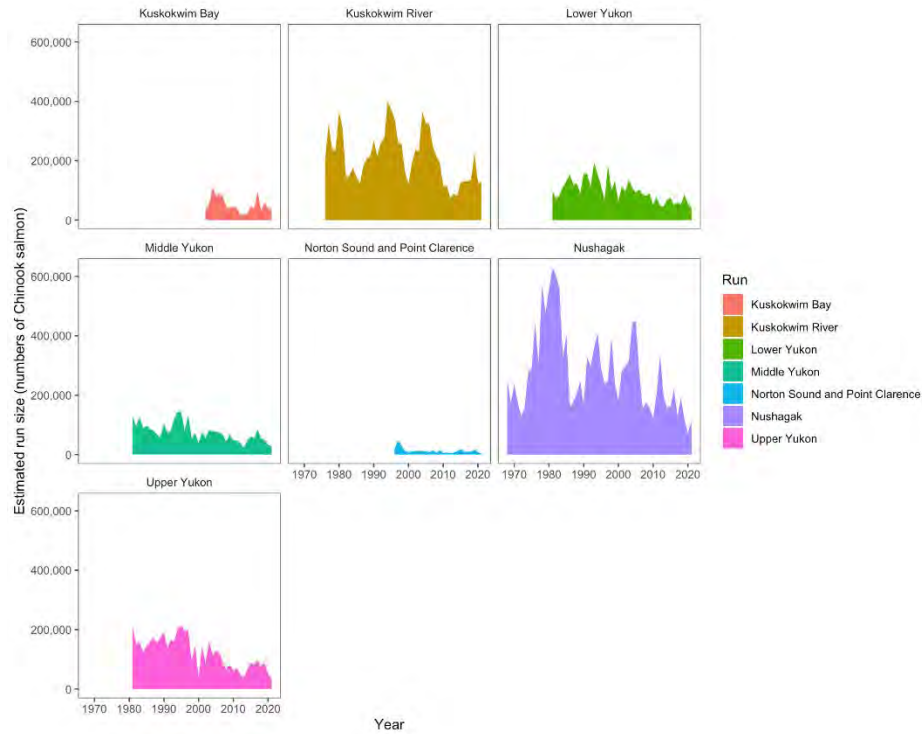


Figure 13: Chinook salmon run estimates by river system.

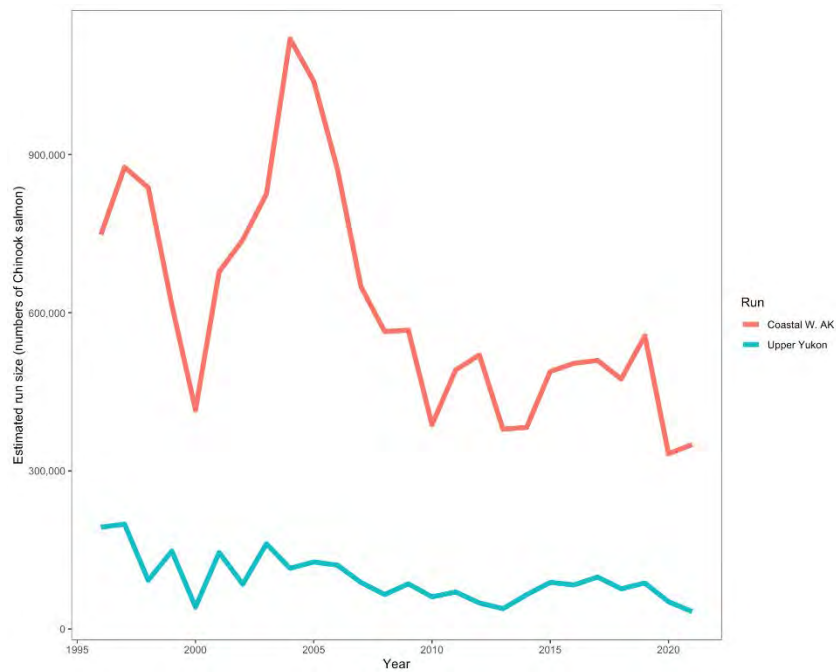


Figure 14: Coastal western Alaska combined run size estimates along with the Upper Yukon.

Table 11: Run size estimates for Coastal west Alaska Chinook salmon stocks.

Year	Nushagak	Norton Sound and Point Clarence	Kuskokwim River	Kuskokwim Bay	Lower Yukon	Middle Yukon	Upper Yukon
1968	228,551						
1969	158,672						
1970	196,081						
1971	169,205						
1972	101,000						
1973	107,999						
1974	183,287						
1975	172,144						
1976	273,656		200,895				
1977	224,104		324,350				
1978	393,636		239,407				
1979	361,210		241,342				
1980	366,555		364,019				
1981	513,708		315,401		74,114	141,413	194,962
1982	509,867		143,390		73,708	100,190	163,100
1983	482,196		148,677		79,953	133,537	183,907
1984	237,104		172,646		123,614	96,346	138,447
1985	314,434		145,134		144,136	101,161	157,690
1986	165,950		124,809		158,655	83,855	176,468
1987	231,453		181,983		116,526	82,285	177,744
1988	141,908		209,991		112,829	64,134	159,524
1989	187,644		214,877		91,841	56,183	166,704
1990	156,663		271,151		132,829	97,059	179,393
1991	246,709		216,726		144,799	76,090	142,805
1992	232,103		261,231		72,384	80,047	180,950
1993	283,393		278,934		182,493	119,324	158,954
1994	334,602		409,446		152,395	137,827	193,971
1995	271,120		374,291		118,404	155,835	217,204
1996	193,141	19,793	307,097		76,482	73,573	196,012
1997	247,327	49,140	300,800		153,109	134,045	199,953
1998	371,638	29,215	190,779		95,420	50,808	97,281
1999	149,248	13,264	161,746		129,402	67,538	124,338
2000	138,044	8,759	129,683		54,596	24,742	54,110
2001	213,306	10,794	207,416		107,168	69,974	104,227
2002	229,485	12,096	224,296	37,281	93,478	56,585	93,991
2003	225,594	12,126	232,759	48,561	107,605	92,019	173,362
2004	356,240	12,097	364,230	105,541	102,954	80,610	127,303
2005	307,701	10,811	326,068	80,593	99,699	73,104	131,942
2006	218,861	7,618	320,091	83,677	96,164	66,530	126,967
2007	125,435	15,023	245,306	77,077	81,841	60,189	92,909
2008	128,752	6,038	213,587	41,945	78,733	41,882	69,730
2009	117,936	15,855	188,981	42,092	81,881	63,414	86,771
2010	94,245	5,658	113,487	41,379	50,767	46,594	62,615
2011	145,232	6,675	116,143	40,166	74,029	46,440	70,606
2012	195,106	4,825	81,368	17,484	47,606	37,552	51,613
2013	132,782	6,716	84,341	18,496	42,032	20,227	39,640
2014	96,639	10,414	84,695	18,117	65,422	45,178	65,128
2015	160,713	18,690	125,759	44,842	65,120	50,425	88,355
2016	167,540	9,340	131,638	37,768	53,954	51,697	83,688
2017	102,407	9,517	131,634	92,427	57,118	84,946	99,776
2018	148,007	9,696	132,363	29,868	49,531	51,680	76,863
2019	80,418	16,841	219,771	57,318	85,391	49,193	85,413
2020	57,968	8,283	124,849	36,452	54,379	32,597	52,120
2021	65,513	5,008	130,195	33,544	40,888	28,027	33,260
2022	54,867	4,444	142,740	37,129	15,298	8,585	13,355
2023	41,839	2,692	134,007	39,356	13,763	9,719	15,820

AEQ model

Methods

A method was developed to estimate how salmon bycatch numbers would propagate to adult equivalent spawning salmon. That is, how many and in what year would the salmon have returned had they not been taken as bycatch. A stochastic adult equivalence” (AEQ) model was developed, which accounts for sources of uncertainty and allows for estimating the impact on run strengths from selected regions (Ianelli and Stram 2015). The steps in this process are briefly outlined as:

1. Compile statistics on Chinook salmon bycatch by region and season in the pollock fishery including
 - Total bycatch by season and strata
 - Length and sex composition of the bycatch
 - Date and location
2. Compile available age composition data organized by strata
3. Convert the seasonal and regional length compositions into age estimates for each year, area, season using the age-length keys from step 2.
4. Provide demographic characteristics of Chinook salmon for use in the AEQ model (updated from the oceanic survival-at-age and maturity-at-age and were the same values as used in Ianelli and Stram 2015).
5. Update the season-specific genetics information (the “Bayes” estimates were used from Iii et al. (2013, 2015, 2018), Guthrie et al. (2013, 2014, 2016) for the period 2011-2019).
6. Run the AEQ model with these inputs (extending the estimates back to 1994-2021) and compile/summarize results.
7. Compare a subset (where data are available) of the AEQ results against corresponding run-strength estimates.

The model on the reduction in Chinook salmon returns in year t , AEQ_t , can thus be expressed (without stock specificity) as:

$$AEQ_t = \sum_{a=3}^7 c_{t,a} \gamma_a + \sum_{j=3}^6 \sum_{a=j+1}^7 [c_{t-(a-j),a} \gamma_a \prod_{i=j}^{a-1} (1 - \gamma_i) s_i]$$

where $c_{t,a}$ is the bycatch of age a salmon in year t , s_a is the proportion of salmon surviving from age a to $a+1$, and γ_a is the proportion of salmon at sea that would have returned to spawn at age a . In words, the first term to the right of the equals sign is simply the number of mature Chinook salmon in the bycatch in the current year whereas the second term accounts for the Chinook salmon caught in previous years that would have been mature in the current year. All age 7 Chinook salmon in the bycatch were assumed to be returning to spawn in the year they were caught (i.e. $\gamma_7 = 1$) and they represent the oldest fish in the model. We assume that 7 year-old Chinook salmon taken in the fall were returning to spawn that year. In fact, these fish would have been more likely to return the following year. This assumption simplified the model and data preparation. Also, relatively few fish this age were caught late in the season.

Given estimates of AEQ, the model partitions these into reporting groups (RG). This was done by assigning the stratum-specific AEQ estimates to each of the nine identified RGs (e.g., Table 5; Guthrie et al., 2013 for RG and GSI determinations). We assumed that given the number of samples used for GSI within each year (t) and stratum (i) that the numbers assigned to RG k can be assumed to follow a multinomial distribution with parameters

$$p_{t,i,1}, \dots, p_{t,i,11}, \quad \sum_k p_{t,i,k} = 1$$

The input sample size for these reporting group composition data was approximated based on the estimated precision of the estimates following the variance of a multinomial proportion. Dropping subscripts, we estimated the multinomial effective sample size (N_{eff}) given the reporting group uncertainty from the genetic analyses as:

$$\text{var}(Np) = Npq$$

where

$$q = (1 - p)$$

$$N_{eff} = pq/\text{var}(p)$$

For the years where GSI information is missing the estimated proportions by RGs were based on mean stratum-specific values from the years when GSI data were available. These additional parameters were constrained based on the estimated within-stratum inter-annual variability. That is, if the proportions assigned to RGs varied as estimated from the genetics data, then that variability was propagated to the years when genetic data were unavailable. This was a compromise which acknowledges sampling uncertainty for those years and correctly weights the information (due to sample size) between years when GSI information was available. For example, the new observer data collection system for genetic samples has resulted in more precise estimates of GSI in recent years hence those years have greater influence on stratum-specific GSI results. Adjusting the AEQ for RG requires estimation over a range of years when GSI results are available. This was accomplished here by applying the appropriate GSI results (i.e. estimates of proportions within RGs) for the years as lagged by AEQ. This step is needed to apportion the AEQ results to stock of origin based on genetic samples which consist of mature and immature fish. By splitting the AEQ estimates to relative contributions of bycatch from previous years, and applying GSI data from those years, they can then be realigned and renormalized to get proportions from systems by year. For years in which GSI information was unavailable, mean GSI data (with an error term which accounted for year-effect variability) were used.

Since Chinook salmon bycatch occurs in both the A and B season of the pollock fishery, data from these seasons were modeled separately. For each separate run, Monte-Carlo Markov Chain (MCMC) samples from the posterior distribution were obtained based on chain lengths of 1 million (after burn in) and selecting every 200th parameter draw. Output resulted in 5,000 samples from each season (summed over strata) and then summed to get annual AEQ totals by RG. The model was implemented using ADMB (Fournier et al., 2012) software.

Separate estimates of run-strengths (from 1994-2021) were used assuming uncertainties in run size:

$$\hat{S}_{t,k} e^{\epsilon_t}, \quad \epsilon_t \sim N(0, \sigma_s)$$

where was a pre-specified level of run-size variance (assumed to correspond to a conservative coefficient of variation of 10% for this study). The measure that relates the historical bycatch levels to the subsequent returning salmon run k in year t, the “impact”, is thus:

$$u_{t,k} = \frac{AEQ_{t,k}}{AEQ_{t,k} + \dot{S}_{t,k}}$$

where $AEQ_{t,k}$ and $\dot{S}_{t,k}$ are the adult-equivalent bycatch and stock size (run return) estimates. The calculation of $AEQ_{t,k}$ includes the bycatch of salmon returning to spawn in year t and the bycatch from previous years for the same brood year (i.e. at younger, immature ages). Note that the allocation of the AEQ to RGs is necessarily independent of the age composition of the bycatch.

Files

In the runs directory the initial model update is in folder named chin24_a and chin24_b. The files sba.dat points to the data files being used. Assembling the datafiles so far has been done outside the R code and model but could be easily configured within R.

Results

Mean and credible intervals from the posterior distribution on adult equivalent mortality shows consistent patterns relative to the PSC bycatch with the largest mortality occurring between 2006-2008 (Figure 15). This was also reflected in the stock-specific AEQ mortality due to PSC bycatch (Figure 16). PSC bycatch (Figure 17). PSC bycatch (Table 12).

Table 12: Estimated number of Chinook salmon adult equivalent (AEQ) mortality due to PSC.

Year	BC	CoastSEAK	CoastWAK	Copper	Mid-Yukon	NAKPenn	NEGOA	NWGOA	Russia	UpYukon	W.USA	Total
1994	6,008	961	15,075	36	375	5,508	8	862	193	582	3,277	32,886
1995	3,468	548	8,963	18	220	3,443	5	453	112	357	1,789	19,377
1996	5,401	842	14,400	24	348	5,810	7	628	176	591	2,612	30,840
1997	6,520	1,083	14,823	54	388	4,419	9	1,203	206	508	4,164	33,378
1998	7,034	1,195	14,993	68	406	3,755	10	1,472	220	468	4,888	34,509
1999	5,017	867	10,137	54	283	2,115	8	1,146	156	289	3,706	23,775
2000	2,879	501	5,691	32	161	1,086	4	680	89	156	2,177	13,455
2001	3,021	488	7,412	20	187	2,599	4	463	97	279	1,715	16,285
2002	4,599	732	11,677	26	289	4,355	6	636	148	456	2,454	25,379
2003	6,011	958	15,217	35	377	5,647	8	840	194	593	3,226	33,105
2004	6,969	1,130	16,914	47	428	5,808	10	1,100	223	629	4,029	37,287
2005	8,705	1,444	19,887	71	519	5,996	13	1,590	276	686	5,523	44,709
2006	11,136	1,798	27,339	73	688	9,597	16	1,704	357	1,030	6,313	60,049
2007	13,466	2,166	33,355	85	835	11,906	19	2,008	432	1,269	7,517	73,058
2008	10,719	1,748	25,652	76	654	8,562	15	1,756	342	938	6,342	56,804
2009	5,225	849	12,601	36	320	4,274	7	839	167	465	3,052	27,835
2010	2,168	341	5,645	11	138	2,196	3	276	70	226	1,102	12,176
2011	1,358	293	6,334	17	134	1,561	3	278	69	255	817	11,118
2012	1,421	351	8,534	24	161	1,452	4	359	89	249	935	13,580
2013	1,484	305	6,488	18	131	1,295	3	303	74	256	833	11,190
2014	1,731	302	5,863	12	156	1,817	3	336	70	290	945	11,525
2015	2,167	361	5,489	11	151	1,699	3	374	69	282	1,222	11,828
2016	3,656	534	6,176	13	194	2,186	4	371	88	324	1,801	15,346
2017	5,970	686	6,172	16	213	3,036	5	362	106	318	2,746	19,631
2018	5,057	571	4,897	16	170	2,688	4	309	88	237	2,329	16,366
2019	4,029	452	5,303	14	147	2,455	4	340	80	200	1,844	14,867
2020	3,844	519	9,816	18	249	3,818	5	571	154	392	1,744	21,131
2021	2,676	447	8,172	22	222	2,972	5	648	119	269	1,529	17,081
2022	1,395	297	5,130	15	140	2,191	3	403	69	152	879	10,674
2023	1,283	213	3,865	7	87	1,997	2	166	45	122	621	8,407

Median values from the posterior distribution of AEQ results appear to hold a relationship when examined since 2001 (Figure 18). For coastal west Alaska combined (excluding Upper Yukon), the bycatch impact in terms of AEQ corresponds to the run size data that is available except for the most recent period since 2011.

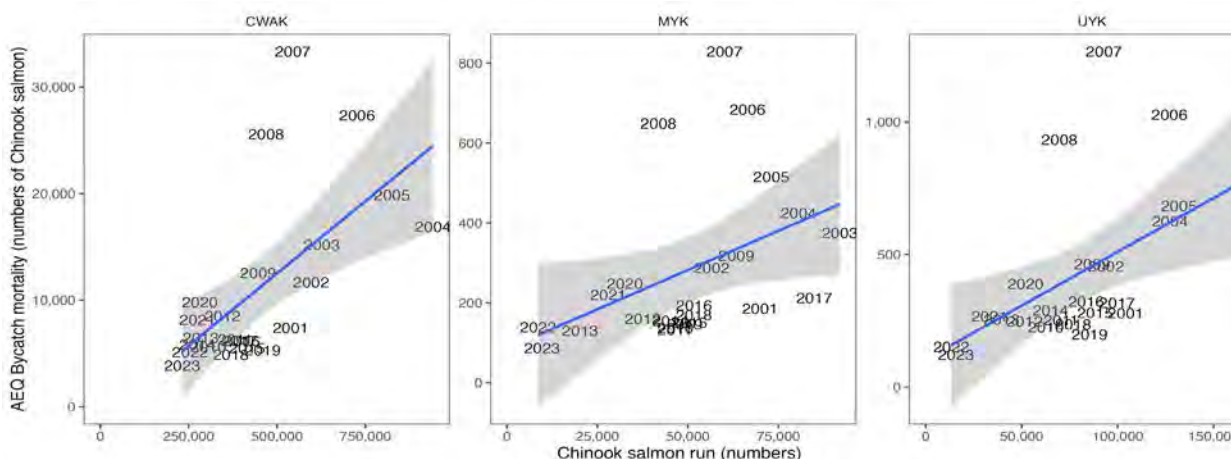
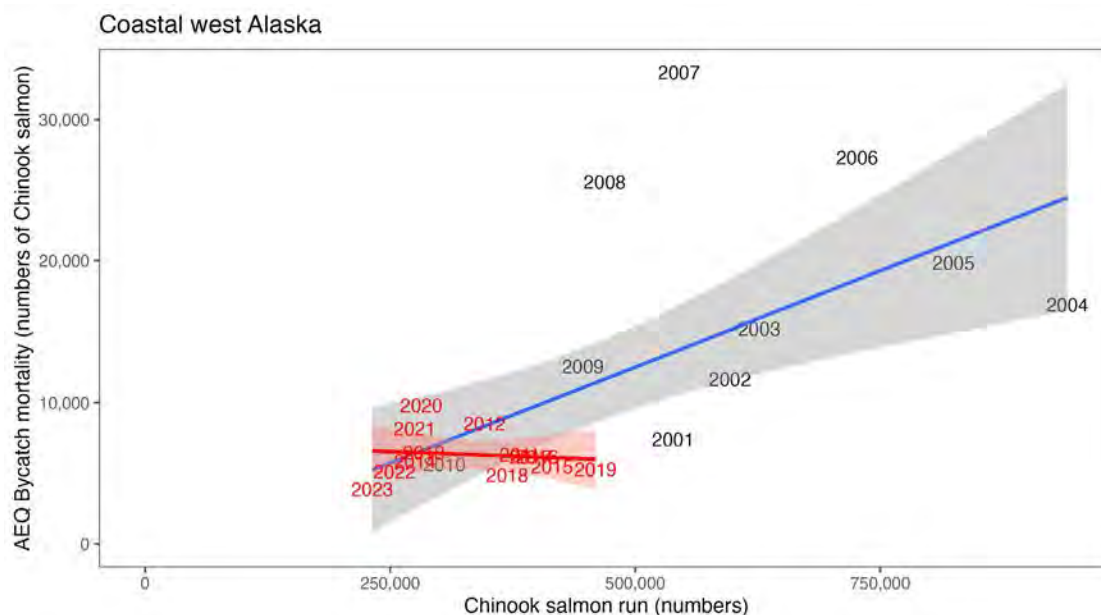
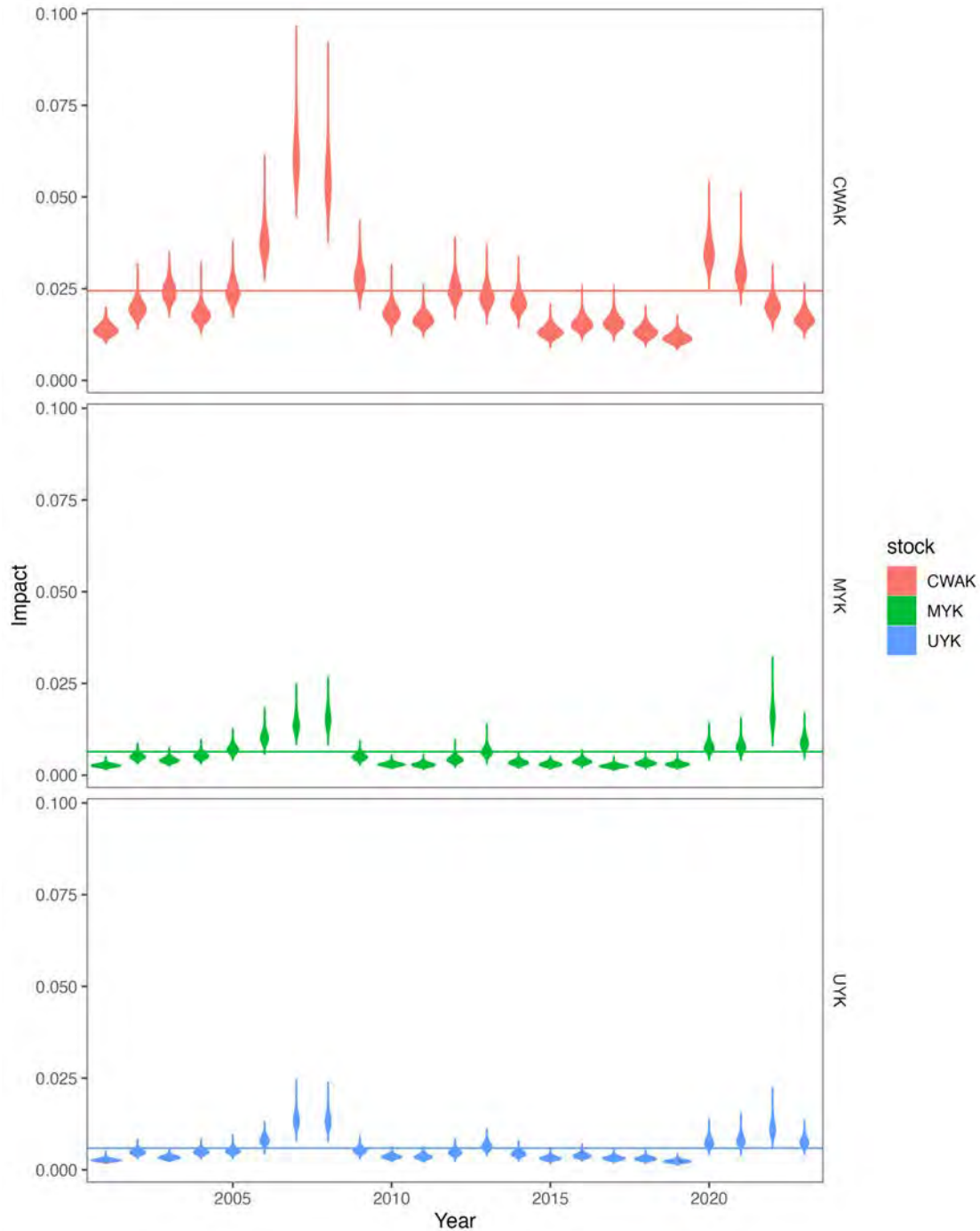


Figure 18: Chinook salmon PSC adult equivalence compared to the run size estimates. Panels are for different river systems based on available genetic stock identifications.



Chinook salmon PSC adult equivalence compared to the combined run size estimates for coastal western Alaska. Blue line is a linear regression result through years 2001-2021 while the red is for just the years 2011-2021.

The impact of PSC on the different stocks has shown an uptick in 2020 compared to the recent decade. Nushagak is over 6 times lower than the run size estimate from 2005, and represents 34% of the coastal western Alaska stocks (including the middle Yukon).



Chinook salmon PSC AEQ divided by in-river run estimates (plus AEQ) to provide the estimated proportional impact by different systems and levels of aggregation. Horizontal lines are the mean values.

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Appendix 1. Estimates of Adult Chinook salmon run size and age proportions

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Introduction

The following describes the basic approaches taken to develop Chinook salmon total run and age proportions for Norton Sound / Port Clarence, Yukon, and Kuskokwim Management Areas. Notable changes to estimation methods have occurred since the last time ADF&G provided information for use in estimating Bering Sea Bycatch, Adult Equivalent impacts on Chinook salmon returns to Western Alaska. Norton Sound / Port Clarence Management Area There are no published total run reconstructions for Chinook salmon returning to Norton Sound / Port Clarence. Similarly, age datasets are largely inadequate to produce reliable estimates of total run age proportions. Abundance estimates provided are minimums and age proportions are based on pooled datasets irrespective of sample location, time, or method. As such, all data provided for this management area is highly uncertain.

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Norton Sound / Port Clarence Management Area

There are no published total run reconstructions for Chinook salmon returning to Norton Sound / Port Clarence. Similarly, age datasets are largely inadequate to produce reliable estimates of total run age proportions. Abundance estimates provided are minimums and age proportions are based on pooled datasets irrespective of sample location, time, or method. As such, all data provided for this management area is highly uncertain.

Available timeseries

Data limitations allow for minimum run estimates for a subset of years, 1996–2023. The Unalakleet River is the predominant Chinook salmon producer in Norton Sound. Consistent annual monitoring of the Unalakleet River began in 1996 with a tower project on North River, a large tributary. Prior to 1996, ground-based assessment projects were rare or short-lived except for Kwiniuk River tower (1965 to present). The 1996–2023 Norton Sound minimum total run estimate was based on the sum of all available abundance data, including reconstructed total run estimate for the Unalakleet River; ground-based and expanded aerial indices of abundance to other systems; and harvest from commercial, subsistence, sport, and test fisheries.

Unalakleet River Run Reconstruction

Escapement estimates from the North River tower and Unalakleet River weir along with 4 years of telemetry were used to create an estimated drainagewide escapement to the Unalakleet River. Telemetry spawning distribution studies were conducted in 1997, 1998, 2009, and 2010, and estimates of North

River escapement as a percentage of the whole were 37% in 1997, 40% in 1998, 34% in 2009, and 53% in 2010. In the years when telemetry occurred the proportional distribution was used to expand the North River Chinook salmon count to a drainagewide estimate. In years prior to 2010, (e.g., 1996 and 2000–2008) the average proportion from the 4 years of telemetry (41%) was used to expand the North River Chinook salmon tower counts to a drainagewide escapement. Starting in 2010, drainagewide escapement was the sum of North River tower and Unalakleet River weir. In 2020, the weir was not operational, therefore the North River contribution was considered 34% of the total run based on the average contribution of the North River to the total escapement in 2017–2019.

Bayesian Estimates of Missed Passage

Bayesian analysis was used to estimate Chinook salmon escapement totals for all years of North River tower and Unalakleet River weir operations, and from 1985 to present for Kwiniuk River tower. Estimates of escapement for these systems were updated in 2024, therefore the escapement totals for the timeseries will be different from prior version. In other systems, reported escapements represent only what was counted at the projects and no attempt was made to estimate missed passage.

Aerial Surveys

Aerial survey counts were less reliable compared to ground-based escapement counts and were used only for years and locations in which no ground-based assessment was conducted. Peak aerial surveys were included when available from all rivers that were flown each year. There was no attempt to cull aerial survey data by survey rating or spawning timing. Aerial survey counts were summed across all systems by year and then expanded assuming aerial survey count represents 30% of the actual count.

Age Composition

Available data to represent the total escapement and harvest of Chinook salmon in Norton Sound is limited. From 1996–2002, 2007, and 2008 only harvest samples were available. Very small sample sizes (e.g., <100) were available from the harvest and escapement in 2003–2007. From 2009–2012 a few hundred samples were available from both the harvest and escapement. Beginning in 2013, nearly all samples were collected from the escapement. In all years, most samples were collected from harvests occurring in the Unalakleet and Shaktoolik Subdistricts or Unalakleet and Shaktoolik escapements, which likely represent most of the Chinook salmon production in the Norton Sound area.

From 2009–2012, there was sufficient pooled samples (>100) to compare the composition of the predominant age classes between the harvest and escapement. Harvest appeared to be moderately selective for larger fish, however; the proportion of each age class in the harvest and escapement datasets were similar and displayed consistent temporal trends. As such, we decided to pool all age data regardless of sample location, timing, or method to represent the total run age by year. There was no age data collected in 1999 and a “best guess” was represented as the average of 1998 and 2000.

Yukon Management Area

There have been substantial improvements in available estimates of abundance for Yukon River Chinook salmon since the last time ADF&G provided information for AEQ analysis. A subcommittee of the Yukon River Panel’s Joint Technical Committee (JTC) has produced annual estimates of total annual run, harvest, and escapement for 3 stock groupings: Lower U.S., Middle U.S., and Canada (Connors et al. *in press*). This new product was a component of a broader effort to estimate productivity and biological reference points for the Canada stock. The stock-specific run estimates are an output from an integrated state-space run reconstruction and spawner-recruitment model fit to available data.

The run reconstruction component of the integrated model combines historical data from various assessment projects that estimate mainstem passage, harvests, tributary escapements, and stock-proportions, to simultaneously estimate stock-specific total run, harvest, and escapement under a single Bayesian estimation framework. All datasets used in this model underwent a robust quality review (Pestal et al. *in press*) and the model structure and results were peer reviewed. Results of the peer review are being summarized by the Canadian Science Advice Secretariate and will be publicly available in Spring of 2022.

Available timeseries

Connors et al. 2023 provides stock-specific abundance estimates for 1981–2019. Harvest stock separation methods were not available prior to 1981, so extending stock-specific datasets prior to 1981 would not be possible. Model input data through 2023 are available, and the model was extended to estimate stock abundance and age proportions.

Abundance estimates

Estimates provided represent simulated median values that “best fit” the available data. Only median values are provided but estimates of uncertainty (posterior credible intervals) could be provided if requested. Due to the modelling approach, stock-specific escapement and harvest will not sum exactly to the stock-specific total, and all 3 stock totals will not sum exactly to the total drainagewide run size.

Age Composition

A robust age sampling program has occurred annually to represent harvest and escapement age composition. Stock-specific harvest age composition estimates came from ADF&G “origins” reports as described in Larson et al. 2020. U.S. escapement age proportions were derived from tributary assessment projects in each U.S. stock group (Lower - Andreafsky, Anvik, Gisasa, Nulato, Tozitna, and Kaltag), (Middle - Chena, Henshaw, and Salcha) and are accessible from the AYK Database Management System. Canada Stock border passage age proportions were based on data collected at the Eagle Sonar test fishery since 2007. From 1882–2006, Canada Stock border passage age proportions were based on samples collected from border fish wheels and bias adjusted using a length selectivity correction method described in Hamazaki 2018. Stock-specific escapement and harvest age proportions were applied by the respective abundances and summed to produce total abundance by age and stock. Proportions were calculated and reported.

Kuskokwim River

Abundance estimates

Standard published run reconstruction methods were used to estimate total annual run size of Kuskokwim River Chinook salmon. Maximum likelihood methods and data inputs are documented in Larson 2024 and are consistent with methods approved by the NPFMC for use in the 3-System Index. Available data allows for run size estimates from 1976–2023.

Age Composition

A robust age sampling program has occurred annually to represent harvest and escapement age composition. Standard methods were used to weight all available escapement and harvest samples by their respective spatial-temporal abundances to generate age proportions representative of the drainagewide escapement and harvest. Escapement and harvest age proportions were applied to reconstructed drainagewide escapement and harvest estimates from the maximum likelihood run

reconstruction model and summed to generate total abundance by age. Proportions were calculated and reported.

Kuskokwim Bay

There are no published total run reconstructions for Chinook salmon returning to Kuskokwim Bay; however, there is a moderate amount of ground-based and aerial escapement data to make a reasonable inference about total run size.

Available Abundance Data

The available data allows for reasonable abundance estimates for 2002–2023. Major spawning tributaries draining into Kuskokwim Bay include the Goodnews, Kanektok, and Arolik rivers. The Goodnews River is monitored by a tower/weir on the Middle Fork (tower 1981–1990, weir 1991–2019) and peak aerial surveys flown throughout the Middle Fork and North Fork. The Kanektok River is monitored by a weir located near the headwaters (2002–2015) and peak aerial surveys flown throughout the drainage. The Arolik is located near the Kanektok River and monitored by aerial survey only. Subsistence and commercial harvest are available for the entire Kuskokwim Bay (Districts 4 and 5, community).

Ground-based weir datasets were used to index the magnitude of the annual escapement. Ground-based escapement estimates were based on standard operating periods and missed passage was estimated using Bayesian methods as described in Dickerson et al. 2019. Middle Fork Goodnews River Weir (MFGNRW) was used to index the Goodnews River drainage. Kanektok weir was used to index the Kanektok and Arolik Rivers.

Goodnews River Run Reconstruction

Escapement to the entire Goodnews River was accomplished by expanding the MFGNRW counts to include the North Fork using 1 of 2 methods depending on data availability. Method 1 was used for years when reliable aerial surveys were flown on both the North Fork and Middle Fork rivers. The total North Fork escapement was assumed to be equal to the MFGNRW estimate adjusted by the aerial survey count ratio observed between the 2 tributaries. Method 2 was used when paired aerial surveys were not available and used a linear regression approach to estimate the annual “expected” ratio of North Fork to Middle Fork escapement using historical observations from Method 1. The sum of the estimated North Fork and Middle Fork escapement was used to represent the total escapement to the Goodnews River.

In 2018 and 2020–2023 MFGNRW did not operate. In 2018 and 2023, multiple linear relationships were used to generate Middle Fork escapement estimates from Kanektok aerial survey counts. In 2020 and 2021, Middle Fork escapement estimates were generated using a linear relationship between historical Middle Fork aerial survey and weir counts. An estimate was not created for 2022 because no assessment occurred in the Kuskokwim Bay that year.

Kanektok and Arolik River Escapement Expansions

A total of 16 non-consecutive years (1999–2023) of aerial surveys were used to conclude that a substantial portion (average: 52%, range: 23–87%) of the total Kanektok River Chinook salmon escapement spawns downriver from the weir. The average distribution was used to expand the Kanektok River weir count to the total drainage for all years during which the weir operated. The Kanektok River weir did not operate successfully in 2006 and was discontinued in 2016. For years 2006, 2017, and 2020, a Kanektok weir equivalent count was approximated using a historical linear relationship between MFGNRW and Kanektok weir ($R^2 = 0.71$). In 2016, 2018, 2019, 2021, and 2023, the Kanektok River weir equivalent count was approximated using a historical linear relationship between the Kanektok River

aerial survey and Kanektok River weir ($R^2 = 0.78$). An estimate was not created for 2022 because no assessment occurred in the Kuskokwim Bay that year.

A total of 6 non-consecutive years (1977–2010) of aerial surveys were used to approximate the relative abundance between the Arolik and Kanektok Rivers. Paired aerial surveys indicate the run abundance to the Arolik is on average 33% of the total expanded run to the Kanektok River. This ratio was applied to the expanded drainagewide escapement to the Kanektok River in each year to approximate the total escapement to the Arolik River.

Total Kuskokwim Bay Run Reconstruction

Total escapement to Kuskokwim Bay was approximated (without error) by summing Chinook salmon escapement estimates from Middle Fork Goodnews River weir estimates (or approximations), North Fork Goodnews River (expansions), expanded Kanektok River weir estimates (or approximations), and Arolik River (expansions). The total escapement estimate for 2022 was the average of escapement estimates for 2021 and 2023. Total escapement was summed with all available harvest data from Goodnews and Platinum community subsistence harvests, District 4 and 5 commercial harvest, and reported sport harvest.

Age Composition

A moderately robust age sampling program has occurred annually to represent harvest and escapement age composition to Kuskokwim Bay. Harvest samples are available from the commercial fishery only. Escapement samples are available from the Middle Fork Goodnews and Kanektok river weirs. Middle Fork Goodnews weir samples were used to represent the entire escapement to the Goodnews River drainage. Kanektok River weir samples were used to represent the escapement to the entire Kanektok River and Arolik rivers. Limited escapement age data were available for 2016–2023, due to discontinuation of both weirs. Samples were not available from MFGNRW in 2018 and 2020–2023, and recent 5-year averages were used. Samples were not available from Kanektok River weir from 2016–2023, and age proportions were assumed to be equal to Goodnews.

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Appendix 5: Information on Community Engagement and Dependence on the Bering Sea Pollock Fishery

This appendix provides supplemental information related to community engagement and dependence on the Bering Sea pollock fishery. It is correlated with Chapter 4.

5.1 Methods Used for Impact Analysis

The analysis of community engagement and dependence on B season pollock uses quantitative fishery information to identify patterns of engagement (or participation) in the Bering Sea pollock fishery. The distribution and relative magnitude of community engagement was captured using a vessel's ownership address listed in the Alaska Commercial Fisheries Entry Commission (CFEC) vessel registration files. This is an indicator of the distribution and magnitude of ownership ties to a particular community and/or region, and it can be used as a proxy for economic activity in the community that is associated with the fishery/sector that may be potentially affected by one or more of the proposed alternatives. The listed ownership address was also used to be consistent with other SIAs prepared for FMP amendment analyses for the Council, and because prior SIAs have described the problematic nature of the existing vessel homeport data (NPFMC, 2021). That being said, some caution is warranted for how vessel ownership information is interpreted because it is not unusual for these vessels to have complex ownership structures that involve more than one entity in more than one community or region. Additionally, the community identified by ownership address may not directly indicate where a vessel spends most of its time, purchases services, or hires its crew from.

To understand the distribution and relative magnitude of community engagement in the Bering Sea pollock fishery through the shore-based processing component, shore-based processors were identified in data provided by AKFIN using the F_ID (intent to operate), SBPR (shore-based processor), and FLTR (floating processor codes). This approach provides information based on the operating location of the plant, rather than other indicators such as company ownership address. The physical location of a plant can be a relative indicator of the local volume of fishery-related activity, and a rough proxy for the relative level of associated employment and local government revenues.

This portion of the analysis also includes a series of tables used to identify patterns of community dependence on the pollock fishery for communities affiliated with the various sectors by ownership address and those Alaska communities where shore-based processing occurs, noting the analysts acknowledge that "dependence" is a complex concept with economic and social dimensions that could be considered in multiple ways. For communities affiliated with the Bering Sea pollock fishery by vessel ownership address, economic dependence is characterized by comparing the gross ex-vessel or first wholesale revenues earned from the pollock fishery to the total revenues generated by the same vessels in all other fisheries (species, gear, and areas). The same general procedure is used for the shore-based processing component.

5.2 Communities Engaged in or Dependent on the B Season Pollock Fishery

This section of the appendix provides the full set of tables and figures for quantitative indicators of community engagement and dependence on the B season pollock fishery. This information mirrors what was provided in the April 2024 SIA, except that 2023 data has been included as the most recent year for which complete fisheries-dependent data are available.

Offshore Component

Table A5-1 Catcher Processors harvesting B season AFA pollock by community of vessel ownership address, 2011–2023

Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023 (number)	Annual Average 2011-2023 (percent)	Unique Vessels 2011-2023 (number)
Anchorage Alaska	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	7.30%	1
Seattle Washington	14	13	13	14	13	13	13	13	12	12	12	12	11	12.7	92.70%	15
Grand Total	15	14	14	15	14	14	14	14	13	13	13	13	12	13.7	100.00%	16

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table A5-2 Catcher Processors harvesting B season Bering Sea pollock, 2011–2023 (2023 dollars)

	Program	2011	2012	2013	2014	2015	2016**	2017	2018	2019	2020	2021	2022	2023	Average 2011-2023 (dollars)
Ex- Vessel	AFA	118,471,252	123,145,462	111,710,221	114,845,750	115,915,259	108,230,624	98,566,465	107,399,360	106,921,175	95,961,061	101,458,383	97,777,257	95,916,887	107,409,166
	CDQ	31,233,081	35,415,628	31,964,367	33,244,040	33,152,877	30,480,164	27,582,568	30,817,395	30,054,595	24,475,161	29,268,690	28,457,091	27,852,544	30,307,554
	Total	149,704,333	158,561,090	143,674,588	148,089,790	149,068,136	138,710,788	126,149,033	138,216,755	136,975,769	120,436,222	130,727,073	126,234,347	123,769,431	137,716,720
Wholesale Value	AFA	403,820,925	400,076,743	344,265,677	354,958,988	364,711,546	379,634,733	359,361,364	333,394,223	380,779,557	309,275,049	325,244,578	302,552,595	304,201,745	350,944,440
	CDQ	106,529,695	115,142,762	98,513,029	102,272,255	104,383,658	107,075,988	100,920,937	96,029,662	107,601,758	79,381,318	94,132,103	88,186,293	88,301,378	99,113,141
	Total	510,350,620	515,219,506	442,778,706	457,231,242	469,095,205	486,710,721	460,282,301	429,423,885	488,381,315	388,656,367	419,376,681	390,738,888	392,503,124	450,057,582

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

*Ex-Vessel Value based on shoreside price

**Includes catcher vessel targeted BS CDQ Pollock delivered to a mothership in 2016 to show all CDQ BS pollock

Table A5-3 First wholesale value diversification for CPs harvesting AFA or CDQ pollock, 2011–2023 (2023 dollars)

Fishery	Annual Average Number of Vessels	Annual Average First Wholesale Value for Fishery	Annual Average Total Wholesale Value from All Area, Gear, and Species Fisheries	Pollock Value as a Percentage of Total Wholesale Value Annual Average
AFA	13.9	613,355,590	804,413,684	76.25%
B Season AFA	13.7	350,944,440	800,895,107	43.82%
CDQ Pollock	14.1	174,690,155	784,986,871	22.25%
B Season CDQ Pollock	11.5	99,113,141	693,059,447	14.30%
B Season AFA+B Season CDQ Pollock	14.2	450,057,582	812,841,429	55.37%
AFA+CDQ Pollock	14.5	788,045,744	818,043,910	96.33%
Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT				

Table A5-4 First wholesale value diversification for communities with Catcher Processors harvesting B season AFA or CDQ pollock, 2011–2023 (millions of 2023 real dollars)

Fleet	Community	B Season Annual Average Number of Vessels	Annual Average Number of All Commercial Fishing Vessels in those Same Communities*	Annual Average 2011-2023 (dollars)	Annual Average Total First Wholesale Value from All Areas, Gears, and Species Fisheries for the Community Fleet*	Participant Wholesale Value as a Percentage of Total Community Wholesale Revenue Annual Average
AFA Catcher Processors	Seattle/Anchorage	14.2	523.9	450,057,582	2,141,770,565	21.0%

*Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table A5-5 Number of Motherships/floating processors accepting B season pollock deliveries by community of ownership address, 2011–2023

Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023 (number)	Annual Average 2011-2023 (percent)	Unique Processors 2011-2023 (number)
Dutch Harbor	2	2	2	2	2	1	1	2	2	2	2	2	1	1.8	52.27%	2
Seattle	2	2	2	2	2	2	2	2	1	1	1	1	1	1.6	47.73%	3
Grand Total	4	4	4	4	4	3	3	4	3	3	3	3	2	3.4	100.00%	4

CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-6 First wholesale revenues earned by Mothership/floating processors accepting deliveries of B season pollock by community of ownership address, 2011–2023 (millions of 2023 real dollars)

Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011- 2023 (millions)	Unique Processors 2011-2023 (number)
Dutch Harbor/Seattle	\$140.71	\$135.95	\$125.51	\$131.97	\$121.76	\$133.43	\$113.48	\$127.30	\$83.98	\$72.85	\$77.59	76.14	*	\$109.70	4

Table A5-7 First wholesale revenue diversification for motherships/floating processors accepting deliveries of B season pollock, 2011–2023 (millions of 2022 real dollars)

Geography	Annual Average Number of Processors	Annual Average First Wholesale Revenues B Season AFA Pollock Only (millions 2022 real \$)	Annual Average Total First Wholesale Revenues from All Area, Gear, and Species Fisheries	AFA Pollock First Wholesale as a Percentage of Total First Wholesale Revenue Annual Average
Dutch Harbor/Seattle	3.5	\$109.7	\$188.5	58.19%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-8 Mothership/floating processors B season pollock revenue as percent of total, 2011–2023 (number of processors)

AFA B Season Pollock Rev as a % of Total	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023
0-10%	0	0	0	0	0	1	0	0	0	0	0	0	0	0.08
10-20%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
20-30%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
30-40%	1	0	0	0	0	0	0	0	0	0	0	0	0	0.08
40-50%	0	1	1	1	1	0	0	0	1	0	0	0	0	0.38
50-60%	2	2	1	2	0	1	2	3	1	3	3	2	0	1.69
60-70%	1	1	2	1	3	2	1	1	1	0	0	1	2	1.23
70-80%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
80-90%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
90-100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Grand Total	4	4	4	4	4	4	3	4	3	3	3	3	2	3.46

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Shoreside Component

Table A5-9 Number of CVs harvesting B season pollock and delivering to shore-based processors by community of vessel ownership address, 2011–2023

Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023 (number)	Annual Average 2011-2023 (percent)	Unique Vessels 2011-2023 (number)
Anchorage/Wasilla	0	0	0	0	0	0	0	0	0	0	0	3	3	0.5	0.69%	3
Kodiak	5	5	5	5	4	4	4	4	4	5	3	3	3	4.2	6.23%	6
Alaska	5	5	5	5	4	4	4	4	4	5	3	6	6	4.6	6.92%	9
Seattle	51	54	55	57	59	55	55	54	54	55	53	46	47	53.5	80.16%	66
Other WA	3	2	3	3	4	3	2	2	2	2	4	2	2	2.6	3.92%	7
Washington	54	56	58	60	63	58	57	56	56	57	57	48	49	56.1	84.08%	70
Newport	8	6	5	4	5	5	4	4	4	4	3	5	4	4.7	7.04%	10
Other OR/Other States	5	5	1	1	1	1	0	1	0	1	0	0	0	1.2	1.85%	7
Oregon/Other States	13	11	6	5	6	6	4	5	4	5	3	5	4	5.9	8.88%	16
Grand Total	72	73	69	70	73	68	65	65	64	67	63	59	59	66.7	100.00%	83

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-10 Number of CVs harvesting B season pollock and delivering to motherships by community of historic vessel ownership address, 2011–2023

Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023 (number)	Annual Average 2011-2023 (percent)	Unique Vessels 2011-2023 (number)
Anchorage/Wasilla	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1.18%	1
Kodiak	1	1	1	1	1	1	1	0	1	1	1	0	0	0.8	5.92%	1
Alaska	1	1	1	1	1	1	1	0	1	1	1	1	1	0.9	7.10%	2
Seattle	13	14	13	12	14	11	12	11	12	12	12	11	9	12.0	92.31%	17
Other WA	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	0.59%	1
Washington	13	13	12	12	13	10	11	10	11	11	11	10	9	11.2	86.39%	18
Grand Total	14	15	14	14	15	12	13	11	13	13	13	12	10	13.0	100.00%	18

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-11 Gross ex-vessel revenues earned by CVs harvesting B season pollock by community of vessel ownership address, 2011–2023 (2023 dollars)

Fleet	Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023 (dollars)	Annual Average 2011-2023 (percent)
AFA Mothership Catcher Vessels	Total	31,783,713	30,670,610	28,081,325	29,645,921	28,934,019	27,052,222	24,305,540	27,883,068	26,749,231	26,791,241	27,398,650	26,077,254	26,477,085	27,834,606	100.00%
AFA Shoreside Catcher Vessels	Total	140,245,544	152,440,642	138,678,056	142,468,597	145,165,126	133,772,042	125,593,511	139,083,129	148,832,966	120,354,262	129,479,610	122,063,130	123,667,675	135,526,484	100.00%
AFA Vessels (All Sectors)	Anchorage/Wasilla	0	0	0	0	0	0	0	0	0	0	0	6,655,518	6,524,755	1,013,867	0.60%
	Kodiak	3,796,200	4,657,369	4,215,360	4,444,195	3,712,717	3,972,786	4,929,192	2,500,128	3,923,982	3,049,082	3,691,541	1,510,271	1,837,314	3,556,934	2.09%
	Alaska Total	3,796,200	4,657,369	4,215,360	4,444,195	3,712,717	3,972,786	4,929,192	2,500,128	3,923,982	3,049,082	3,691,541	8,165,789	8,362,069	4,570,801	2.69%
	Seattle	141,016,033	*	143,712,822	148,447,972	150,942,033	137,419,800	*	*	*	*	138,079,272	*	*	141,389,665	68.08%
	Other WA*	8,895,029	*	12,403,649	13,045,427	13,064,914	12,166,221	*	*	*	*	11,568,198	*	*	10,229,456	6.00%
	Washington	149,911,061	162,594,532	156,116,471	161,493,399	164,006,948	149,586,021	139,865,878	159,325,220	166,374,542	140,759,967	149,647,470	133,999,860	137,367,196	151,619,120	74.07%
	Newport	10,094,864	9,380,512	*	*	*	*	5,103,981	*	5,283,673	*	3,539,249	5,974,735	4,415,496	5,933,033	3.49%
	Other OR/Other Sta	8,227,132	6,478,839	*	*	*	*	0	*	0	*	0	0	0	1,238,135	7.89%
	Oregon/Other States	18,321,995	15,859,351	6,427,550	6,176,924	6,379,481	7,265,457	5,103,981	5,140,848	5,283,673	3,336,453	3,539,249	5,974,735	4,415,496	7,171,169	23.23%
	Total	172,029,257	183,111,252	166,759,381	172,114,518	174,099,145	160,824,264	149,899,050	166,966,197	175,582,197	147,145,503	156,878,260	148,140,384	150,144,761	163,361,090	100.00%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

* Other WA includes: Anacortes, Chinook, Mount Vernon, Neah Bay and Vancouver

**Other OR/Other States includes: (Depoe Bay, Florence, Independence, Keizer, Port Orford, Portland, South Beach) Oregon and Half Moon Bay California

Table A5-12 Gross ex-vessel value diversification for CVs harvesting B season pollock by community of ownership address, 2011–2023 (2023 dollars)

Fleet	Community	Annual Average Number of Vessels	Annual Average Ex Vessel Value from B Season AFA	Annual Average Total Ex Vessel Value from All Area, Gear, and Species Fisheries	AFA Value as a Percentage of Total Ex-Vessel Value Annual Average	
AFA Mothership Catcher Vessels	Total	13.0	27,834,606	58,756,779		47.37%
AFA Shoreside Catcher Vessels	Total	66.7	135,526,484	289,343,756		46.84%
AFA Vessels (All Sectors)	Anchorage/Wasilla	0.5	1,013,867	2,085,889		48.61%
	Kodiak	4.3	3,556,934	12,815,759		27.75%
	Alaska Total	4.8	4,570,801	14,901,648		30.67%
	Seattle	60.9	141,389,665	269,274,516		52.51%
	Other WA*	2.7	10,229,456	18,609,592		54.97%
	Washington	63.6	151,619,120	287,884,108		52.67%
	Newport	4.7	5,933,033	16,106,755		36.84%
	Other OR/Other States	1.3	1,238,135	4,224,857		29.31%
	Oregon/Other States	6.0	7,171,169	20,331,612		35.27%
	Total	74.4	163,361,090	323,117,369		50.56%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-13 Gross ex-vessel value diversification for communities with CVs harvesting B season AFA pollock, 2011-2023 (2023 dollars)

Fleet	Community	B Season Annual Average Number of Vessels	Annual Average Number of All Commercial Fishing Vessels in those Same Communities	B Season Annual Average 2011-2023 (dollars)	Annual Average Total Ex-Vessel Revenues from All Areas, Gears, and Species Fisheries for the Community Fleet	Participant Ex-Vessel Value as a Percentage of Total Community Ex-Vessel Revenue Annual Average
AFA Mothership Catcher Vessels	Total	13.0	862.6	27,834,606	933,869,524	3.0%
AFA Shoreside Catcher Vessels	Total	66.7	984.3	135,526,484	995,952,689	13.61%
AFA Vessels (All Sectors)	Anchorage/Wasilla	0.5	275.8	1,013,867	88,794,511	1.14%
	Kodiak	4.3	244.1	3,556,934	126,391,450	2.81%
	Alaska Total	4.8	519.9	4,570,801	215,185,961	2.12%
	Seattle	60.9	336.5	141,389,665	702,241,997	20.13%
	Other WA	2.7	94.6	10,229,456	37,697,531	27.14%
	Washington	63.6	431.1	151,619,120	739,939,528	20.49%
	Newport	4.7	14.9	5,933,033	28,515,794	20.81%
	Other OR/Other States	1.3	18.5	1,238,135	12,311,406	10.06%
	Oregon/Other States	6.0	33.4	7,171,169	40,827,200	17.56%
	Total	74.4	984.4	163,361,090	995,952,689	16.40%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table A5-14 Number of shore-based processors accepting B season deliveries by community of operation, 2011–2023

Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023	Annual Average 2011-2023	Unique Processors 2011-2023
														(number)	(percent)	(number)
Akutan	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	18.57%	1
King Cove	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	18.57%	1
Dutch Harbor	3	3	3	3	3	3	3	3	4	4	4	4	4	3.4	62.86%	5
Grand Total	5	5	5	5	5	5	5	5	6	6	6	6	6	5.4	100.00%	7

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-15 Gross first wholesale revenues earned by shore-based processors from B season pollock deliveries, 2011–2023 (2023 dollars)

Community	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023	Annual Average 2011-2023
														(millions)	(percent)
Akutan/Dutch Harbor/King Cove	\$383.37	\$413.91	\$366.17	\$378.28	\$353.95	\$364.39	\$326.46	\$354.24	\$431.73	\$349.01	\$368.56	\$360.35	\$414.33	\$374.21	100.00%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-16 Gross first wholesale revenue diversification for shore-based processors accepting B season pollock deliveries, 2011-2023 (2023 dollars)

Geography	Annual Average Number of Processors	Annual Average First Wholesale Revenues B Season AFA Pollock Only	Annual Average Total First Wholesale Revenues from All Area, Gear, and Species Fisheries	AFA Pollock First Wholesale as a Percentage of Total First Wholesale Revenue Annual Average
		(millions 2023 real \$)		
Akutan/Dutch Harbor/King Cove	5.4	\$374.2	\$853.9	43.82%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-17 Gross first wholesale revenue diversification for shore-based processors accepting B season pollock deliveries, 2011–2023 (2023 dollars)

Geography	Annual Average Number of Processors	Annual Average Number of All Commercial Fishing Processors in those Same Communities	Annual Average First Season AFA Pollock (millions 2023 real \$)	Annual Average Total First Wholesale Revenues from All Areas, Gears, and Species Fisheries for the Community Fleet (millions 2023 real \$)	B Season AFA Pollock First Wholesale Revenue as a Percentage of Total Community First Wholesale Revenue Annual Average
Akutan/Dutch Harbor/King Cove	5.4	7.3	\$374.2	\$1,060.2	35.30%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Table A5-18 Shore-based processor's B season pollock revenue as percent of total, 2011–2023 (number of processors)

AFA B Season Pollock Rev as a % of Total	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Annual Average 2011-2023
0-10%	1	0	1	0	1	1	1	0	0	0	1	1	0	0.54
10-20%	0	1	0	1	0	0	0	1	1	1	0	0	1	0.46
20-30%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
30-40%	1	0	0	0	0	0	0	0	0	1	1	0	0	0.23
40-50%	2	2	3	3	2	3	3	3	3	3	0	3	3	2.54
50-60%	1	2	1	1	2	1	1	1	2	1	4	1	2	1.54
60-70%	0	0	0	0	0	0	0	0	0	0	0	1	0	0.08
70-80%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
80-90%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
90-100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Grand Total	5	5	5	5	5	5	5	5	6	6	6	6	6	5.38

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT

Pollock Dependent Communities School Enrollment Information

Below are figures portraying school enrollment information for select Alaska communities and Newport, Oregon (2014-2023). Declining school enrollments can signal communities in transition.



Figure A5-1 K-12 school enrollment (number of students) for Alaska communities substantially engaged in or dependent on B season pollock, 2014–2023

Source: Alaska Department of Education.

Figure A5-2 shows school enrollment in Newport from 2014 to 2023. There are 18 schools in Newport, with a total enrollment of 5,122 students in 2023. The number of students dropped substantially during the Covid-19 pandemic and have still not recovered from pre-pandemic enrollment.

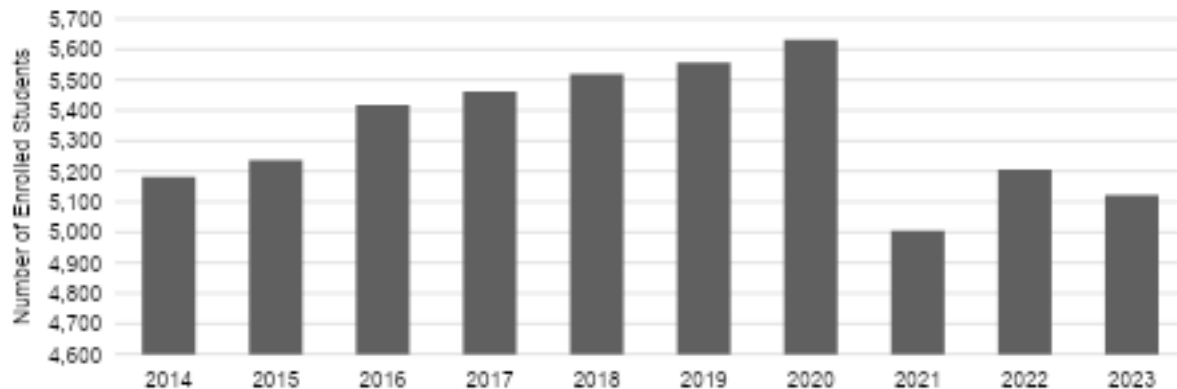


Figure A5-2 K-12 school enrollment (number of students) for Newport, Oregon, 2014–2023

Source: Oregon Department of Education.

Appendix 6: Vessel-level Analysis for Alternative 2 or 3

This appendix provides supplemental information related to vessel-level impacts under an overall chum salmon PSC limit (Alternative 2 or 3) in connection with Section 4.3.2.

The analysis of economic impacts of a chum PSC limit (Alternative 2 and 3) and the corridor cap (Alternative 5) on the pollock industry is often focused at the AFA and CDQ sector-level because there are intrinsic characteristics and practical constraints that are shared among vessels within a sector. However, within a sector, impacts from the proposed actions will also be experienced differently by participating entities. Even if a sector or cooperative is able to fully harvest its B season pollock apportionment, impacts from a chum salmon PSC limit under Alternative 2 or 3 or an area closure under Alternative 5 could still be experienced at the cooperative-, company-, and vessel-level.

Decisions of whether and how to operate in the B season with chum salmon PSC limit or corridor caps will be made by an AFA company and within the cooperatives. This includes consideration of the risk of a chum PSC limit even before the B season begins. This assessment will be made with imperfect information on catch rates and chum PSC encounters. Although additional seasons operating under a chum salmon PSC limit may provide more insight to the degree of constrain, annual factors (e.g., pollock aggregation, encounters with other PSC species, ocean and weather, etc.) will continue to add uncertainty. There are substantial fixed and initial variable costs associated with any participation in the pollock B season fishery and if a company perceives the risk of operation to be too great, they may choose to operate differently even prior to incurring any avoidance costs or before a closure results in forgone revenue. This could include consolidation of pollock quota onto other vessels owned by the same company or leased to an unaffiliated vessel within their cooperative. If this occurred, that vessel owner may receive a fraction of the revenue they would have earned from harvesting the pollock directly. This decision would also reduce income and opportunity for the captains and crew. This type of impact may not be apparent at the sector level if all of the sector's quota was harvested but could nonetheless result in adverse distributional impacts for vessels/companies and the individuals associated with them.

It is anticipated that if a chum salmon PSC limit is implemented, similar to Chinook salmon PSC, the sector or cooperative would choose to apportion the limit to the vessel-level. This could provide further accountability and reduce the risk that the cooperative or sector would exceed their apportionment of the total chum salmon PSC limit. While NMFS would apportion any chum salmon PSC limit to cooperatives and CDQ groups, a sub-division of the apportionment could occur through contractual agreement (i.e., IPA or inter-cooperative agreement). If a vessel reached their individual limit, it is likely these agreements would require them to stop fishing. While it might be possible for them to receive chum salmon PSC or a PSC/ pollock pairing by transfer from other vessels within their cooperative, based on the limited transfer patterns for Chinook salmon PSC and the incentive for a vessel to maintain their own PSC in reserve, this is not expected to be common. More likely, to the extent it is possible,¹ it is expected that a vessel that still has a chum salmon PSC apportionment available would lease the remainder of that vessel's pollock quota. Therefore again, the pollock could be fully harvested at the sector or cooperative level; while adverse impacts are still experienced for the vessel owner and crew of the vessel that exceeded its vessel-level apportionment.

To further demonstrate this point, the analysts used information provided in the inshore CV inter-cooperative reports on vessel-level apportionments of Chinook PSC (including transfers) to provide illustrations of how individual inshore CVs may have performed relative to a vessel-level apportionment

¹ Some vessels may have additional constraints on leasing B season pollock. For instance, GOA sideboard-exempt CVs could face penalties if they leased Bering Sea B season pollock while fishing above the sideboard limits in the GOA in the same year (see the section following this one on spillover impacts for more detail).

of chum salmon PSC during 2021, 2022, and 2023. The chum salmon PSC limit and apportionment from Alternative 2 that resulted in the lowest amount for inshore cooperatives (100,000 chum salmon and AFA apportionment) and highest PSC limit and apportionment (550,000 chum salmon and 3-year average apportionment) were included and are referred to as lowest PSC limit and highest PSC limit here. Each calculated vessel-level chum salmon PSC apportionment was then compared to the actual chum salmon catch by each vessel. The figures demonstrate the number of chum salmon PSC over or under a vessel could have been relative to a hypothetical vessel-level chum PSC apportionment. As noted in the DEIS, had these limits been in place in these years, these vessels would have been expected to alter their fishing strategies, to the degree they could.

There are several additional notes associated with these examples. The allocations and catch do not account for Amendment 69 harvest² and the figures do not include inshore CVs that were not active in the Bering Sea pollock B season. Therefore, the figures do not represent the cooperative-level impacts, which would both include both the additional catch from the Amendment 69 fishing and the additional allocation of chum salmon PSC from vessels that did not fish (although transfers were accounted for). The analysts are not aware of all the joint ownerships and relationships between vessels and therefore these are also not accounted for. Presumably if two or more vessels are owned by the same company, then shifting pollock or associated PSC from one vessel to another in under the same ownership structure would not be as impactful for that company; however, it may still have implications for the captain and crew.

As would be expected, lower PSC limits/apportionments have the greatest potential impact on the largest number of vessels. However, there is substantial interannual variability between 2021-2023.

2021:

- In 2021, the lowest chum salmon PSC level could have halted the operations of up to 42 of the 62 active inshore CVs, if they did not receive PSC transfers from within their cooperative or alter their fishing behavior.
- Additionally in a year like 2021, many of the vessels that potentially would have exceeded their vessel-level chum salmon PSC limit at the lower PSC limit, would have still exceeded it at the highest chum salmon PSC limit considered. Of the 62 active inshore CVs, 23 vessels would have exceeded their vessel-level allocations if they did not receive PSC transfers from within their cooperative or alter their fishing behavior.
- In 2021, the inshore CV sector as a whole would have reached its sector-level chum salmon PSC limit if the fleet did not alter fishing behavior, whether the chum salmon PSC limit was set to 100,000 or 550,000, if the AFA apportionment was selected. If the 3-year average apportionment was selected with a chum PSC limit of 550,000, the inshore CV sector would not have reached the sector-level limit in 2021, however there would still be a substantial number of vessels at their hypothetical vessel-level limit.

2022:

- In 2022, 42 of the 61 active inshore CVs potentially would have exceeded their vessel-level chum salmon PSC limit at the lower PSC limit and 3 of the active 61 inshore CVs potentially would have exceeded their vessel-level chum salmon PSC limit at the highest PSC limit.

² Amendment 69 to the BSAI groundfish FMP provided each inshore cooperative an opportunity to lease a portion its pollock allocation to a non-member AFA inshore catcher vessel. This leasing does not imply that quota is transferred from one cooperative to another, but rather that the non-member AFA catcher vessel becomes a de facto member of the cooperative to which the quota is allocated.

- In 2022, the inshore CV sector would have reached the lowest chum salmon PSC limit under all apportionments. The sector would not have reached the highest PSC limit under any apportionment.

2023:

- In 2023, 29 of the 57 active inshore CVs potentially would have exceeded their vessel-level chum salmon PSC limit at the lower PSC limit and 8 of the active 57 inshore CVs potentially would have exceeded their vessel-level chum salmon PSC limit at the highest PSC limit.
- In 2023, the inshore CV sector would have reached the lowest chum salmon PSC limit under all apportionments. The sector would not have reached the highest PSC limit under any apportionment.

This analysis demonstrates another layer of impacts that may be experienced by the vessels/ companies using the inshore sector as an example. As shown for all three years, at the higher chum salmon PSC limit/ apportionment the sector would not have reached its apportionment, yet adverse impacts could have still been experienced for the vessel owner and crew of the vessel that exceeded its vessel-level apportionment in all three years.

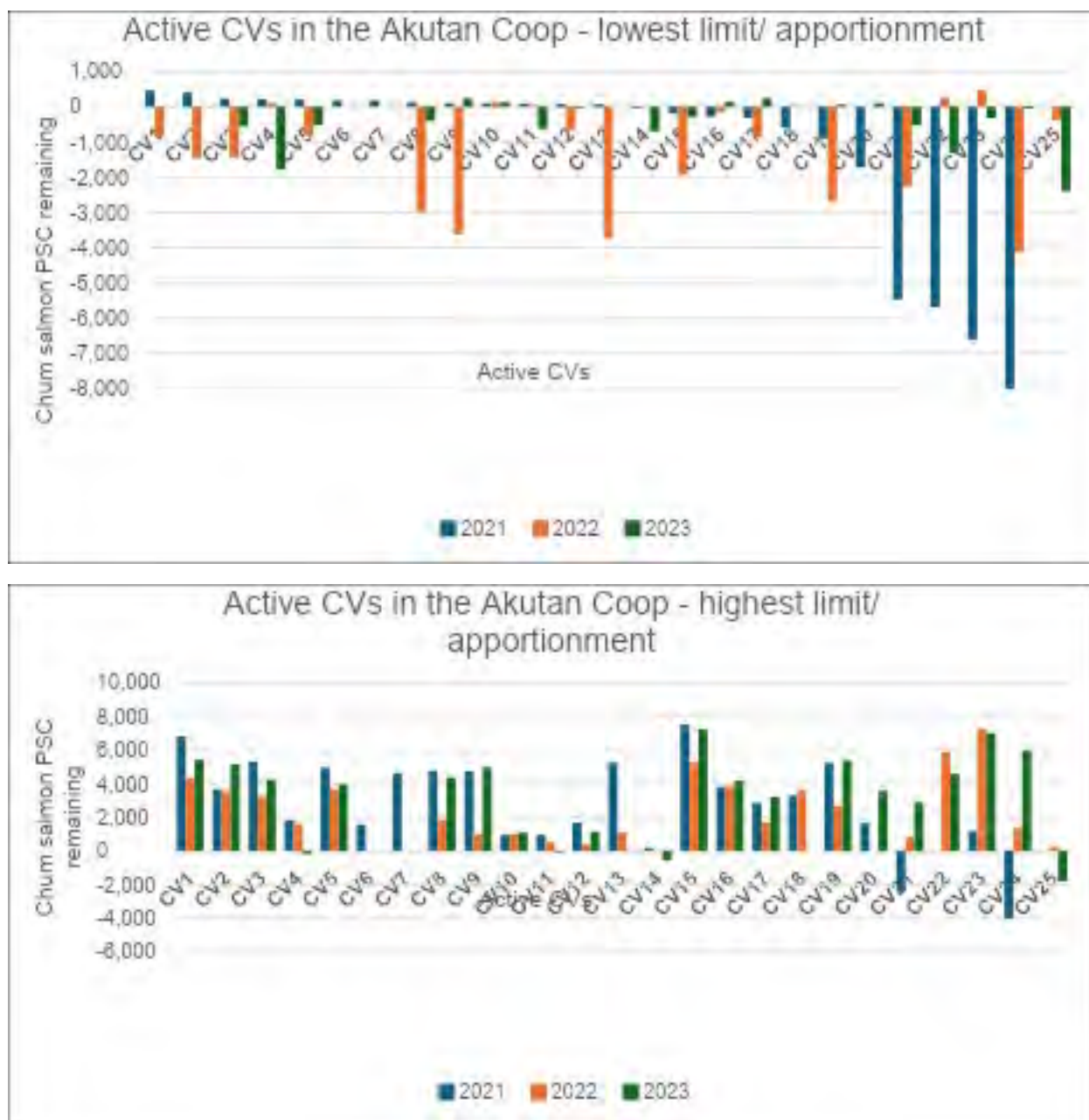


Figure A6-1 Akutan Cooperative: Potential vessel-level impacts for CVs active in the Bering Sea pollock B season, demonstrated by subtracting annual vessel-level chum salmon bycatch by a vessel-level PSC limit generated from the lowest PSC limit and apportionment (100,000 chum salmon and AFA apportionment; upper figure) and highest PSC limit and apportionment (550,000 chum salmon and 3-year avg apportionment; bottom figure), 2021-2023

Source: AFA Annual Catcher Vessel Inter-coop Reports, 2021-2023

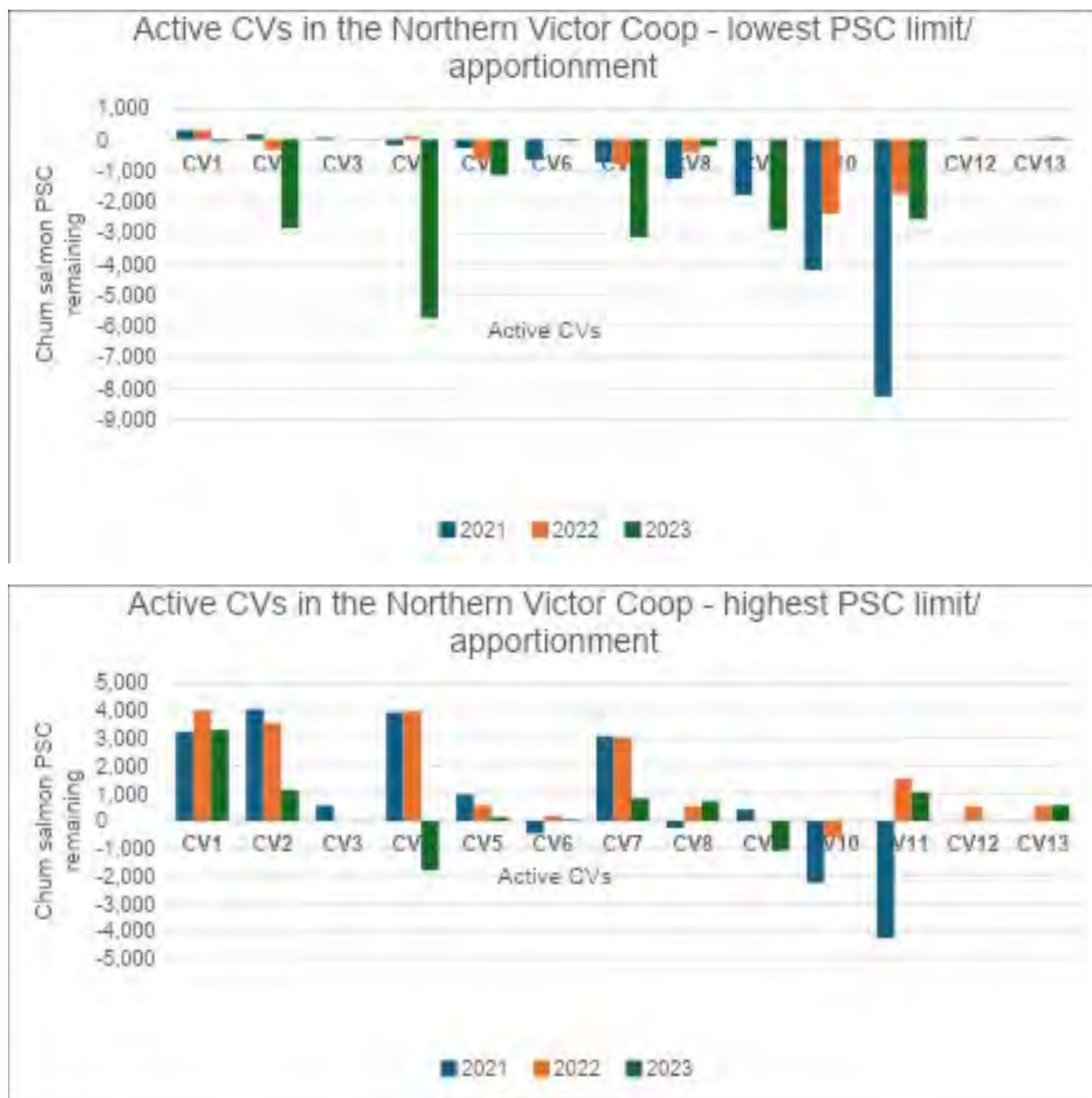


Figure A6-2 Northern Victor Cooperative: Potential vessel-level impacts for CVs active in the Bering Sea pollock B season, demonstrated by subtracting annual vessel-level chum salmon bycatch by a vessel-level PSC limit generated from the lowest PSC limit and apportionment (100,000 chum salmon and AFA apportionment; upper figure) and highest PSC limit and apportionment (550,000 chum salmon and 3-year avg apportionment; bottom figure), 2021-2023

Source: AFA Annual Catcher Vessel Inter-coop Reports, 2021-2023



Figure A6-3 Peter Pan Cooperative: Potential vessel-level impacts for CVs active in the Bering Sea pollock B season, demonstrated by subtracting annual vessel-level chum salmon bycatch by a vessel-level PSC limit generated from the lowest PSC limit and apportionment (100,000 chum salmon and AFA apportionment; upper figure) and highest PSC limit and apportionment (550,000 chum salmon and 3-year avg apportionment; bottom figure), 2021-2023

Source: AFA Annual Catcher Vessel Inter-coop Reports, 2021-2023



Figure A6-4 Unalaska Cooperative: Potential vessel-level impacts for CVs active in the Bering Sea pollock B season, demonstrated by subtracting annual vessel-level chum salmon bycatch by a vessel-level PSC limit generated from the lowest PSC limit and apportionment (100,000 chum salmon and AFA apportionment; upper figure) and highest PSC limit and apportionment (550,000 chum salmon and 3-year avg apportionment; bottom figure), 2021-2023

Source: AFA Annual Catcher Vessel Inter-coop Reports, 2021-2023

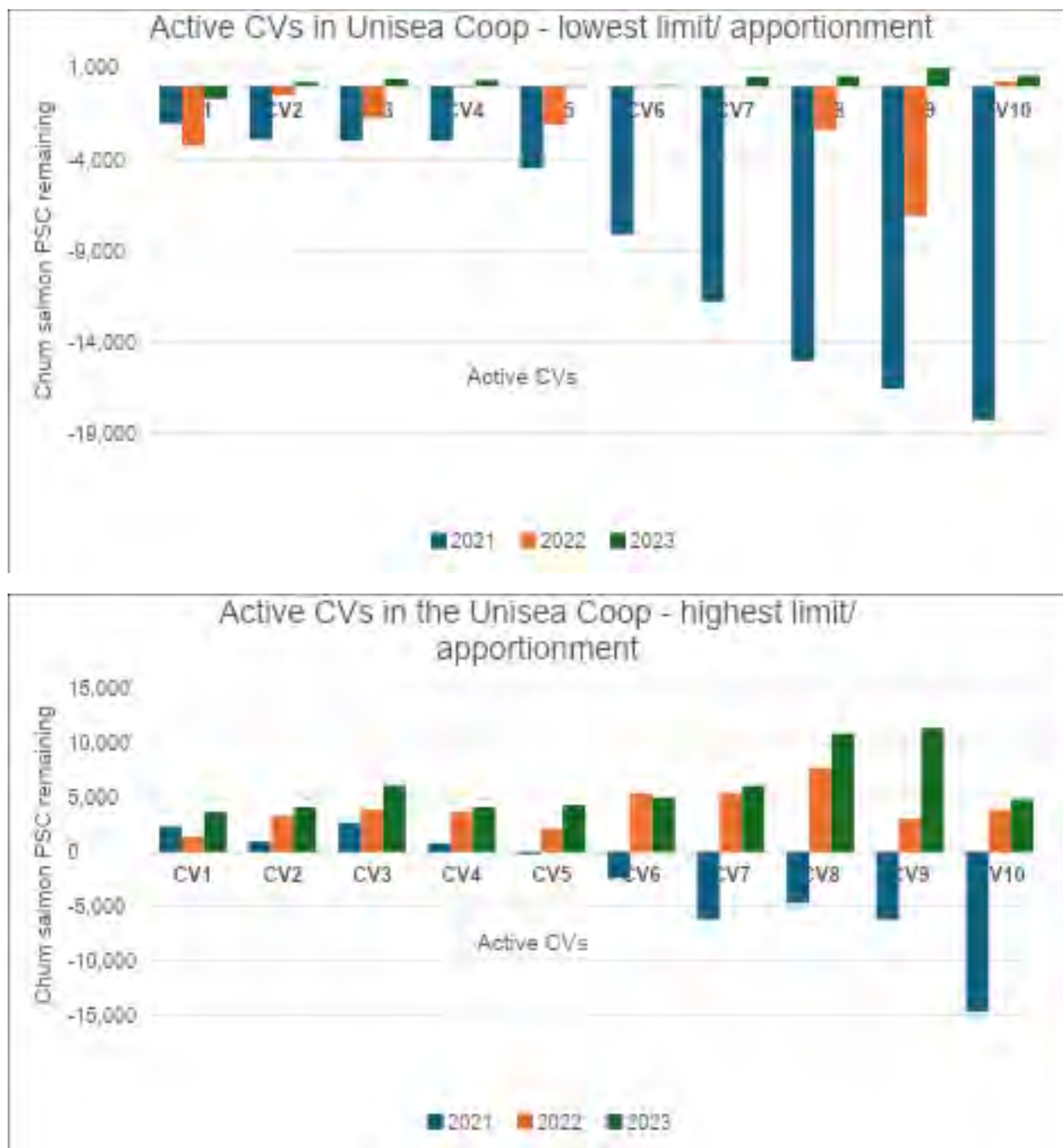


Figure A6-5 Unisea Cooperative: Potential vessel-level impacts for CVs active in the Bering Sea pollock B season, demonstrated by subtracting annual vessel-level chum salmon bycatch by a vessel-level PSC limit generated from the lowest PSC limit and apportionment (100,000 chum salmon and AFA apportionment; upper figure) and highest PSC limit and apportionment (550,000 chum salmon and 3-year avg apportionment; bottom figure), 2021-2023

Source: AFA Annual Catcher Vessel Inter-coop Reports, 2021-2023

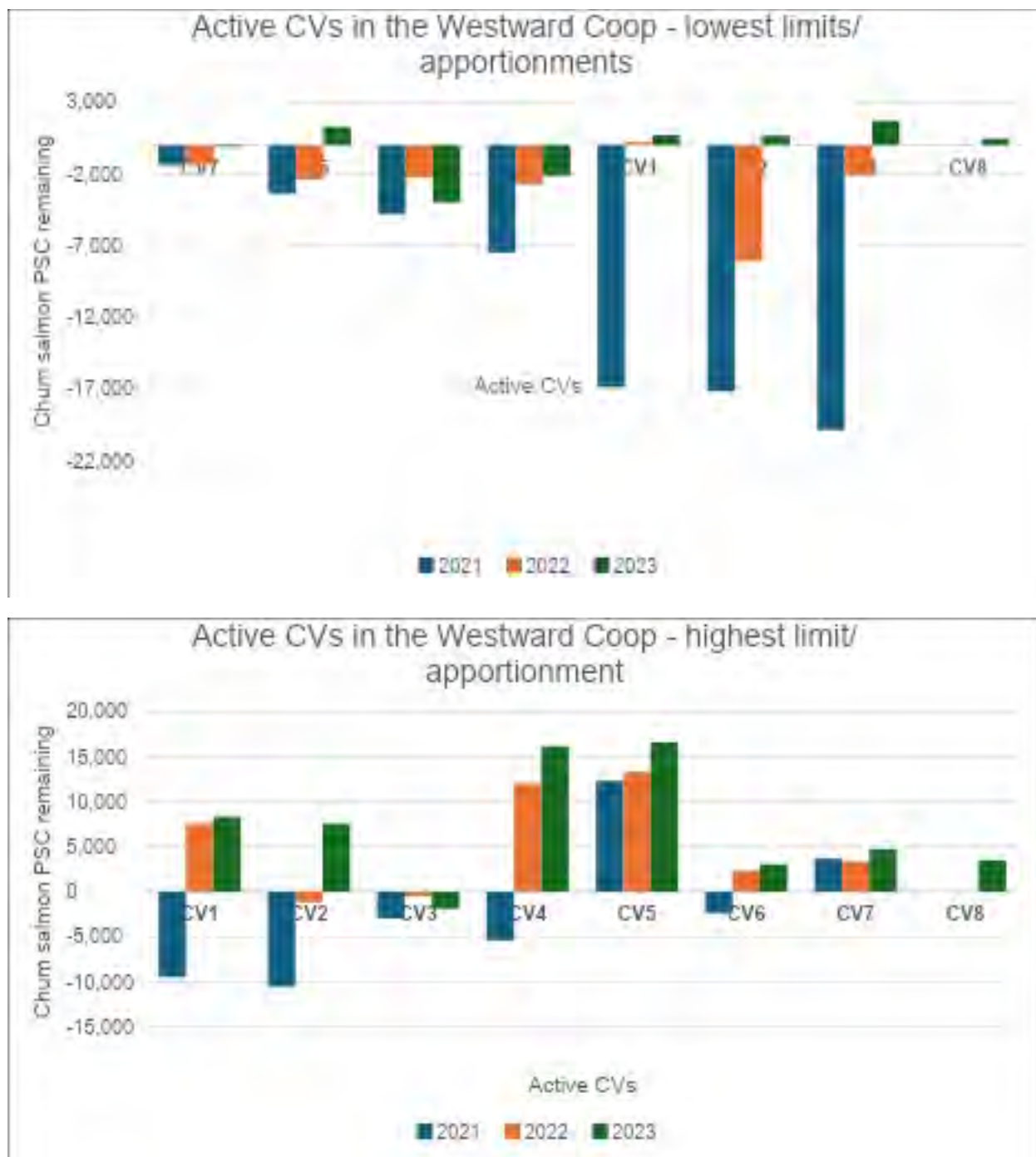


Figure A6-6 Westward Cooperative: Potential vessel-level impacts for CVs active in the Bering Sea pollock B season, demonstrated by subtracting annual vessel-level chum salmon bycatch by a vessel-level PSC limit generated from the lowest PSC limit and apportionment (100,000 chum salmon and AFA apportionment; upper figure) and highest PSC limit and apportionment (550,000 chum salmon and 3-year avg apportionment; bottom figure), 2021-2023

Source: AFA Annual Catcher Vessel Inter-coop Reports, 2021-2023

Appendix 7: Additional Tables on Potentially Forgone Revenue and Revenue at Risk

This appendix provides supplemental tables related to Section 4.3 of the DEIS on potential impacts to the Bering Sea pollock fishery. These tables use the retrospective methods described in Section 3.1.4 to estimate the amount of pollock harvest and associated revenue that may be forgone if an overall chum salmon PSC limit had hypothetically been in place, 2011-2023. ‘Revenue at risk’ values are also provided using the same methods but in consideration of an inseason corridor limit (Alternative 5). Under any alternative considered these estimates are expected to represent an upper bound of gross revenue impacts, given the expectation that if implemented in the future, fishermen will work to prevent a closure to the extent that they are able.

Table A7-1 Upper bound of B season gross ex vessel revenue potentially forgone under Alternative 2 or 3 by pollock sector (millions of 2022 \$)

Cap	100,000				325,000				550,000			
Sector	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-year Average												
2011		\$40.9	\$18.0	\$54.6								
2012												
2013				\$33.5								
2014		\$34.8		\$56.0								
2015		\$26.2	\$6.4	\$48.7								
2016	\$8.2	\$81.7	\$15.4	\$47.0		\$43.9	\$4.7			\$14.6		
2017	\$17.3	\$65.7	\$14.3	\$71.5	\$14.7	\$58.4			\$14.7	\$48.0		
2018	\$24.8	\$92.9	\$20.3	\$97.8	\$22.5	\$67.3						
2019	\$9.8	\$44.5	\$14.7	\$92.4		\$25.6	\$5.6					
2020	\$5.9	\$31.0	\$7.7	\$55.2		\$7.5		\$11.0				
2021	\$17.9	\$46.4	\$16.3	\$80.1	\$17.9	\$30.3	\$12.1	\$63.5	\$17.9		\$4.0	
2022		\$8.3	\$6.8	\$25.1			\$0.1					
2023		\$0.8	\$11.0	\$16.5								
Option 2: 5-year Average												
2011		\$40.9	\$18.0	\$62.1								
2012												
2013				\$40.9								
2014		\$34.8		\$56.0								
2015		\$17.7	\$5.1	\$48.7								
2016	\$8.2	\$73.8	\$15.4	\$47.0		\$33.6	\$4.7					
2017	\$17.3	\$65.7	\$12.3	\$71.5	\$14.7	\$58.4			\$10.0	\$48.0		
2018	\$24.8	\$92.9	\$20.3	\$97.8	\$20.7	\$11.3						
2019	\$9.8	\$44.5	\$14.7	\$92.4		\$25.6	\$5.6					
2020	\$4.6	\$31.0	\$7.7	\$55.2				\$16.9				
2021	\$17.9	\$46.4	\$14.2	\$80.1	\$17.9	\$12.3	\$12.1	\$63.5	\$17.9			\$54.7
2022		\$8.3	\$6.8	\$25.1			\$0.1					
2023			\$11.0	\$23.5								
Option 3: Pro Rata												
2011		\$40.9	\$18.0	\$62.1								
2012												
2013				\$40.9								
2014		\$34.8		\$56.0								
2015		\$17.7	\$6.4	\$48.7								
2016	\$8.2	\$73.8	\$15.4	\$47.0		\$33.6	\$4.7					
2017	\$17.3	\$65.7	\$14.3	\$71.5	\$14.7	\$58.4			\$10.0	\$48.0		
2018	\$24.8	\$92.9	\$20.3	\$97.8	\$20.7	\$11.3						
2019	\$9.8	\$38.3	\$14.7	\$92.4		\$25.6	\$5.6					
2020	\$4.6	\$31.0	\$7.7	\$55.2				\$16.9				
2021	\$17.9	\$46.4	\$16.3	\$80.1	\$17.9	\$12.3	\$12.1	\$63.5	\$17.9		\$4.0	\$54.7
2022		\$8.3	\$6.8	\$25.1			\$0.1					
2023			\$11.0	\$23.5								
Option 4: AFA												
2011		\$3.5	\$18.0	\$90.1								
2012												
2013				\$50.9								
2014		\$15.8		\$56.0								
2015		\$2.1	\$6.4	\$48.7				\$22.9				
2016	\$6.4	\$61.4	\$15.4	\$57.1		\$14.6	\$4.7					
2017	\$17.3	\$58.4	\$14.3	\$71.5	\$14.7	\$48.0		\$8.6	\$10.0	\$0.8		
2018	\$24.8	\$85.8	\$20.3	\$106.9								
2019	\$5.0	\$31.6	\$14.7	\$108.3			\$5.6	\$13.3				
2020		\$20.8	\$7.7	\$55.2				\$36.9				
2021	\$17.9	\$46.4	\$16.3	\$89.3	\$17.9		\$12.1	\$63.5	\$0.8		\$8.5	\$54.7
2022		\$8.3	\$6.8	\$35.9			\$0.1					
2023			\$11.0	\$30.7								

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Table A7-2 Upper bound of B season gross first wholesale revenue potentially forgone under Alternative 2 or 3 by pollock fishing sector (millions of 2022 \$)

Cap	100,000				325,000				550,000			
Sector	CD Q	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-year Average												
2011		\$139.5	\$61.5	\$164.0								
2012												
2013				\$100.1								
2014		\$107.5		\$164.1								
2015		\$82.5	\$20.1	\$133.2								
2016	\$28.8	\$286.4	\$54.3	\$146.3		\$153.4	\$16.4			\$50.9		
2017	\$63.4	\$238.8	\$52.5	\$210.0	\$53.7	\$212.1			\$53.7	\$174.1		
2018	\$77.2	\$288.6	\$63.3	\$281.2	\$70.0	\$209.1						
2019	\$35.0	\$158.5	\$52.3	\$294.3		\$90.8	\$19.9					
2020	\$19.0	\$99.3	\$24.4	\$145.5		\$23.9		\$28.2				
2021	\$57.5	\$148.8	\$52.1	\$225.5	\$57.5	\$97.1	\$38.8	\$178.7	\$57.5		\$12.9	
2022		\$25.7	\$20.9	\$72.9			\$0.2					
2023		\$2.7	\$35.0	\$57.9								
Option 2: 5-year Average												
2011		\$139.5	\$61.5	\$186.3								
2012												
2013				\$121.8								
2014		\$107.5		\$164.1								
2015		\$55.8	\$15.9	\$133.2								
2016	\$28.8	\$258.4	\$54.3	\$146.3		\$117.6	\$16.4					
2017	\$63.4	\$238.8	\$44.9	\$210.0	\$53.7	\$212.1			\$36.6	\$174.1		
2018	\$77.2	\$288.6	\$63.3	\$281.2	\$64.6	\$35.2						
2019	\$35.0	\$158.5	\$52.3	\$294.3		\$90.8	\$19.9					
2020	\$14.8	\$99.3	\$24.4	\$145.5				\$43.6				
2021	\$57.5	\$148.8	\$45.6	\$225.5	\$57.5	\$39.5	\$38.8	\$178.7	\$57.5			\$153.8
2022		\$25.7	\$20.9	\$72.9			\$0.2					
2023			\$35.0	\$81.3								
Option 3: Pro Rata												
2011		\$139.5	\$61.5	\$186.3								
2012												
2013				\$121.8								

2014		\$107.5		\$164.1								
2015		\$55.8	\$20.1	\$133.2								
2016	\$28.8	\$258.4	\$54.3	\$146.3		\$117.6	\$16.4					
2017	\$63.4	\$238.8	\$52.5	\$210.0	\$53.7	\$212.1		\$36.6	\$174.1			
2018	\$77.2	\$288.6	\$63.3	\$281.2	\$64.6	\$35.2						
2019	\$35.0	\$136.1	\$52.3	\$294.3		\$90.8	\$19.9					
2020	\$14.8	\$99.3	\$24.4	\$145.5				\$43.6				
2021	\$57.5	\$148.8	\$52.1	\$225.5	\$57.5	\$39.5	\$38.8	\$178.7	\$57.5	\$12.9	\$153.8	
2022		\$25.7	\$20.9	\$72.9			\$0.2					
2023			\$35.0	\$81.3								
Option 4: AFA												
2011		\$11.7	\$61.5	\$269.7								
2012												
2013				\$150.5								
2014		\$48.9		\$164.1								
2015		\$6.5	\$20.1	\$133.2				\$64.9				
2016	\$22.4	\$214.7	\$54.3	\$177.4		\$50.9	\$16.4					
2017	\$63.4	\$212.1	\$52.5	\$210.0	\$53.7	\$174.1		\$26.7	\$36.6	\$2.9		
2018	\$77.2	\$266.8	\$63.3	\$307.0								
2019	\$17.7	\$112.2	\$52.3	\$345.8			\$19.9	\$43.7				
2020		\$66.5	\$24.4	\$145.5				\$95.6				
2021	\$57.5	\$148.8	\$52.1	\$251.1	\$57.5		\$38.8	\$178.7	\$2.7	\$27.2	\$153.8	
2022		\$25.7	\$20.9	\$104.2			\$0.2					
2023			\$35.0	\$105.0								

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Table A7-3 Percent of the B season gross ex vessel revenue potentially forgone under Alternative 2 or 3

Cap	100,000				325,000				550,000			
Sector	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-year Average												
2011		36%	60%	40%								
2012												
2013				25%								
2014		31%		40%								
2015		23%	23%	35%								
2016	28%	78%	60%	36%		42%	18%			14%		
2017	65%	69%	61%	59%	55%	61%			55%	50%		
2018	83%	90%	78%	73%	76%	65%						
2019	34%	43%	58%	72%		25%	22%					
2020	25%	34%	30%	44%		8%		9%				
2021	63%	47%	66%	64%	63%	31%	49%	51%	63%		16%	
2022		9%	28%	21%								
2023		1%	48%	14%								
Option 2: 5-year Average												
2011		36%	60%	45%								
2012												
2013				30%								
2014		31%		40%								
2015		16%	18%	35%								
2016	28%	71%	60%	36%		32%	18%					
2017	65%	69%	53%	59%	55%	61%			38%	50%		
2018	83%	90%	78%	73%	70%	11%						
2019	34%	43%	58%	72%		25%	22%					
2020	19%	34%	30%	44%				14%				
2021	63%	47%	57%	64%	63%	13%	49%	51%	63%			44%
2022		9%	28%	21%								
2023			48%	20%								
Option 3: Pro Rata												
2011		36%	60%	45%								
2012												
2013				30%								
2014		31%		40%								
2015		16%	23%	35%								
2016	28%	71%	60%	36%		32%	18%					
2017	65%	69%	61%	59%	55%	61%			38%	50%		
2018	83%	90%	78%	73%	70%	11%						
2019	34%	37%	58%	72%		25%	22%					
2020	19%	34%	30%	44%				14%				
2021	63%	47%	66%	64%	63%	13%	49%	51%	63%		16%	44%
2022		9%	28%	21%								
2023			48%	20%								
Option 4: AFA												
2011		3%	60%	66%								
2012												
2013				38%								
2014		14%		40%								
2015		2%	23%	35%				16%				
2016	21%	59%	60%	44%		14%	18%					
2017	65%	61%	61%	59%	55%	50%		7%	38%	1%		
2018	83%	83%	78%	79%								
2019	17%	31%	58%	84%			22%	10%				
2020		22%	30%	44%			0%	30%				
2021	63%	47%	66%	71%	63%		49%	51%	3%		34%	44%
2022		9%	28%	30%								
2023			48%	26%								

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Table A7-4 Percent of the B season gross first wholesale revenue potentially forgone under Alternative 2 or 3

Cap	100,000				325,000				550,000			
Sector	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-year Average												
2011		36%	60%	40%								
2012												
2013				25%								
2014		31%		40%								
2015		23%	23%	35%								
2016	28%	78%	60%	37%		42%	18%			14%		
2017	65%	69%	61%	59%	55%	61%			55%	50%		
2018	83%	90%	78%	73%	76%	65%						
2019	34%	43%	58%	71%		25%	22%					
2020	25%	33%	30%	44%		8%	0%	8%				
2021	63%	47%	66%	64%	63%	31%	49%	51%	63%		16%	
2022		9%	28%	21%								
2023		1%	47%	14%								
Option 2: 5-year Average												
2011		36%	60%	45%								
2012												
2013				31%								
2014		31%		40%								
2015		16%	18%	35%								
2016	28%	71%	60%	37%		32%	18%					
2017	65%	69%	52%	59%	55%	61%			38%	50%		
2018	83%	90%	78%	73%	70%	11%						
2019	34%	43%	58%	71%		25%	22%					
2020	19%	33%	30%	44%				13%				
2021	63%	47%	58%	64%	63%	13%	49%	51%	63%			44%
2022		9%	28%	21%								
2023			47%	20%								
Option 3: Pro Rata												
2011		3%	60%	66%								
2012												
2013				38%								
2014		14%		40%								
2015		2%	23%	35%				17%				
2016	21%	59%	60%	45%		14%	18%					
2017	65%	61%	61%	59%	55%	50%		8%	38%	1%		
2018	83%	83%	78%	79%								
2019	17%	31%	58%	84%			22%	11%				
2020		22%	30%	44%				29%				
2021	63%	47%	66%	71%	63%		49%	51%	3%		34%	44%
2022		9%	28%	30%								
2023			47%	26%								
Option 4: AFA												
2011		36%	60%	45%								
2012												
2013				31%								
2014		31%		40%								
2015		16%	23%	35%								
2016	28%	71%	60%	37%		32%	18%					
2017	65%	69%	61%	59%	55%	61%			38%	50%		
2018	83%	90%	78%	73%	70%	11%						
2019	34%	37%	58%	71%		25%	22%					
2020	19%	33%	30%	44%				13%				

2021	63%	47%	66%	64%	63%	13%	49%	51%	63%	16%	44%
2022		9%	28%	21%							
2023			47%	20%							

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Table A7-5 Upper bound of potentially forgone gross ex vessel revenue across sectors under Alternative 2 or 3 (millions of 2022 \$)

PSC Limit	100,000				325,000				550,000			
Apportionment	3-yr average	5-yr average	AFA	Pro-rata	3-yr average	5-yr average	AFA	Pro-rata	3-yr average	5-yr average	AFA	Pro-rata
2011	\$114	\$121	\$112	\$121	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2012	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2013	\$33	\$41	\$51	\$41	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2014	\$91	\$91	\$72	\$91	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2015	\$81	\$71	\$57	\$73	\$0	\$0	\$23	\$0	\$0	\$0	\$0	\$0
2016	\$152	\$144	\$140	\$144	\$49	\$38	\$19	\$38	\$15	\$0	\$0	\$0
2017	\$169	\$167	\$162	\$169	\$73	\$73	\$71	\$73	\$63	\$58	\$11	\$58
2018	\$236	\$236	\$238	\$236	\$90	\$32	\$0	\$32	\$0	\$0	\$0	\$0
2019	\$161	\$161	\$160	\$155	\$31	\$31	\$19	\$31	\$0	\$0	\$0	\$0
2020	\$100	\$99	\$84	\$99	\$18	\$17	\$37	\$17	\$0	\$0	\$0	\$0
2021	\$161	\$159	\$170	\$161	\$124	\$106	\$93	\$106	\$22	\$73	\$64	\$77
2022	\$40	\$40	\$51	\$40	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2023	\$28	\$35	\$42	\$35	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Average	\$105	\$105	\$103	\$105	\$30	\$23	\$20	\$23	\$8	\$10	\$6	\$10
Median	\$100	\$99	\$84	\$99	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Table A7-6 Upper bound of potentially forgone gross first wholesale revenue across sectors under Alternative 2 or 3 (millions of 2022 \$)

PSC Limit	100,000				325,000				550,000			
Apportionment	3-yr average	5-yr average	AFA	Pro-rata	3-yr average	5-yr average	AFA	Pro-rata	3-yr average	5-yr average	AFA	Pro-rata
2011	\$365	\$387	\$343	\$387	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2012	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2013	\$100	\$122	\$151	\$122	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2014	\$272	\$272	\$213	\$272	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2015	\$236	\$205	\$160	\$209	\$0	\$0	\$65	\$0	\$0	\$0	\$0	\$0
2016	\$516	\$488	\$469	\$488	\$170	\$134	\$67	\$134	\$51	\$0	\$0	\$0
2017	\$565	\$557	\$538	\$565	\$266	\$266	\$255	\$266	\$228	\$211	\$39	\$211
2018	\$710	\$710	\$714	\$710	\$279	\$100	\$0	\$100	\$0	\$0	\$0	\$0
2019	\$540	\$540	\$528	\$518	\$111	\$111	\$64	\$111	\$0	\$0	\$0	\$0
2020	\$288	\$284	\$236	\$284	\$52	\$44	\$96	\$44	\$0	\$0	\$0	\$0
2021	\$484	\$477	\$510	\$484	\$372	\$315	\$275	\$315	\$70	\$211	\$184	\$224
2022	\$120	\$120	\$151	\$120	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2023	\$96	\$116	\$140	\$116	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Average	\$330	\$329	\$319	\$329	\$96	\$75	\$63	\$75	\$27	\$32	\$17	\$33
Median	\$288	\$284	\$236	\$284	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Table A7-7 Gross ex vessel revenue at risk under Alternative 5, suboption 1, 2011-2023 (millions of 2022\$)

Cap: Sector:	50,000				200,000				350,000			
	CDQ	CP	M	CV	CDQ	CP	M	CV	CDQ	CP	M	CV
Option 1: 3-year Average												
2011			\$3.0	\$23.1								
2012												
2013				\$25.2								
2014				\$7.9								
2015				\$4.4								
2016	\$4.3	\$31.8	\$3.5	\$3.3		\$18.6	\$2.3			\$6.2		
2017	\$9.0	\$32.0	\$0.2	\$15.4	\$6.4	\$27.5		\$0.6	\$6.4	\$22.8		
2018	\$1.4	\$9.6	\$1.7	\$21.4		\$2.9						
2019		\$2.8		\$5.6								
2020				\$0.04								
2021	\$4.0	\$1.2	\$5.9	\$30.7	\$0.2	\$1.2	\$4.8	\$19.4	\$0.2	\$1.2	\$4.8	\$14.8
2022		\$8.6	\$1.6	\$12.5								
2023				\$3.1								
Option 2: 5-year Average												
2011			\$4.1	\$23.1								
2012												
2013				\$25.2								
2014				\$7.9								
2015				\$4.4								
2016	\$5.2	\$31.8	\$4.6	\$3.3	\$0.1	\$18.6	\$3.0			\$6.2		
2017	\$9.0	\$32.0	\$0.2	\$15.4	\$9.0	\$22.8		\$0.6	\$6.4	\$22.8		
2018	\$1.4	\$9.6	\$1.7	\$21.4	\$0.2	\$2.9						
2019		\$2.8		\$5.6								
2020				\$0.0								
2021	\$4.0	\$1.2	\$6.7	\$30.7	\$0.2	\$1.2	\$4.8	\$19.4	\$0.2	\$1.2	\$4.8	\$14.8
2022		\$3.2	\$1.6	\$12.5								
2023				\$3.1								
Option 3: Pro Rata												
2011			\$3.0	\$24.6								
2012												
2013				\$25.2								
2014				\$14.2								
2015				\$6.1								
2016	\$4.3	\$27.0	\$3.5	\$3.3		\$6.2	\$2.3			\$6.2		
2017	\$9.0	\$32.0	\$0.2	\$15.4	\$6.4	\$22.8		\$3.2	\$6.4	\$22.8		
2018	\$1.4	\$9.6	\$1.7	\$21.4								
2019		\$2.8		\$5.6								
2020				\$1.4								
2021	\$4.0	\$1.2	\$6.7	\$30.7	\$0.2	\$1.2	\$4.8	\$19.4	\$0.2		\$4.8	\$19.4
2022		\$1.6	\$1.6	\$12.5								
2023				\$3.1								
Option 4: AFA												
2011			\$4.1	\$26.4								
2012												
2013				\$42.3								
2014				\$14.2				\$1.7				
2015				\$6.1				\$0.9				
2016	\$4.3	\$22.8	\$4.6	\$6.3			\$2.3	\$1.3				
2017	\$9.0	\$27.5	\$0.2	\$15.4	\$6.4	\$22.8		\$10.4	\$6.4	\$12.1		
2018	\$1.4	\$4.5	\$1.7	\$21.4				\$6.7				
2019				\$7.9								
2020				\$1.4								
2021	\$4.0	\$1.2	\$6.7	\$31.2	\$0.2		\$4.8	\$23.4	\$0.2		\$4.8	\$19.4
2022			\$1.6	\$12.5				\$0.3				
2023				\$4.4								

Source: NMFS Alaska Region CAS, data compiled by AKFIN

Table A7-8 Gross first wholesale revenue at risk under Alternative 5, suboption 1, 2011-2023 (millions of 2022\$)

Cap: Sector:	50,000				200,000				350,000			
	CDQ	CP	M	S	CDQ	CP	M	S	CDQ	CP	M	S
Option 1: 3-year average												
2011			\$10.5	\$70.2								
2012												
2013				\$74.0								
2014				\$23.4								
2015				\$11.4								
2016	\$14.9	\$111.2	\$12.1	\$9.8		\$65.2	\$8.2			\$21.8		
2017	\$32.9	\$116.2	\$0.8	\$44.3	\$23.3	\$99.6		\$1.8	\$23.3	\$82.7		
2018	\$4.4	\$29.5	\$5.1	\$59.9		\$8.7						
2019		\$9.8		\$16.8								
2020				\$0.1								
2021	\$12.7	\$3.7	\$18.8	\$84.4	\$0.5	\$3.7	\$15.4	\$53.7	\$0.5	\$3.7	\$15.4	\$40.9
2022		\$26.4	\$4.8	\$36.8								
2023				\$10.7								
Option 2: 5-year average												
2011			\$14.2	\$70.2								
2012												
2013				\$74.0								
2014				\$23.4								
2015				\$11.4								
2016	\$18.1	\$111.2	\$16.1	\$9.8	\$0.5	\$65.2	\$10.6			\$21.8		
2017	\$32.9	\$116.2	\$0.8	\$44.3	\$32.9	\$82.7		\$1.8	\$23.3	\$82.7		
2018	\$4.4	\$29.5	\$5.1	\$59.9	\$0.5	\$8.7						
2019		\$9.8		\$16.8								
2020				\$0.1								
2021	\$12.7	\$3.7	\$21.6	\$84.4	\$0.5	\$3.7	\$15.4	\$53.7	\$0.5	\$3.7	\$15.4	\$40.9
2022		\$9.8	\$4.8	\$36.8								
2023				\$10.7								
Option 3: Pro Rata												
2011			\$10.5	\$74.7								
2012												
2013				\$74.0								
2014				\$42.0				\$4.9				
2015				\$15.7				\$2.3				
2016	\$14.9	\$94.6	\$12.1	\$9.8			\$8.2	\$4.1		\$21.8		
2017	\$32.9	\$116.2	\$0.8	\$44.3	\$23.3	\$82.7		\$30.2	\$23.3	\$82.7		
2018	\$4.4	\$29.5	\$5.1	\$59.9				\$18.5				
2019		\$9.8		\$16.8								
2020				\$3.8								
2021	\$12.7	\$3.7	\$21.6	\$84.4	\$0.5		\$15.4	\$64.7	\$0.5		\$15.4	\$53.7
2022		\$4.7	\$4.8	\$36.8				\$0.8				
2023				\$10.7								
Option 4: AFA												
2011			\$14.2	\$79.7								
2012												
2013				\$123.5								
2014				\$42.0								
2015				\$15.7								
2016	\$14.9	\$79.6	\$16.1	\$18.7		\$21.8	\$8.2					
2017	\$32.9	\$99.6	\$0.8	\$44.3	\$23.3	\$82.7		\$9.8	\$23.3	\$43.6		
2018	\$4.4	\$13.9	\$5.1	\$59.9								
2019				\$23.9								
2020				\$3.8								
2021	\$12.7	\$3.7	\$21.6	\$85.8	\$0.5	\$3.7	\$15.4	\$53.7	\$0.5		\$15.4	\$53.7
2022			\$4.8	\$36.8								
2023				\$15.7								

Source: NMFS Alaska Region CAS, data compiled by AKFIN



Appendix 8

Additional Information about Kuskokwim River Chum Salmon

Authored by the Kuskokwim River Inter-Tribal Fish Commission
Last updated: May 19, 2025

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Appendix At A Glance

- Kuskokwim chum salmon, historically one of the most abundant and reliable salmon species in the Kuskokwim region, have remained low since a dramatic decline in 2021.
- The stewardship relationship between Alaska Native people and Kuskokwim salmon has been intentionally developed and passed down across generations for millennia. Kuskokwim communities have harvested chum salmon for human and dog food, waterproof materials, sharing, and cultural activities associated with these uses.
- Since 2021, KRITFC and YDNWR have jointly developed salmon management and harvest strategies to guide their decision-making. The key principles of KRITFC-YDNWR co-stewardship can be used as a model for reimagining marine-life stage management of chum salmon for the benefit of the species, salmon-dependent communities, and the pursuit of the Purpose and Need of this action.
- Subsistence harvests of chum salmon across the Kuskokwim during 2020–2024 were the lowest since the 1960s, with record-low harvests in 2021 and 2022. Commercial chum salmon fisheries peaked in 1988 with a 2025 inflation-adjusted ex-vessel value exceeding \$10,760,000, and helped support local mixed subsistence-cash economies, but no longer operate.
- Increased reports of suicide, depression and anxiety, alcoholism and drug abuse, diet-related diseases, co-morbidities, and theft and vandalization in Kuskokwim communities can be linked with the legacies of colonization that have contributed to losses of traditional ways of life and traditional foods, including chum salmon.
- Many factors accumulate together and over time to drive chum salmon declines, including wasting fish, conflicts over fish and management practices, loss of traditional ways of life/education/stewardship, excessive overharvest of fish, and disruption of marine food webs and ocean-to-rivers ecosystems.
- Rebuilding chum salmon stock abundance is impossible without recognizing that many drivers of declines can be mitigated by changes to fisheries management.
- Through generations, localized salmon populations become uniquely adapted to their natal streams. These can be considered discrete spawning populations. Particularly when facing low stock abundance and high removal levels, the return of a single chum salmon can support the viability of a discrete spawning population.
- Every chum salmon removed is a salmon that cannot complete its life cycle and spawn, pass on climate resilience genetics to its offspring, help rebuild stock abundance and maintain discrete spawning populations, and support the continuation of subsistence fishing traditions.
- Large-scale industrial trawl fisheries have altered North Pacific food webs and habitat, inducing a trophic cascade of negative impacts throughout the marine ecosystem. Because the Kuskokwim’s freshwater ecosystem is connected to that of the North Pacific—especially through anadromous salmon—these impacts extend into the headwaters of the river system in throughout the Interior region of Alaska.
- The exclusion of Indigenous people and their values and knowledge systems from modern fisheries management has contributed to chum salmon stock declines.
- The marine salmon management emphasis on Maximum Sustainable Yield and Optimum Yield directly conflicts with, and contradicts, Indigenous stewardship of traditional foods.

- The erasure of Indigenous salmon management is anthropogenic in nature and can be corrected, particularly through the pursuit of co-management and Indigenous-led management with Alaska Tribal Nations and (inter-)Tribal organizations to uplift gravel-to-gravel salmon stewardship and conservation
- Ongoing research projects by NOAA’s Auke Bay Lab, University of Alaska Fairbanks, and Bristol Bay Science and Research Institute have the potential for improving genetic stock resolution for WAK chum salmon populations and improving real-time chum salmon bycatch avoidance in the Bering Sea.

1. Introduction and Acknowledgements

This appendix was authored by the Kuskokwim River Inter-Tribal Fish Commission (KRITFC) as a cooperating agency to this Environmental Impact Statement process. It was last updated on May 19, 2025. The intent of this appendix is to provide additional information to decision makers and the public about Kuskokwim chum salmon; Kuskokwim Tribes and fisheries co-stewardship, Kuskokwim community dependence on chum salmon, and Tribal analyses of factors cumulatively contributing to chum salmon declines.

While this appendix focuses on chum salmon in the Kuskokwim River region, KRITFC is acutely aware that other watersheds throughout the state, and particularly in Western and Interior Alaska, are facing similar multi-year, multi-species salmon disasters. Alaska Native communities in each of these regions are suffering resounding impacts to their holistic health and well-being and the dissolution of generations-old cultures and traditions. Ecosystems across Alaska are missing or seeing reductions in keystone species that, for thousands of years, have uniquely connected the rivers to the seas. The KRITFC additionally acknowledges that experiences with and impacts from salmon declines vary within the Kuskokwim region and are felt uniquely by each community, family, and individual.

This appendix is not meant to be a complaint or to dismiss gratitude for the salmon and fish families are able to harvest on the Kuskokwim River, nor is this appendix fully comprehensive to the community-, region-, or species-level. Rather, KRITFC hopes this document elevates the knowledge of Kuskokwim Tribal fishers, managers, Elders, and communities so effective, equitable, and meaningful action can take place for the benefit of Kuskokwim salmon, people, and their interwoven ways of life.

Please reach out to KRITFC’s leads for additional information or with questions: Terese Vicente, Policy & Programs Director (terese@kritfc.org), and Kevin Whitworth, Executive Director (kevinwhitworth@kritfc.org).

2. Chum Salmon of the Kuskokwim River

Located south of the Yukon River and north of Bristol Bay, the Kuskokwim River stretches more than 700 miles from the southwestern coast of Alaska into the interior region south of Denali National Park. Throughout its course, the Kuskokwim provides life, nutrients, and habitat for myriad species of vegetation, berries, flowers, land and marine mammals, migratory and resident birds, and freshwater and ocean fish. Of these species, salmon provide a key link between the marine and freshwater ecosystems.

The Kuskokwim River is known for prolific Pacific salmon runs. Substantial populations of Chinook, chum, coho, and sockeye salmon—and to a lesser extent, pink salmon—also spawn and are harvested in the watershed. While these species all provide critical ecosystem services for the Kuskokwim region, this document focuses on chum salmon for this draft Environmental Impact Statement (DEIS) analysis and the Council’s established Purpose and Need.

Historically, chum salmon were one of the most abundant and reliable species of salmon in the Kuskokwim region. While no total return estimates exist for chum salmon on the Kuskokwim, a sonar that operated from 1980 to 2010 at the mouth of the Aniak River drainage—a middle Kuskokwim tributary with one of the highest chum salmon productivities in the watershed—provides some indication at historical chum salmon abundance. During its 30-year operation, an annual average of 400,000 salmon spawners, understood to be mostly chum salmon, returned to the Aniak River; in 1980, its first year of operation, the sonar counted a passage of over 1,169,400 chum salmon (Figure 1; AYKDBMS 2024).

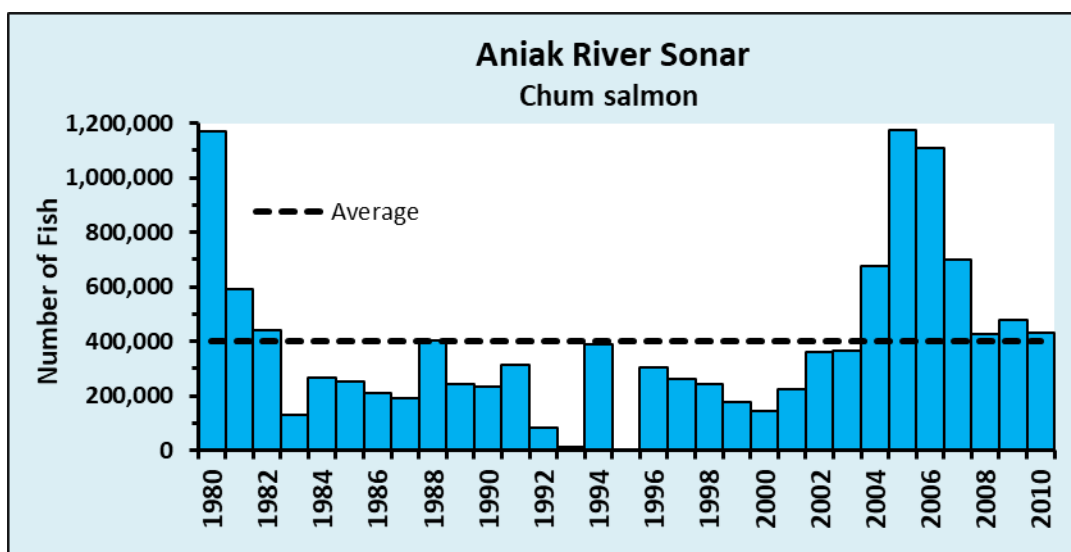


Figure 1. Aniak River sonar salmon passage, understood to be mostly chum salmon, 1980-2010 compared to 30-year average (dashed line). Note: No data available in 1995. Source: AYKDBMS.

When factoring in subsistence harvests, commercial harvests, and returns to other tributaries, annual chum salmon returns to the Kuskokwim in periods of abundance may have averaged around 1 million fish. These returns bring millions of pounds of marine-derived nutrients to support ecosystem biodiversity in the Kuskokwim region (see DEIS Sections 4.4.3.2.3 and 4.5.5.3.2).

As discussed in this DEIS and elsewhere (e.g., KRITFC 2021, 2023, 2024), **Kuskokwim chum salmon abundance dramatically declined in 2021 and has since remained low.** Estimates at Kuskokwim River assessment projects, including the George River and Kogruluk River weirs and Kuskokwim River sonar, showed marginal improvement in 2024 compared to recent years, but counts are still well-below historic levels (Figure 2).

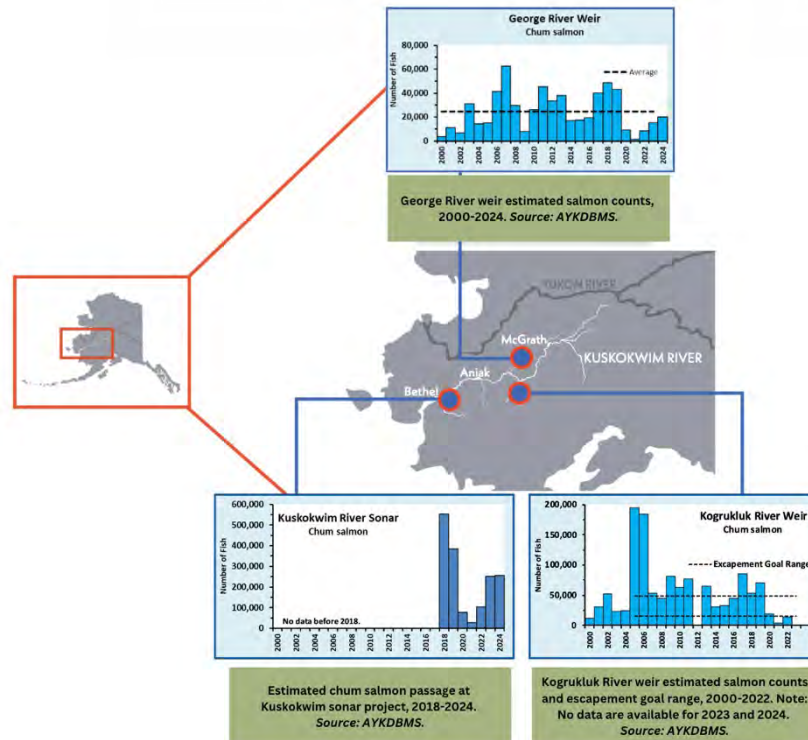


Figure 2. Chum salmon abundance at the George River weir, Kogrukluk River weir, and Kuskokwim River sonar, through 2024. Note: Sonar data is available beginning 2018, and no data are available from the Kogrukluk River weir in 2023 and 2024. Source: AYKDBMS.

3. Tribal Nations and Fisheries Co-Stewardship on the Kuskokwim River

➤ 3.A. Ancestral Communities' Relationships with Chum Salmon

Human communities have inhabited and harvested salmon in the Yukon-Kuskokwim region for over 11,000 years (Halffman et al. 2015). In the Kuskokwim region, archaeological evidence shows Indigenous humans from the coast at Nunalleq (Quinhagak) to the interior headwaters at Tochak' (McGrath) have relied on salmon for at least 800 years, although oral tradition and Traditional Knowledge (TK) date this relationship back much further (KUAC 2013; Nunalleq 2024). The stewardship relationship between Alaska Native people and Kuskokwim salmon—careful and respectful harvest, preparation, consumption, and celebration of annual, reliable runs of fish—has been intentionally developed and passed down across generations.

Four major ethnolinguistic groups of people call the Kuskokwim watershed home: the Central Yupiit, Deg Xit'an, Stony River Dena'ina, and Upper Kuskokwim Athabascan (see DEIS Section 4.4.3.2, Figure 4-24). Each group has its own distinct language with its own name for chum salmon, signifying the extent to which this species is a key part of the life and language—the cultural foundation—of these people across the Kuskokwim River's extent (Table 1).

Table 1. Common names for chum salmon on the Kuskokwim, languages of these names, and regional cultural and geographic ties associated with the language/name.

Name	Language	Cultural & Geographic Ties
<i>Iqalluk, Kangitneq</i>	Yugtun	Central Yupiit peoples of the lower and middle Kuskokwim
<i>Nalay</i>	Deg Xinag	Deg Xit'an peoples of the middle and upper Kuskokwim
<i>Alima</i>	Tanaina	Dena'ina peoples of Lime Village and the Stony River region
<i>Srughot'aye</i>	Dinak'i	Upper Kuskokwim Athabaskan peoples in the headwaters of the Kuskokwim
<i>Oncorhynchus keta</i>	Latin	Western scientific researchers and agencies throughout the Kuskokwim
Chum salmon	English	English speakers throughout the Kuskokwim
Dog salmon	English	English speakers throughout the Kuskokwim

➤ 3.B. Kuskokwim River Tribes and the Inter-Tribal Fish Commission

Forty federally recognized Tribal Nations have cultural and traditional ties to salmon in the Kuskokwim drainage. The total census population across these communities is 18,550 as of 2024 (Table 2; Alaska Department of Labor and Workforce Development 2025). Most rural residents of these communities, the majority of whom are Tribal citizens, are impacted by recent ongoing declines of multiple species of salmon, including chum salmon. Furthermore, each Tribal citizen in these communities has a unique and ancestral relationship with chum (and other) salmon.

Listed from coast to headwaters, these are: Newtok Village (Mertarvik), Native Village of Tununak, Nunakauyarmiut (Toksook Bay), Native Village of Nightmute, Native Village of Mekoryuk, ***Village of Chefornak***, *Native Village of Kipnuk*, ***Native Village of Kwigillingok***, *Native Village of Kongiganak*, Platinum Traditional Village, Native Village of Goodnews Bay, ***Native Village of Kwinhagak (Quinhagak)***, ***Native Village of Tuntutuliak***, ***Native Village of Eek***, ***Native Village of Napakiak***, ***Native Village of Napaskiak***, ***Kasigluk Traditional Elders Council***, ***Native Village of Nunapitchuk***, ***Village of Atmautluak***, *Oscarville Traditional Village*, ***Orutsararmiut Traditional Native Council (Bethel)***, ***Organized Village of Kwethluk***, ***Akiachak Native Community***, ***Akiak Native Community***, ***Tuluksak Native Community***, ***Village of Lower Kalskag***, ***Village of Kalskag***, ***Village of Aniak***, ***Native Village of Chuathbaluk***, ***Native Village of Napaimute***, ***Village of Crooked Creek***, ***Native Village of Georgetown***, *Village of Red Devil*, ***Village of Sleetmute***, ***Village of Stony River***, *Lime Village*, ***Takotna Village***, ***McGrath Native Village***, ***Telida Village***, and ***Nikolai Edzeno' Village***.

Of these Tribes, 33 Tribes (italicized) were originally invited to join KRITFC because of their direct geographical connection to the Kuskokwim drainage, and 28 of those Tribes (bolded and italicized) have ratified KRITFC's constitution, joined its compact, and appointed a Commissioner to represent the Tribe.

Table 2. 2024 census data in communities with customary and traditional ties to salmon in the Kuskokwim drainage. Source: Alaska Department of Labor and Workforce Development, 2025. Note: Some Tribal leaders have noted these census data do not capture the full population sizes of communities and should thus be taken as underestimates (M. Andrew, pers. comm., April 2025).

Tribe/Village City Community	City/Community Census Data		Tribe/Village	City/Community Census Data
Newtok Village/Mertarvik	278*		Orutsararmiut Traditional Native Council/Bethel	6,022
Native Village of Tununak	396		Organized Village of Kwethluk	845
Nunakauyarmiut/Toksook Bay	633		Akiachak Native Community	716
Native Village of Nightmute	284		Akiak Native Community	503
Native Village of Mekoryuk	197		Tuluksak Native Community	465
Village of Chefornek	508		Village of Lower Kalskag	250
Native Village of Kipnuk	714		Village of Kalskag/Upper Kalskag	192
Native Village of Kwigillingok	377		Village of Aniak	426
Native Village of Kongiganak	526		Native Village of Chuathbaluk	85
Platinum Traditional Village	66		Native Village of Napaimute	N/A
Native Village of Goodnews Bay	237		Village of Crooked Creek	98
Native Village of Kwinhagak	800		Native Village of Georgetown	N/A
Native Village of Tuntutuliak	490		Village of Red Devil	17
Native Village of Eek	413		Village of Sleetmute	70
Native Village of Napakiak	325		Village of Stony River	61
Native Village of Napaskiak	489		Lime Village	9
Kasigluk Traditional Elders Council	670		Takotna Village	43
Native Village of Nunapitchuk	555		McGrath Native Village	264
Village of Atmautluak	367		Telida Village	N/A
Oscarville Traditional Village	75		Nikolai Edzeno' Village	84
TOTAL	18,550			

N/A = no data available.

*City Census Data combines census data for Newtok and Mertarvik cities, recognizing the Newtok community's relocation to Mertarvik.

From KRITFC's 28 Commissioners, a seven-member Executive Council, including a Chair, Vice-Chair, and Secretary, is elected from the Commissioners to represent the seven Tribally determined governance units of the Kuskokwim River (Figure 3). The Chair position rotates among the lower, middle, and upper portions of the river every two years to foster opportunity for river-wide engagement and leadership. Any number of Elder Advisors may also be appointed to provide guidance to KRITFC; as of the time of this writing, KRITFC has two Elder Advisors.

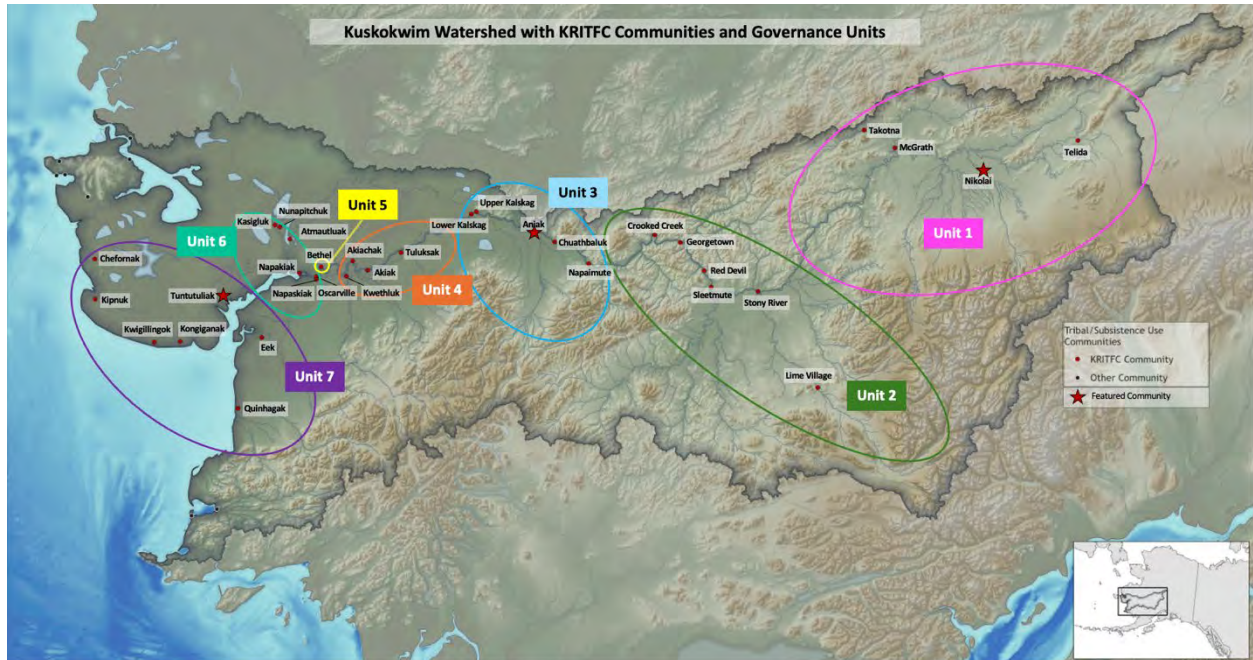
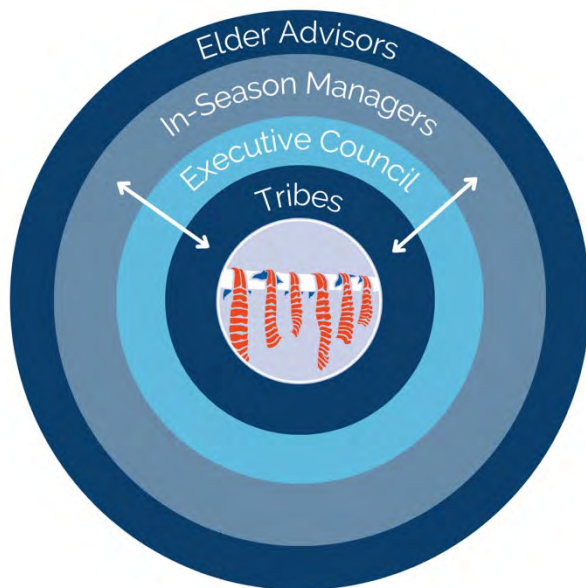


Figure 3. KRITFC's seven governance units along the Kuskokwim River, self-designated by Member Tribes according to geographical and cultural similarities. Read more about featured communities Nikolai, Aniak, and Tuntutuliak in Section 4.D. of this appendix. Adapted from map by J. Davies.



KRITFC's governance model is intentionally designed, as illustrated in Figure 4. At the center of KRITFC's work is the salmon. As salmon are harvested, shared, and conserved, KRITFC's Tribes converse and collaborate with the Executive Council, which in turn converses and collaborates with KRITFC's Tribal In-Season Managers. The In-Season Management team is also in conversation with the Tribes. Surrounding all of this work are the Elders and their wisdom, teachings, and guidance for the stewardship of salmon.

Figure 4 (left). KRITFC's governance model. At the center is the salmon. Tribes, Executive Council members, and In-Season Managers are all in communication to protect, conserve, and restore salmon. Elder Advisors surround and guide the entirety of KRITFC's work.

The mission of KRITFC is to be the voice of the Kuskokwim, living and sharing our traditional ways of life. Its vision is sovereign Indigenous stewardship, detailed in the preamble to KRITFC's constitution:

*"We, the Tribes of the Kuskokwim River and its tributaries, proclaim that our fisheries are essential to our cultural, nutritional, economic and spiritual well-being and our way of life. We recognize our responsibility and authority to exercise our inter-Tribal treaty rights to act as stewards to our common traditional territories and resources. Since time immemorial, we have properly cared for the fishery resources of the Kuskokwim River Drainage. We commit to conserve, restore, and provide for Tribal use of fisheries based on Indigenous knowledge systems and scientific principles. Founded on Tribal unity, and striving for consensus, we form the Kuskokwim River Inter-Tribal Fisheries Commission for the health and well-being of our Tribal members, our future generations, and all Alaskans who rely upon the health of the fisheries."*¹

➤ **3.C. Kuskokwim Fisheries Co-Stewardship**

The KRITFC was established in May 2015 to address the longstanding exclusion of Kuskokwim River Tribal Nations from fisheries management. Regional subsistence, commercial and sport fishery salmon management had primarily been led by the Alaska Department of Fish and Game (ADF&G) since statehood. In 2014, Chinook salmon declines triggered federal management under Title VIII of the Alaska National Interests Lands Conservation Act (ANILCA), authorizing the Federal Subsistence Board (FSB) to manage subsistence salmon fisheries in federal waters of the Kuskokwim River. The FSB now typically delegates its management authority to the U.S. Fish and Wildlife Service (USFWS) at Yukon Delta National Wildlife Refuge (YDNWR). This shift from ADF&G to FSB/USFWS management is the manifestation of the dual salmon management system on the Kuskokwim, a situation that exists throughout Alaska.

Before KRITFC was established, Tribal citizens and rural residents were held only to an advisory role in fisheries management on the Kuskokwim River (e.g., the state Kuskokwim River Salmon Management Working Group or federal Regional Advisory Councils), and Tribal governments or authorized Tribal organizations were not designated parties of co-management arrangements. Moreover, the dual management system on the Kuskokwim led to bifurcated fisheries regulations, fostering confusion and intra- and inter-regional tensions among fishers and communities. One of KRITFC's primary aims is to promote unity and collaboration among Kuskokwim Tribes as a key part of our Indigenous values and knowledge; in recognition that all Tribes along the Kuskokwim are sharing in the burden of salmon conservation; and for the inclusion of river-wide Tribal voices and knowledge in fisheries management.

In a momentous step towards these goals, KRITFC signed a memorandum of understanding (MOU) with USFWS in May 2016 to formalize the Tribal-federal salmon co-stewardship partnership in federal waters of the Kuskokwim, which extend from the mouth of the river to

¹ Available on KRITFC's website at <https://static1.squarespace.com/static/5afdc3d5e74940913f78773d/t/5aff1e7570a6adafa2afcf9e/1526669051355/41Z8707-KRITFC+Constitution.PDF>

Aniak as part of the YDNWR (Figure 3).² Under this arrangement, KRITFC Commissioners annually elect five In-Season Managers to represent Tribes from the coast to the headwaters in “substantive consultation” with the federal in-season manager (historically, the FSB, and more recently, the YDNWR Manager) in the process of developing federal fisheries management decisions. The MOU provides pathways to include both TK and Western scientific information in decision-making and planning.

Though some of the In-Season Managers and KRITFC Member Tribes reside outside of YDNWR’s boundaries, all salmon destined for tributaries upstream of Aniak must first pass through these federal waters. Middle and upper river Tribal fishers are thus included in decisions about fisheries downstream from their harvest areas. This models a mechanism for Tribal involvement in co-management of fisheries occurring downstream from the Kuskokwim in the Bering Sea.

Since 2021, KRITFC and YDNWR have jointly developed salmon management and harvest strategies to guide their co-stewardship and decision-making. These strategies are publicly available on KRITFC’s website and are kept in “living draft” form, as consultation on, and development of, this joint approach is continuous.³ **Key principles and objectives in these strategies include:**

- **Avoiding collective (cumulative) overharvest of salmon** while aiming to rebuild stocks.
- Taking a **conservation-based and precautionary** management approach.
- **Maintaining a drainage-wide perspective** while making decisions that affect federal waters of the Kuskokwim.
- Basing decisions upon **TK and local knowledge (LK)** as part of the best available information **alongside Western scientific monitoring data**.

These principles could be used as a model for reimagining marine-life stage management of chum salmon for the benefit of the species, salmon-dependent communities, and the pursuit of the Purpose and Need of this action.

4. Kuskokwim River Chum Salmon: Knowledge, Fisheries, and Impacts of Declines

Section 4.4.3.2 of the DEIS, co-authored by KRITFC and Tanana Chiefs Conference (TCC), describes the ways in which chum salmon foster holistic well-being in Indigenous communities and ecosystems in the Kuskokwim, Yukon, and other regions of Western and Interior Alaska. To summarize this section: chum salmon are vital to Indigenous peoples and ways of life of these regions, including the Kuskokwim, where physical, cultural, economic, social, and ecological health and well-being are intricately interconnected with the abundance of chum and other salmon. In addition, an overview of Kuskokwim subsistence and commercial management

² Additional information about the development of this MOU and its terms of agreement can be found on KRITFC’s website at https://static1.squarespace.com/static/5afdc3d5e74940913f78773d/t/5dcb2a0ebc75324ecc635451/1573595663976/MOU_Final_wSignatures.pdf.

³ Available at <https://www.kuskosalmon.org/documents>.

systems and harvest levels can be found in Sections 4.4.3.1.4 and 4.4.4.1 respectively, of the DEIS.

The KRITFC wishes to expand upon these three sections by providing (a) additional TK and observations of Kuskokwim fishers on the importance of chum salmon in traditional ways of life; (b) a deeper analysis of the role of chum salmon in regional Kuskokwim subsistence and commercial harvests; (c) additional discussion of the holistic impacts of salmon declines; and (d) glimpses of life in three Kuskokwim communities particularly affected by chum salmon declines.

➤ **4.A. Additional TK and LK of the Importance of Chum Salmon**

Here, we provide additional TK and LK about the centrality of chum salmon to the way of life to the people of the Kuskokwim.⁴ This section should be read in partnership with Sections 3.3.3.15 and 4.4.3.2 of the DEIS and the TK, LK, and information about Kuskokwim and Yukon Salmon People provided therein.

Salmon, including chum salmon, are the keystone food for people on the Kuskokwim, and to which Kuskokwim people have a deep stewardship relationship:

“In Yup’ik, the general word for food is neqa, which is also the word for fish. So if neqa is not how you view fish—if food is not the first thing you think of—then we come from different worlds. For us, we wouldn’t exist without salmon. On the river, we coexist, salmon and people. And it’s always been that way. We have this deep spiritual relationship that we have the obligation, but also the privilege, to maintain between fish and people.” – Jonathan Samuelson (in KRITFC 2021:12).

Beyond food, chum salmon have been harvested to create waterproof fish-skin clothing, boots, and containers (Fienup-Riordan et al. 2007). They were also used to teach young fish cutters the art of respectfully and carefully processing salmon. Elder women often recall their grandmothers, mothers, and aunts allowing them to learn how to cut Chinook salmon only after they mastered their *uluqaq* and skills on chum salmon (Fienup-Riordan et al. 2020). This may be because of the immense abundance of chum salmon in the region, as well as because many were used to feed dog teams, and thus did not need to be cut perfectly for presentation.

The importance of harvesting and processing chum salmon to feed dog teams cannot be overstated. Until more frequent use of airplanes in the 1930s and snowmachines in the 1970s, dog teams were the primary transportation of people, mail, goods, and harvests (Pennyoyer 1965; Ikuta et al. 2013). Elders recall when every family had a dog team so they could travel between villages, check their traplines, go to ice-fishing holes, and haul people and supplies (Mikow et al. 2019; Native Village of Georgetown 2021). It was thus critical for families to put up hundreds to

⁴ KRITFC staff and partners spent significant time between May 2024 and April 2025 documenting TK of Kuskokwim salmon with 25 TK holders throughout the Kuskokwim. At the time of the submission of this appendix, the TK shared during these interviews has not been publicly released. This TK may be available to bring to the Council when it reviews the DEIS and these appendices. In the meantime, general information from these and other public records has been paraphrased by KRITFC staff, and direct quotes and sources of TK/LK have been provided where they have been published for public access.

thousands of fish as good fuel for their teams, and chum salmon were the ideal fish for this, hence their nickname “dog salmon.” As two middle Kuskokwim Elders recall:

“They pressed them, they had a press, had a couple of, like little rag, about a foot apart, those bundles were supposed to weigh 30 pounds a bundle, they had posts a foot apart – they’d load them with head to tail, head to tail, with dry fish. They’d put sticks down on them and press them down...They’d bale fish...I remember flying them out to trappers.” – Richard Wilmarth (in Native Village of Georgetown 2021:57)

“Yeah, that was one of my favoritest things to do was bale...make bales of dog food. And then my dad used to get, [o]h, my word, they used to cut thousands and thousands of dog salmon for dog fish. Thousand, and I remember long time ago when we used to get like 3,000 dog fish a day, my mom and dad would cut them all.” – Judy Vanderpool (in Native Village of Georgetown 2021:57)

Chum salmon have long been important for human consumption as for sled dog diets. Elders were taught that, without dryfish provided by chum and other salmon, winter starvation and sickness are likely. Chum salmon are especially important for Elders, the sick and those with open wounds, and those who cannot stomach oilier fish, like Chinook salmon and whitefish (Fienup-Riordan et al. 2020; KRITFC 2023).

A key part of traditional culture in the Kuskokwim includes sharing harvests of chum salmon and other fish, especially with Elders, widows and orphans, travelers, and people without means to harvest their own fish. This tradition of sharing with those in need continues today, and many people on the Kuskokwim aim to harvest enough salmon to be able to share generously throughout the year. As explained by Kuskokwim TK holders:

“Our culture is, and has always been, one where we believe in the importance of sharing, especially with those who are less fortunate; widows or those who don’t have the equipment or transportation to go out and process fish.” – O. Morgan (in Esquible et al. 2024:11)

“I remember by grandparents, my parents, and a lot of old people always talked about how you have to share. You never, never let anyone go hungry. If you have something, they don’t have it, you offer.” – Debby Hartman (in Native Village of Georgetown 2021:73)

Along with sharing, avoiding all waste is a key traditional teaching of the stewardship of salmon (and all traditional foods):

“The most important one [value] would be to respect the salmon as if they were humans and had a spirit and soul...part of that respect is never to waste any part of the salmon. We were told that if we are wasteful of this resource it will stop giving itself to us in the end...I was taught to give the utmost respect toward any living thing, not just salmon...” – J. Cleveland (in Esquible et al. 2024:10)

Elders and old-timers of the Kuskokwim region remember eras when chum and other salmon were so plentiful, one would feel fish tails slap across their legs and feet while swimming or wading in the river on a hot day, and one could imagine crossing sloughs and creeks by using the

backs of fish as steppingstones. The Aniak River in particular was known to be an incredibly productive tributary for chum salmon, known for its “stink” in the late summer and fall as hundreds of thousands of chum salmon carcasses decomposed on its banks (KRITFC 2023:5).

Chum salmon no longer swim in abundance on the Kuskokwim. The TK holders on the Kuskokwim discuss numerous factors, including non-environmental factors, driving chum salmon declines. These include:

- The waste of fish, including in bycatch and intercept fisheries, and improperly disposing of inedible fish parts.
- A decline in traditional education of youth.
- Fighting and arguing over fish, including among regions of the Kuskokwim and with in-river and marine managers, agencies, and outside fisheries (see Table 3).
- Increasing harvest restrictions as well as increasing Western storebought foods leading to the decline of fish harvests, and subsequent decline in fish giving themselves to be harvested.
- Excessive overharvest in bycatch and intercept fisheries, as well as in former in-river commercial fisheries.
- Disruption of chum salmon’s marine food webs and habitat.
- Climate change (see Fienup-Riordan 2020; KRITFC 2021; KRITFC 2023; KRITFC 2024; Esquible et al. 2024).

Many on the Kuskokwim feel immense anxiety about how future generations of Kuskokwim fishers will learn how to care for fish, their families and communities, and themselves, as shared by one TK holder:

“I feel that the traditional knowledge of processing our fish isn’t going to be passed down to our children/grandchildren because of the fishing restrictions. There won’t be any fish caught to show and carry on the tradition of how to catch our fish, cut them, hang them, smoke them, and putting them away once dried.” – O. Morgan (Esquible et al. 2024:13)

The threat of losing a way of life and the holistic knowledge, traditions, and history that form part of it because of declines in salmon and salmon fishing restrictions is thus palpable for Kuskokwim harvesters.

➤ **4.B. Subsistence Fisheries and the Role of Chum Salmon in Subsistence Diets**

Subsistence harvests of chum salmon have steadily declined across the Kuskokwim in the last decade, with record-low harvests in 2021 and 2022 (Figure 5). Per household harvest of chum salmon (Figure 6) shows a starker downward trend across KRITFC governance units (Figure 3) since 1990. The Amounts Reasonably Necessary for Subsistence (ANS) for Kuskokwim chum salmon (41,200-116,400 fish) has not been met since 2019 (Smith et al. 2022; KRITFC 2024). The lack of achieving chum ANS compounds concerns over food security given that the Chinook salmon ANS was last met in 2010.

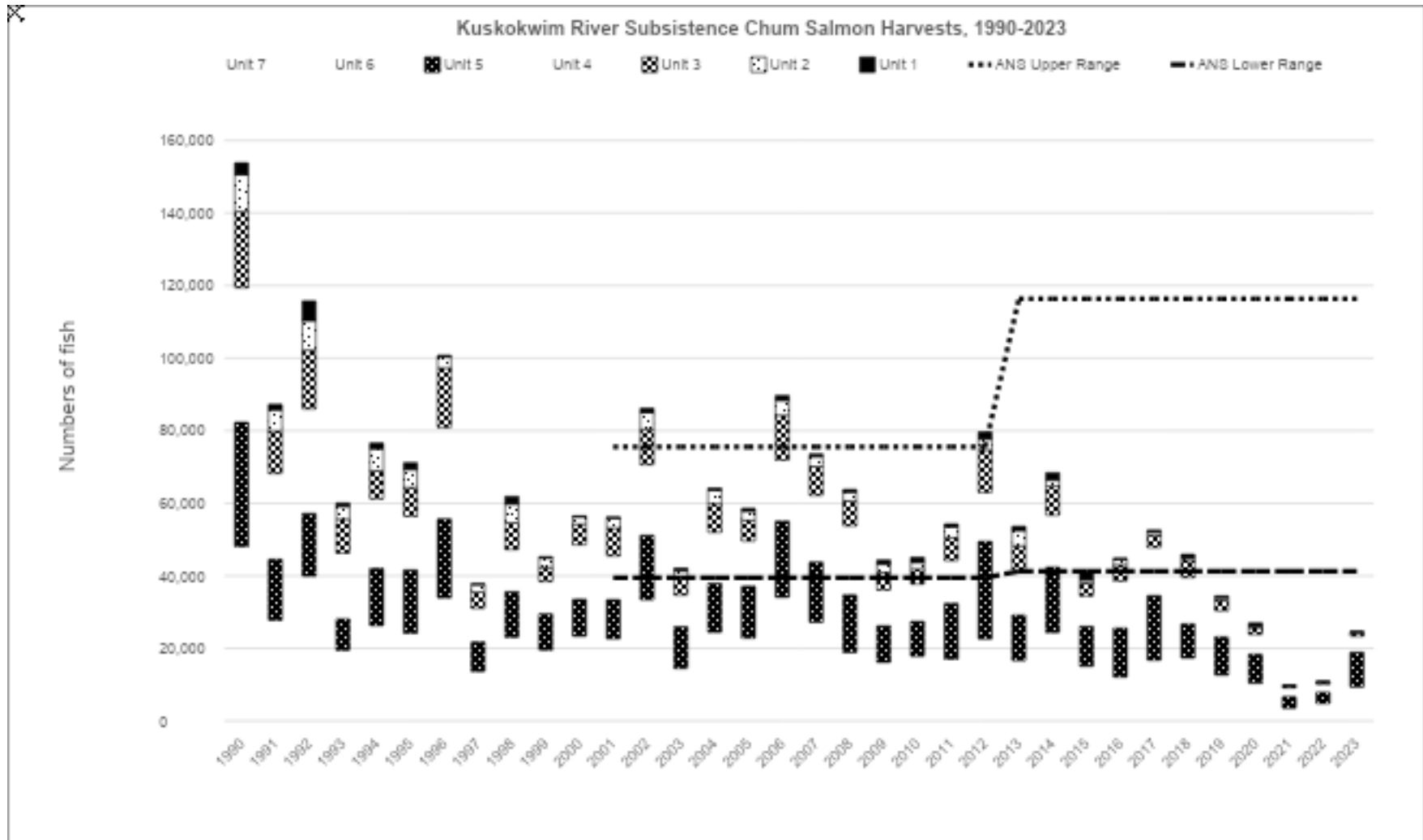


Figure 5. Kuskokwim River chum salmon subsistence harvests, compared with Amounts Reasonably Necessary for Subsistence (ANS) levels, by KRITFC governance units, 1990-2023. Sources: Bembenic and Koster 2024; D. Koster, ADF&G, pers. comm.

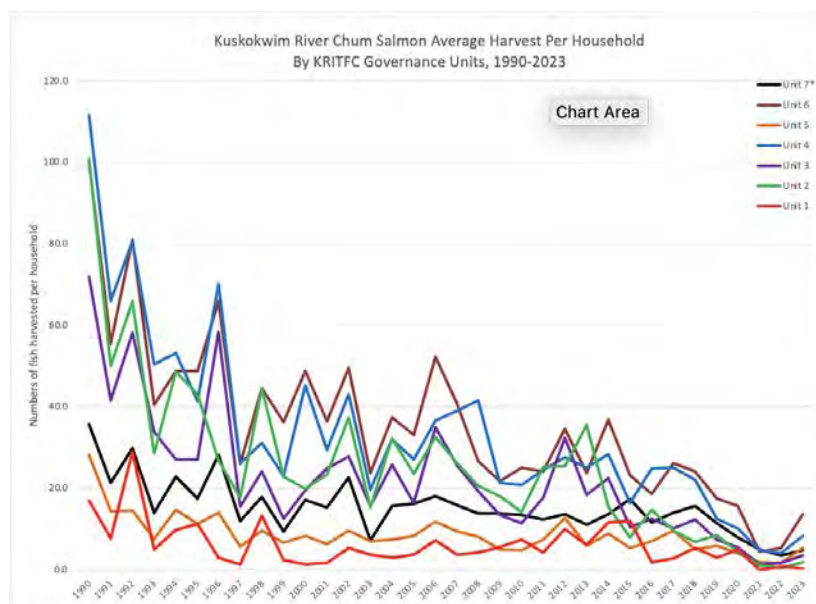


Figure 6. Kuskokwim River chum salmon average harvest per household by KRITFC governance units (see Figure 3), 1990-2023. Sources: Bembenic and Koster 2024; D. Koster, ADF&G, pers. comm.

The following subsistence harvest figures show ADF&G subsistence data pooled over 1984–2013. Data were derived as percentages of total edible pounds of harvested wild foods to allow comparison of individual resource categories to better understand community subsistence economies. The quantities and quality of the available subsistence resources, as well as the underlying subsistence economies, have changed over the past four decades (Godduhn et al. 2020; Bembenic and Koster 2024). Notably, Chinook and chum salmon declines in recent years have resulted in a greater reliance on other salmon and non-salmon species and other subsistence resources, as available, to meet food security needs. However, the years portrayed in this section roughly represent years of high or historical abundance of chum salmon relative to recent declines.

Figure 7 shows the role of salmon species, including chum salmon, in the overall subsistence economies of Kuskokwim area communities during the study years. Data were compiled from ADF&G Division of Subsistence reports and the Community Subsistence Information System (CSIS 2024; J. Simon, pers. comm. as consultant to KRITFC, 2018). These generalized subsistence harvest figures show the overall contribution of individual salmon species to community economies and ways of life in different portions of the Kuskokwim watershed, but do not show how total resource use has changed by subsistence users following the collapse of Chinook and chum salmon returns in recent years. Data are summarized by KRITFC governance units (see Figure 3) to provide an overview of the varying composition of wild food harvests along the Kuskokwim River drainage and coastal areas, with a focus on the reliance of specific salmon species for subsistence purposes.

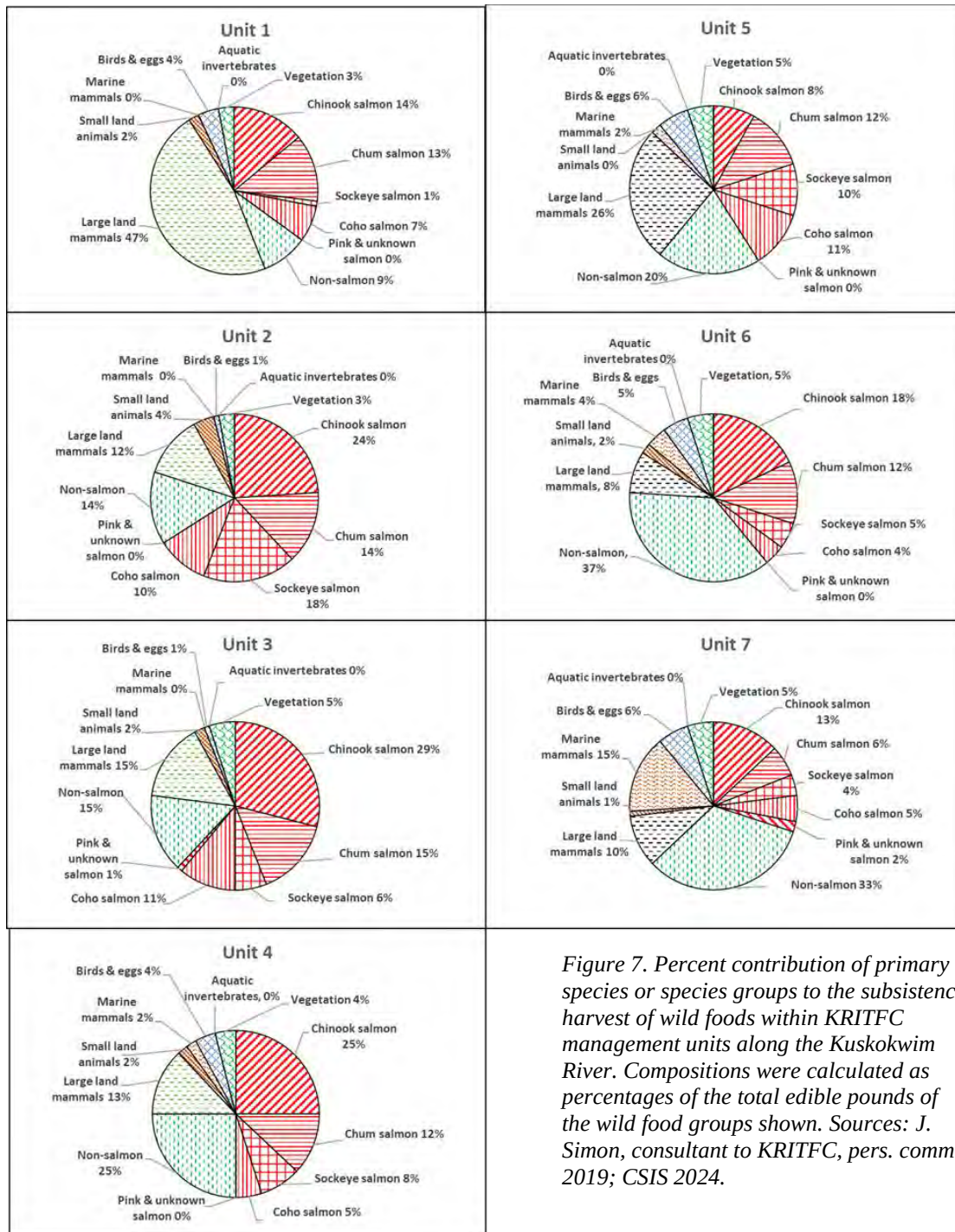


Figure 7. Percent contribution of primary species or species groups to the subsistence harvest of wild foods within KRITFC management units along the Kuskokwim River. Compositions were calculated as percentages of the total edible pounds of the wild food groups shown. Sources: J. Simon, consultant to KRITFC, pers. comm. 2019; CSIS 2024.

The Upper Kuskokwim Athabascan communities forming KRITFC Unit 1 are in the Kuskokwim watershed headwaters (Figure 3). Furthest from the coast, Unit 1 residents rely heavily on non-coastal resources, with salmon availability primarily limited to Chinook, chum, and coho salmon (Figure 7; Godduhn et al. 2020). Land mammals comprised the highest percentage (47%) of the total subsistence harvest, but that percentage has likely increased given salmon declines in the past decade. In previous times of abundance, salmon contributed a total of 35% to the overall subsistence economy in the headwaters. Chinook salmon was the second highest resource

harvest in headwaters communities (14% of total), followed by chum salmon (13%). Notably, sockeye salmon contribute only 1% of the subsistence diet in Unit 1 communities, which is the smallest contribution of sockeye salmon to regional subsistence diets found among the KRITFC governance units. Most sockeye salmon populations in the Kuskokwim spawn within or downriver of the Stony River drainage—more than 100 river miles downstream of McGrath, the Unit 1 community furthest downriver—with only very small populations of sockeye found to spawn in or near Unit 1 communities fishing areas. Thus sockeye, while a uniquely abundant and reliable source of salmon for many communities on the Kuskokwim during present multi-species declines, are not available to fill food security needs for Unit 1 communities.

The KRITFC's Unit 2 communities had a higher reliance on salmon (66% of total) than any other resource, and a higher reliance on fish (80% of total) when including non-salmon species, compared to other KRITFC units (Figure 7). Chinook salmon comprised 24% of the total subsistence harvest, followed by sockeye salmon (18%), chum salmon (14%), and coho salmon (10%). Large land mammal harvests were only 12% of overall subsistence harvests in the study years, likely due to declines in caribou and moose.

The KRITFC's Unit 3 communities also had a high reliance on salmon (62% of total) compared to other resources, and also a high reliance on fish (77% of total) when including non-salmon species (Figure 7). A 29% contribution of Chinook salmon to subsistence harvests was the highest among KRITFC management units. Chum salmon, non-salmon, and large land mammals each comprised 15% of the Unit 3 subsistence harvests.

The KRITFC's Unit 4 communities also had a higher reliance on salmon (50% of total) than other resource groups (Figure 7). Chinook salmon contributed 25% of total subsistence harvests, followed by chum salmon (12%). Non-salmon fishes tied with Chinook salmon in providing a 25% contribution to the Unit 4 subsistence economy, with the harvest of fish at 75% when including non-salmon species.

KRITFC's Unit 5 includes only the community of Bethel, the major hub in the Yukon-Kuskokwim Delta region, the largest community by population and with the largest Tribal government (Orutsararmiut Traditional Native Council) by citizenship in the Kuskokwim (Figure 3). Annual compositions of Bethel subsistence harvests are more diverse with less reliance on a single harvest group compared to most Kuskokwim area communities, likely owing both to its diverse population as well as its central location to freshwater, marine, and terrestrial foods. Salmon species in total comprised 41% of annual subsistence harvests, with chum salmon providing the largest total contribution at 12% (Figure 7). Fish species in aggregate represented 61% of the subsistence harvest, while large land mammals contributed the largest single group harvest (26%) by Bethel residents.

KRITFC's Unit 6 communities relied on salmon more than any other resource group, with 39% of the total annual subsistence harvest (Figure 7). Chinook salmon comprised 18% of total subsistence harvests, followed by chum salmon (12%), and fish groups in total comprised 76% of all subsistence harvests.

Residents in coastal KRITFC Unit 7 relied more on non-salmon fishes (33%) than other resource groups, with pooled salmon comprising 30% of total annual subsistence harvests (Figure 7). Chinook salmon contributed 13% of total subsistence harvests, followed by chum salmon at 6%. Marine mammals comprised 15% of annual subsistence harvests.

In terms of long-term trends, these data show the importance of chum salmon as a core component of annual subsistence harvests. However, for many communities, the 2022 chum salmon harvest was >75% less than the recent 10-year average and four communities reported no chum salmon harvests (Figure 6; Bembenic and Koster 2024). Declines in subsistence harvests are having tremendous negative impacts to holistic well-being in Indigenous communities in the Kuskokwim, as detailed in Section 4.4.3.2.2 of the DEIS.

➤ **4.C. Commercial Fisheries and Subsistence Economies**

Since time immemorial, salmon have been interwoven with life in the Kuskokwim Region as a source of protein and as a cultural and economic resource. There is a deep and long-term reliance on salmon, whether consumed by the harvesters, shared with neighbors, shipped to family, or commercially sold for export if returns are adequate (Ikuta et al. 2013). The barter and trade of natural resources has also been a major component of subsistence economies, with trade networks extending across the Kuskokwim region and beyond.

Chum salmon have had a long history of being sold commercially to support local economies, dating back to at least 1913 in Kuskokwim Bay and 1935 in the mainstem Kuskokwim River (Pennoyer et al. 1965). While early commercial fisheries opportunistically sold chum salmon (and other species) in Chinook salmon-focused fisheries, chum salmon began to be intentionally targeted in 1967 for commercial use (Estensen et al. 2009). However, a lack of accurate biological data, including annual subsistence harvest surveys, “greatly hindered any formulation of regulations for proper utilization of the salmon resources” during this time (Pennoyer et al. 1965). Harvest guidelines were gradually increased in order to explore the relationship between harvests and escapements (Burkey et al. 2000) without necessarily having the data—beyond economic revenue—to justify quotas set arbitrarily by USFWS prior to statehood, and by ADF&G post-1959.

Annual commercial harvests increased following the 1983 change from a harvest-guideline management strategy to an escapement-objective strategy, with commercial harvest peaking at 1,381,700 chum salmon in 1988 (Figure 8). Beginning in the late 1990s, the commercial chum salmon fishery was constrained by low market interest in chum salmon and limited processing capacity. Poor Chinook and chum salmon returns during 1999–2001 resulted in few commercial fishing opportunities during June and July (Elison et al. 2015). While Chinook and chum salmon returns improved in the mid-2000s, another slump in their abundance, poor market conditions, limited processing capacity, and an increased need to prioritize salmon harvests for subsistence uses in line with the state statutory obligations have caused commercial fishing opportunities since the mid-2000s to be minimal (Smith et al. 2022). Since the recent chum salmon collapse, commercial harvests have been limited to a small number of catcher-sellers targeting coho salmon.

Figure 8 shows Kuskokwim River chum salmon harvests by subsistence, commercial, and other (e.g., sportfish) user groups during 1960–2024. Commercial chum salmon harvests in the 1980s and 1990s often exceeded subsistence harvests, likely due to the abundance of Chinook salmon to meet subsistence/food security needs; the availability of chum salmon that could be sold to generate cash to support other subsistence activities; and the increasing reliance on gas-powered snowmachines, rather than dog teams, leading to fewer chum salmon harvest needs.

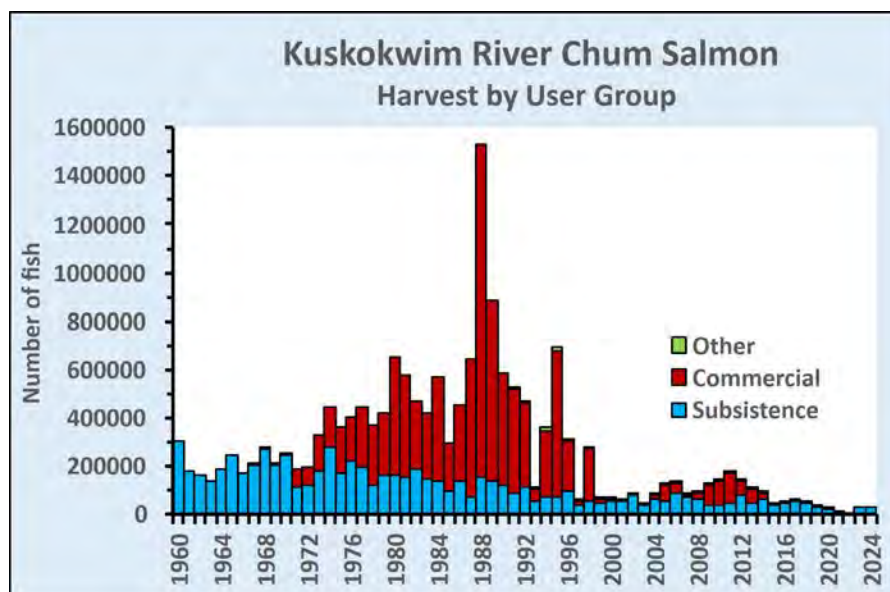


Figure 8. Kuskokwim River chum salmon harvest for subsistence, commercial, and other (e.g., sport fish) uses. Note: Data for 2023 and 2024 are preliminary; and no commercial fishing data are available since 2015 due to confidentiality requirements for few harvesters. Sources: Bembenic and Koster 2024; Chythlook 2024; D. Koster, ADF&G, pers. comm.

Between the 1970s and 1990s, the commercial salmon of chum salmon (and other salmon species) was an important source of annual revenue for the mixed economies of the Kuskokwim River drainage, especially in communities in the lower Kuskokwim (see DEIS Sections 4.4.3.2.2.3 and 4.4.3.1.4). Figure 9 shows the ex-vessel value of chum salmon commercially harvested from all districts in the Kuskokwim River management area, 1967–2024 (note: no commercial chum salmon harvests have occurred since 2015). Figure 10 shows this same data adjusted for inflation in 2025 U.S. dollars.

The average commercial harvest ex-vessel value for chum salmon in the Kuskokwim management area was \$890,000 annually during 1973–1995, equivalent to \$2,930,000 annually when adjusted for inflation to today's values. **During the 1988 peak year, landings generated \$3,985,000 for Kuskokwim communities, or the equivalent of \$10,760,000 in 2025.** In 2011–the most recent high-profit commercial chum salmon year in the Kuskokwim management area—fishers generated \$1,029,000 in chum salmon ex-vessel value, equating to \$1,461,000 after adjusting for today's inflation. **This revenue, which used to support the purchase of gear and gas for subsistence activities, infrastructure development for cities, and needs of Kuskokwim families, is no longer available with the closure of commercial chum salmon fisheries.**

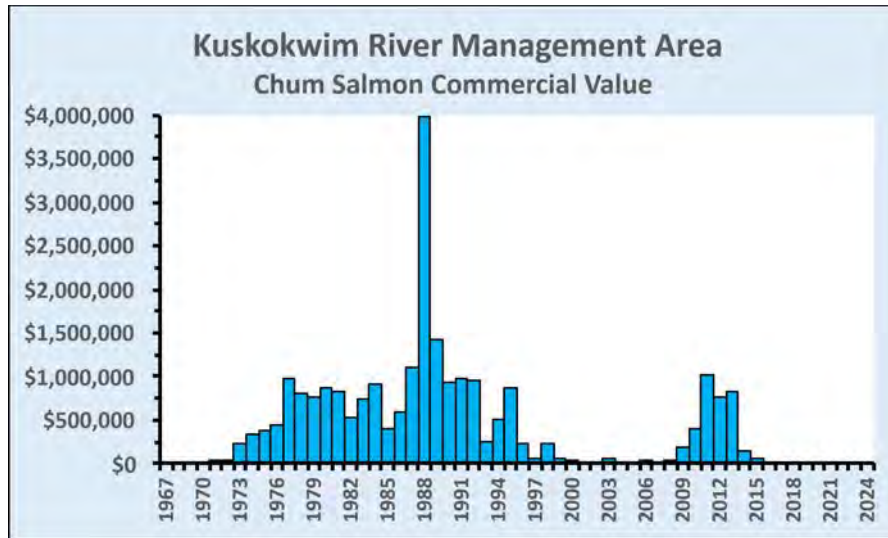


Figure 9. Ex-vessel value of chum salmon commercially harvested from the Kuskokwim River Management Area, 1967–2024. Sources: Runfola and Larson 2025; ADF&G end of season news release.

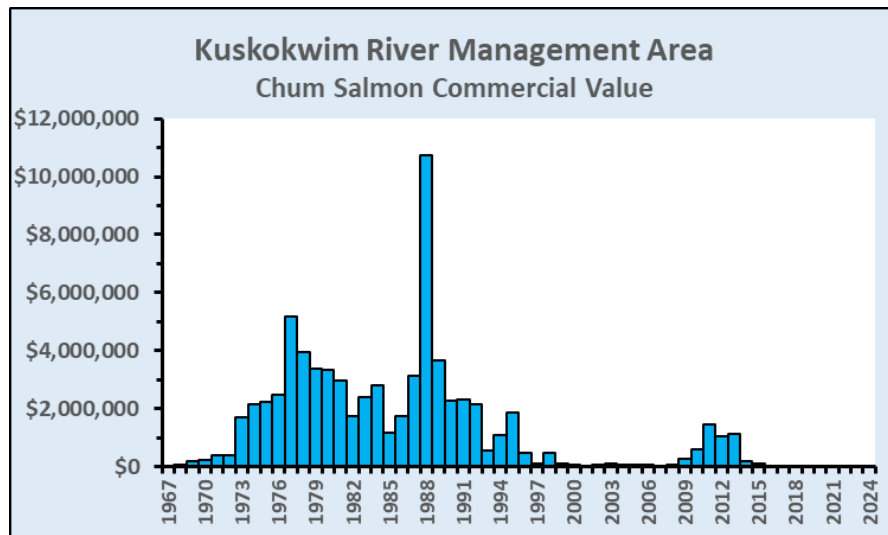


Figure 10. Ex-vessel value of chum salmon commercially harvested from the Kuskokwim River Management Area, 1967–2024, with values adjusted for inflation to 2025 dollar values. Sources: Runfola and Larson 2025; ADF&G end of season news release; <https://www.usinflationcalculator.com/>.

Many Kuskokwim Elders fondly remember the days of successful commercial fishing harvests and continue to carry their Commercial Fishery Entry Permit (CFEC) cards in their wallets, despite no longer being able to use them for commercial fishing. For these residents, commercial harvesting was a key part of the seasonal round in the modern mixed economy of rural Alaska post-statehood; its importance paralleled that of subsistence fishing chores during the summertime. The cash income gained by local, family-owned commercial fishing boats on the Kuskokwim supported the mixed economies of the region.

At the same time, many Kuskokwim TK holders and Elders recall the boats lined up by commercial tenders with a grimace, observing that the management allowing the high commercial harvests of salmon and salmon roe contributed to contemporary declines.

➤ **4.D. Holistic Impacts of Salmon Declines**

Declines in subsistence and commercial salmon harvests and increasing regulation and criminalization of traditional fishing activities inflicts immense harm on Kuskokwim fishers' mental and physical health, as well as to communal wellness (see DEIS Section 4.4.3.2.2.2; KRITFC 2024). Traditional roles to steward salmon and culture—like Elders instructing youth in the right ways to live (*yuuyaraq* in Yugtun) and men fishing and hunting to sustain their families—are changing, and some link these changes to heightened depression, anxiety, alcohol and drug abuse, and suicide in Alaska Native communities on the Kuskokwim and throughout the state. Suicide is now the fourth leading cause of death in Alaska Native communities, and suicide rates in Alaska Native communities—and particularly among rural Alaska Native youth and Alaska Native men—are disproportionately high compared to those in non-Native communities across the state and country (ANTHC 2021a; Stone et al. 2022).

As traditional foods like salmon become less available, Kuskokwim people are consuming more store-bought foods. Unlike traditionally prepared and preserved salmon, these foods are highly processed and filled with unhealthy ingredients and high quantities of sugar and fat. Levels of diet-related diseases, like diabetes, heart disease, and cancer, are disproportionately high in Alaska Native communities, and this can be linked with declines in numbers of and opportunity to harvest traditional foods. Effects of these diseases are also compounded by high levels of poverty and food, economic, and employment insecurity in rural Alaska Native communities (ANTHC 2021b).

Kuskokwim communities also increasingly report episodes of fish camp theft and vandalization as salmon abundance and harvest opportunities decrease. Fishers talk about needing to guard set nets and smokehouses from people who, seemingly desperate for a taste of fish they are unable to procure (due to the high cost of subsistence gear and gas, limited fishing opportunities, etc.), steal from their neighbors or damage their property. Elders say these things were not seen in “the old days,” when fish were abundant, nor are part of traditional values to respect one another’s belongings and live honest lives.

Increased reports of suicide, depression and anxiety, alcoholism and drug abuse, diet-related diseases, co-morbidities, and theft and vandalization in Kuskokwim communities can be linked with legacies of colonization that have contributed to losses of traditional ways of life and traditional foods, including salmon (see Section 5.D of this appendix; DEIS Sections 4.4.3.2.2.1 and 4.4.3.2.2.2; DeCou et al. 2013; Lavoie et al. 2025; Stevens and Black 2019). Declines in chum salmon and loss of this critical part of Kuskokwim peoples’ lives are thus posing significant, existential threats to regional food security and health, millennia-old cultural traditions, spiritual and communal wellness, economic security, and holistic well-being. These threats are compounded with declines in other salmon, like Chinook and coho salmon, and non-fish traditional foods, like caribou and migratory waterfowl.

➤ **4.E. Glimpses into the Role of Chum Salmon: Tuntutuliak, Aniak, and Nikolai, AK**

While harvesters throughout the Kuskokwim River drainage are feeling impacts of recent chum salmon declines to food security, culture, and holistic well-being, certain regions and communities may be experiencing intensified impacts because of the role chum salmon play in regional diets, economies, and ecosystems.

The Kuskokwim communities of Tuntutuliak, Aniak, and Nikolai are three such communities that may be experiencing intensified impacts of chum salmon declines. KRITFC has selected these communities as case studies because of their different locations in the Kuskokwim watershed (Nikolai is located in the headwaters, Aniak in the middle river, and Tuntutuliak near the coast; Figure 3), distinctive sociocultural/socioeconomic reliance on chum salmon, and recent work with KRITFC staff and partners to document TK of salmon in these communities. Figure 11 shows annual chum salmon subsistence harvests from 1990 to 2023 in these communities. KRITFC does not intend to illustrate that families in these communities are more dependent upon chum salmon than those other communities, nor that other communities are not suffering from chum salmon declines and harvest restrictions. All Kuskokwim River salmon-dependent communities are experiencing the holistic impacts of chum salmon declines (DEIS Sections 4.4.3.2 and 4.5.1.1).

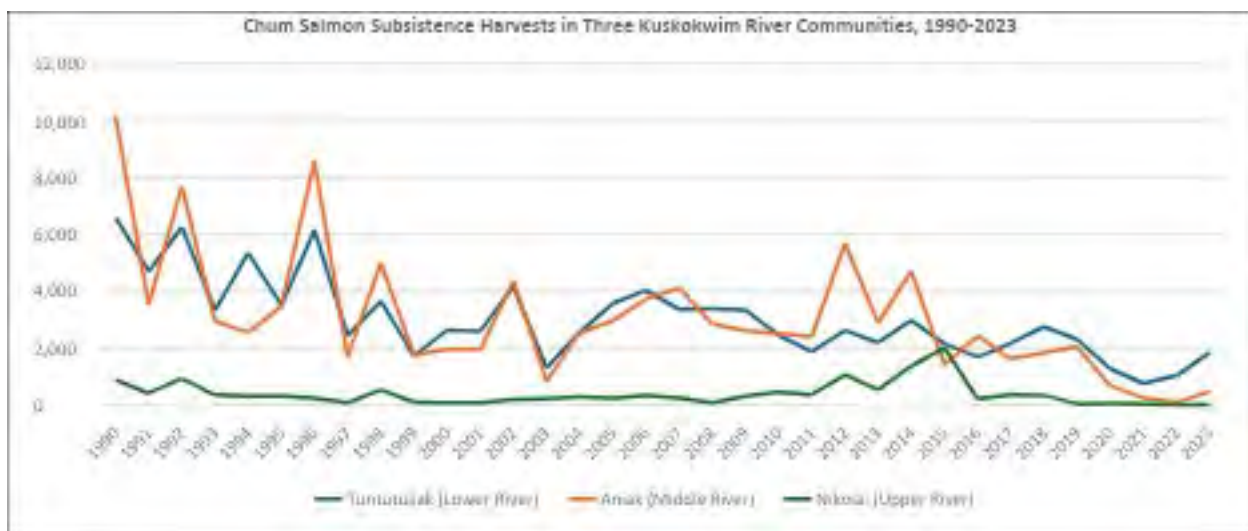


Figure 11. Annual chum salmon subsistence harvests in three communities across the Kuskokwim River watershed: Tuntutuliak (lower river), Aniak (middle river), and Nikolai (upper river), 1990-2023. Sources: Bembenic and Koster 2024; D. Koster, ADF&G, pers. comm.

Tuntutuliak:⁵ The community of Tuntutuliak, or *Tuntutuliaq* in Yugtun (meaning “the place of many caribou/deer”), is located on the banks of the Qinaq (Kinak) River in the lower Kuskokwim. The community was established in the mid-1940s after resettling from the old village, called Qinaq. One of the coastal communities of the Kuskokwim, Tuntutuliak’s 490 residents⁶ are familiar with their estuarine, tundra environment and tidal flooding. They are also among the first Kuskokwim fishers to encounter and harvest salmon each year, traveling down the Qinaq River and navigating sandbars near the mouth of the Kuskokwim River to harvest these fish. Tuntutuliak residents primarily use drift gillnets to harvest chum and other salmon

⁵ Additional, comprehensive socioeconomic information about Tuntutuliak, compiled by Alaska Fisheries Information Network in 2011, can be found at https://apps-afsc.fisheries.noaa.gov/REFM/Socioeconomics/Projects/communityprofiles/Tuntutuliak_Profile_2000_2010.pdf.

⁶ Census estimates for Tuntutuliak, Aniak, and Nikolai are current as of July 2024, from Alaska Department of Labor and Workforce Development, <https://live.laborstats.alaska.gov/data-pages/alaska-population-estimates>.

species, as the regional tidal influence, copious sandbars, and wide river make other gear types challenging to operate effectively.



Panel 1. In Tuntutuliak, one can see boats lining the muddy banks of the Kinak River (left), boardwalks leading to town (center), and fish camps in the center of the village (right). Many families are opting to process fish in the village rather than moving seasonally to Tunt Fish Camp near the mouth of the Johnson River. Credit T. Vicente/KRITFC (left, center) and K. Maxie/KRITFC (right).

Commercial chum salmon fishing used to be an important part of the way of life of Tuntutuliak families. Most Elders recall their families being heavily involved in commercial fisheries between the 1960s and 1990s, with men in the families boating from Tuntutuliak fish camp (“Tunt Fish Camp”) near the mouth of the Johnson River to Bethel to sell chum and other salmon at tenders there. The income from commercial fisheries was valuable for families in a region where jobs and income can be scarce, and it provided support for subsistence fishing and the harvest of other traditional foods. The last commercial fishery for chum salmon occurred in 2015, when 48 active CFEC salmon permit holders in Tuntutuliak collectively earned \$93,586 from commercially harvested salmon (CFEC 2024). However, in 1988, the peak year of commercial fishing on the Kuskokwim (Figure 9), 49 Tuntutuliak permit holders generated \$894,000 in fish sales, worth a 2025 equivalent of \$2,425,000 (CFEC 2024). Revenue from commercial salmon sales supported the mixed economy of the community (DEIS Section 4.4.4.1).

Subsistence harvest of chum and other salmon has been and continues to be a key part of the seasonal harvest cycle in Tuntutuliak. However, as with harvest patterns in Aniak and Nikolai, subsistence chum salmon harvests have trended downward, particularly with the displacement of regular dog team use by snowmachines and other vehicles in the latter half of the 20th century, as well as recent fishing restrictions during the chum salmon season. Between 1990 and 2019, Tuntutuliak residents harvested an average of 3,300 chum salmon community-wide per year for subsistence. This has dropped to 1,200 fish between 2020 and 2023 (Figure 11). In recent years, increasing numbers of Tuntutuliak families are processing fish in the village, rather than moving to Tunt Fish Camp. As shared by one Tuntutuliak Elder:

"I'm one of the fish campers...but I don't go to fish camp because of the fish closures. There's only maybe 5 in Tunt [who use their] fish camp right now. No, that's not that many." – Adolph Lupie (in KRITFC 2021:7).

Restrictions reducing the amount of time families can fish, as well as increasing dependence on “9-to-5” jobs and rising costs of fuel and equipment, are heavily influencing families’ decisions to spend summers in the village (KRITFC 2024:13).

Aniak:⁷ The community of Aniak, or *Anyaraq* in Yugtun (meaning “the place where it comes out,” referring to the Aniak River) is located in the middle Kuskokwim at the confluence of the Kuskokwim and Aniak rivers (Mikow et al. 2019). The 426 residents of Aniak rely heavily on chum salmon, among other traditional foods, to meet subsistence needs and practice their way of life. Chum salmon are primarily harvested with drift gillnets, set gillnets, fish wheels, and rod and reel by Aniak residents in the past and present. Between 1990 and 2019, Aniak residents annually harvested an average of 3,400 chum salmon were annually harvested for subsistence, with a community harvest of 10,200 chum salmon reported in 1990. This decreased to an average of 360 fish per year between 2020 and 2023, with only 80 chum salmon harvested by community subsistence fishers in 2022 and 160 in 2023 (Figure 11).



Panel 2. Gillnet, fish cutting station, and boats along the shore in Aniak, August 2024. Credit T. Vicente/KRITFC.

As was discussed in Section 2 of this appendix, the Aniak River is a primary spawning tributary for salmon and has historically been one of the most productive chum salmon tributaries within the Kuskokwim River drainage (Figure 1). People in Aniak have starkly noticed the loss of chum salmon in this tributary, particularly marked by the lack of “stink” of chum carcasses decomposing on riverbanks. As one Elder and LK holder in Aniak reflected on recent declines:

“When I first came to Aniak in the 1960s, there were people who made their money off fur in the winter and fish in the summer; that’s how they could buy a new outboard or net. They were able to do that because the chum salmon went up the Aniak valley to die. Elders talk about the stink up there, and the first year we had a sonar on the Aniak, we had a million chums up there; but no longer. We should think of chums as the sponsor of marine-derived nutrients and make sure we don’t downplay this.” – LaMont Albertson (in KRITFC 2023:5).

Chum salmon declines in the Aniak region are thus tangibly felt not just by human residents, but by the ecosystem.

Nikolai:⁸ The community of Nikolai, or *Edzeno’ Nikolai* in Dinak’i (referring to the traditional name of the South Fork of the Kuskokwim), is located along the forested banks of the South Fork at the headwaters of the Kuskokwim River. Most of Nikolai’s 84 residents are Upper Kuskokwim Athabascan.

⁷ Additional, comprehensive socioeconomic information about Aniak, compiled by Alaska Fisheries Information Network in 2011, can be found at https://apps-afsc.fisheries.noaa.gov/REFM/Socioeconomics/Projects/communityprofiles/Aniak_Profile_2000_2010.pdf.

⁸ Additional, comprehensive information about the history and culture of Nikolai, compiled by Ray Collins in 2000 and revised in 2004, can be found at <https://www.nps.gov/dena/learn/historyculture/upload/Dichinanek-Hwtana-508.pdf>.

Chum salmon, most often called “dog salmon” by residents in English or *srughot'aye* by Dinak'i language speakers, are a key part of the subsistence salmon diet in Nikolai alongside Chinook and coho salmon (best known as “red” salmon in this community). Traditional and modern chum salmon harvest methods by Nikolai residents include set gillnets, fish wheels, rod and reels, dipnets, and fish traps/weirs. Chum salmon are often cut into kites or flatfish by Nikolai fish cutters at their Blackwater and Big River fish camps (see Panel 3, right). To process fish in this way, the cutter removes the head, guts, and backbone of the fish, leaving its two filets and tail intact. They may make cuts in the flesh of the salmon to speed the drying process and wedge a stick horizontally between the filets to keep them from curling in on one another. Half-dried, half-baked fish is another popular way to process and serve chum salmon.



Panel 3. View of the South Fork Kuskokwim from Nikolai (left; credit T. Vicente/KRITFC). At right, flatfish hanging in Blackwater Fish Camp circa 1970s (credit Esai family archives).

Chum salmon harvests in Nikolai have been steadily declining for many years. During 1990–2019, an average of 430 chum salmon were harvested by community fishers. Zero chum salmon were reportedly caught in 2022, and in 2023, this increased to only one fish (Figure 11).

Sockeye salmon are rare in Nikolai, if present at all, as most sockeye salmon spawn in tributaries downstream of the South Fork of the Kuskokwim River. When interviewing TK holders and Elders in Nikolai in June 2024 about types of salmon they have seen and/or harvested in or near Nikolai in their lifetimes, only 1 of 7 people said they were familiar with sockeye salmon in their region. Unlike many residents of the middle and lower Kuskokwim, Nikolai residents are unable to rely on abundant sockeye salmon to fill food security needs during recent concurrent declines of chum, Chinook, and coho salmon.

5. Cumulative Factors Contributing to Kuskokwim Chum Salmon Declines

Numerous compounding environmental and anthropogenic (human-caused) drivers are contributing to Kuskokwim River chum salmon declines (Figure 12; see also DEIS Sections 3.3.3.1.4 and 3.3.3.1.5). Oftentimes, these drivers are both environmentally and anthropogenically induced, as is the case with climate change and ecological imbalances.

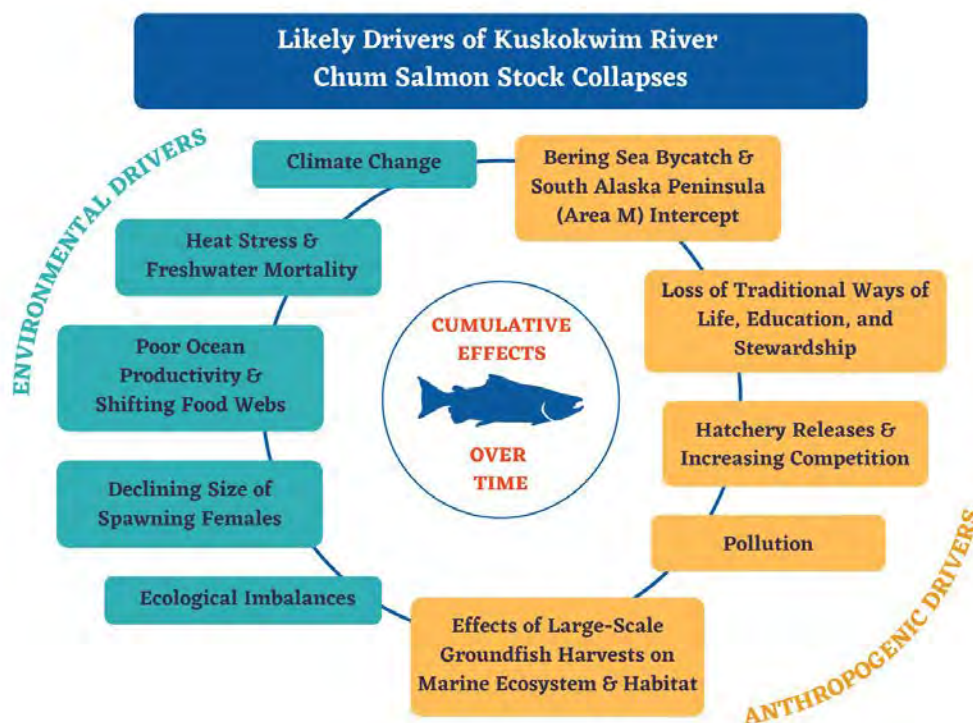


Figure 12. Likely environmental and anthropogenic drivers of chum salmon stock collapses on the Kuskokwim River. These drivers accumulate over time.

Without the cessation or lessening of the intensity of these factors, it is challenging—perhaps impossible—for chum salmon stocks to restore to former abundances. Over time and across the salmon ecosystem, these drivers act together to contribute to low abundance of chum salmon. Figure 13, adapted from a figure published in the 2022 Eastern Bering Sea Ecosystem Status Report, illustrates these co-occurring factors that, over the course of one life cycle, likely contributed to low 2023 chum salmon returns to the Kuskokwim and Yukon rivers.

Critical to understanding how to rebuild chum salmon stock abundance is recognizing that many of these drivers—particularly those that are anthropogenic in nature—can be mitigated by changes to fisheries management. This includes the management practices and policies of the National Marine Fisheries Service (NMFS) and the North Pacific Fishery Management Council (Council), ADF&G and the Alaska Board of Fisheries (BOF), and entities operating outside of Alaska and the United States. This section focuses on key anthropogenic drivers that can and must be addressed by management intervention, and not those of environmental nature. For more information on some of the environmental drivers of chum salmon declines, see DEIS Sections 3.3.3.1.4 and 4.4.3.2.3.

FACTORS AFFECTING 2023 YUKON & KUSKOKWIM CHUM SALMON RUNS AND SUBSISTENCE HARVESTS

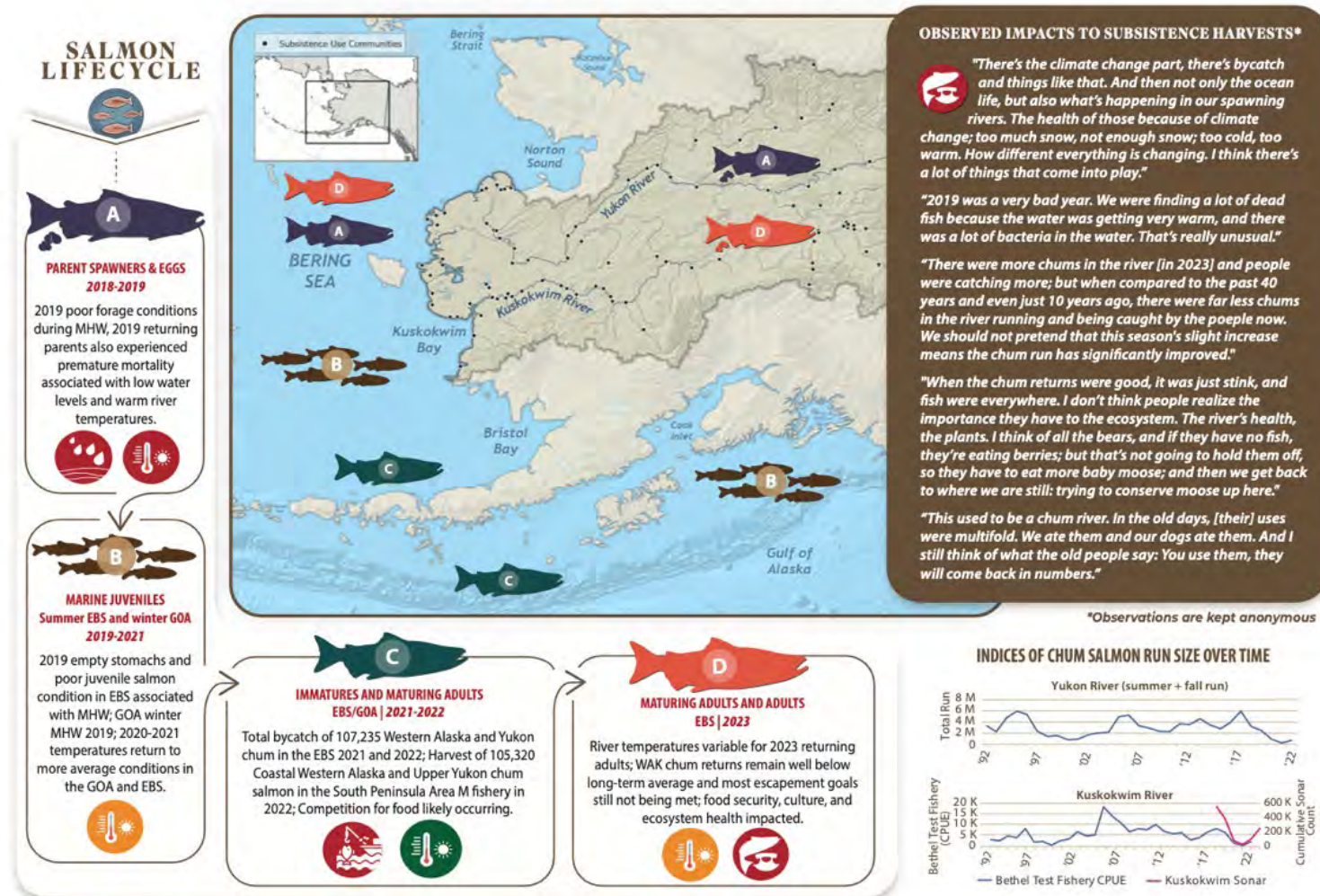


Figure 13. Factors affecting 2023 Yukon and Kuskokwim chum salmon and subsistence harvests, adapted by P. Chambers from 2023 Eastern Bering Sea Ecosystem Status Report (Whitworth et al. 2023).

➤ **5.A. Chum Salmon Local Adaptation and Discrete Spawning Populations**

The return of most anadromous salmonids (including chum salmon) to natal sites for spawning is a core life history trait. This “homing” increases the probability that fish of reproductive ages will find mates and locate favorable habitats for both adult spawning and juvenile survival. As a result, the return of salmonids to natal sites is highly adaptive, provides fitness benefits, and has also contributed to the evolution of a myriad of locally adapted populations (Taylor 1991; Quinn 1993; McDowall 2001; Keefer and Caudill 2014).

Through generations, localized salmon populations become uniquely adapted to their natal streams through aspects such as water flow and temperature, spawning substrate, rearing habitat, and run timing. **These can be considered discrete spawning populations: tributary stocks with significant spatial or temporal separation such that they may be genetically distinct.** Variation in life history and population characteristics among salmon subpopulations enhances resilience to environmental change and dampens interannual variability in ecosystem services across the broader population (Connors et al. 2022). As a result, ecological variation is considered central to strategies for managing risks to ecosystems and developing climate resilience in an increasingly variable and uncertain environment (Schindler et al. 2010).

However, environmental aspects also change over time. Genetic variation allows for some adaption to environmental change (e.g., run timing varies across a range of dates and the optimal spawning date in a given year may depend water temperature and water flow). “Straying” (typically defined as adult migration to, and attempted reproduction at, non-natal sites) remains a critical component of salmon life history that maintains genetic diversity. Straying allows for recolonization of habitat after local extinction events (e.g., a landslide into spawning grounds) or colonization of new habitats (e.g., following glacial recession; Milner and Bailey 1989; Quinn 1993; Keefer and Caudill 2014), although such adaptation into newly available habitats may take decades or longer. In addition, the loss of subpopulations that can respond differently to different environmental conditions may reduce the resilience of the greater chum salmon population across the Kuskokwim drainage. The underlying rate of chum salmon straying varies by subpopulation or spawning areas. Straying, when it occurs, tends to be more common among salmon population that are closer in their temporal and spatial spawning events.

Efforts to discriminate spawning chum salmon populations from the Western Alaska genetic group have been challenging, but research is ongoing (DeCovich et al. 2012; McKinney et al. 2022). Fall chum salmon populations in the Middle and Upper Yukon and the Upper Kuskokwim have been found to be genetically distinct from summer chum salmon populations on both rivers (Olsen et al. 2008; Garvin et al. 2013). Several recent developments to discriminate spawning populations show promise including the use of strontium isotopes (Brennan et al. 2019; Brennan and Schindler 2019), and other research is underway to develop the stock portfolio for Western and Interior Alaska chum salmon that may reveal additional discrete spawning populations on the Kuskokwim River (see Attachment 1).

It is critical to recognize that, particularly when experiencing low stock abundance, the return of a single chum salmon can support the viability of discrete spawning populations. Sustained levels of chum salmon removals, including through bycatch and intercept, likely have

greater negative impacts to the viability of discrete spawning populations during times of low abundance (e.g., in 2020–2023) compared to periods of high abundance. In other words, as chum salmon decline, every salmon that returns becomes biologically more important for the sustainability of its discrete spawning population as well as overall stock abundance (DEIS Section 4.4.5.3.2).

Figure 14 shows three scenarios of varying (low, medium, high) chum salmon removals. When fish removals (e.g., from bycatch, intercept, targeted fisheries, predation, etc.) are low (Scenario 1), abundance of all populations is likely to remain high. The impact on genetic diversity within the watershed is low, and genetic diversity of discrete spawning populations remains high. When fish removals are moderate (Scenario 2), abundance of a population(s) may decrease, and the risk for losing genetic diversity of a discrete spawning population(s) increases moderately. When fish removals are high (Scenario 3), abundance of most populations may decrease, and the risk for losing genetic diversity of most discrete spawning populations may increase significantly.

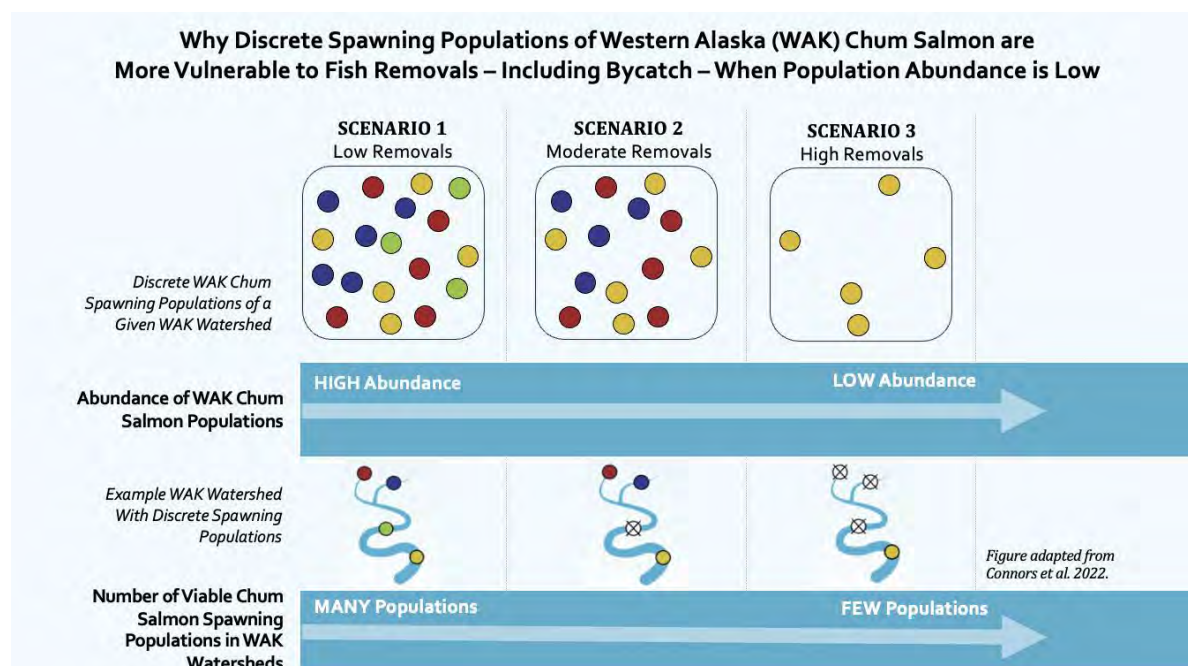


Figure 14. Schematic showing why discrete spawning populations of Western Alaska chum salmon are more vulnerable to overharvest when populations are low, as adapted from foundational fisheries ecology principles described in Connors et al. 2022. Different color circles represent discrete spawning populations within chum salmon stocks of a Western Alaska river.

The loss of discrete spawning populations has significant impacts to human and non-human communities that have adapted to harvest from those localized populations. If these populations weaken or are extirpated, the communities dependent upon them may not meet their harvest needs. This could lead to heightened food insecurity and cultural loss amongst human communities, and a loss of vital ecosystem services that affect human and non-human consumers alike (DEIS Sections 4.5.1.1, 4.5.5.3.1, and 4.5.5.3.3). This must be considered as NMFS and the Council seek to meet the Purpose and Need of this action.

➤ 5.B. Bycatch and Intercept

Chum salmon bycatch in the Bering Sea/Aleutian Islands groundfish fisheries and intercept in the South Alaska Peninsula Unimak and Shumagin Islands (Area M) June fisheries are leading anthropogenic drivers of Kuskokwim chum salmon declines.

This analysis focuses on bycatch in the Bering Sea pollock trawl fishery, and NMFS and the Council are currently responsible for minimizing bycatch in only this fishery. However, **from a Tribal perspective, it is difficult to consider the impacts of bycatch by Bering Sea fisheries—especially the inshore catcher-vessel fleet fishing north of the Alaska Peninsula—without also considering those of the Area M June fishery, managed by ADF&G and the BOF.**

Western Alaska chum salmon, including Kuskokwim River stocks, annually encounter both fisheries as they migrate through False Pass and the Aleutian Islands from wintering grounds in the Gulf of Alaska and summering grounds in the Bering Sea (Figure 15). In addition to the cumulative impacts of chum salmon removals by these fisheries, the disjointed management (e.g., NMFS/Council vs. ADF&G/BOF) of chum salmon in these critical migratory corridors contributes to the failure to conserve and rebuild Western Alaska and Kuskokwim chum salmon. Consistently, the inshore catcher-vessel fleet has caught the highest numbers of Western Alaska chum salmon, which aligns with knowledge of the migratory pathway of these fish through waters just north of the Alaska Peninsula, where the pollock trawl fleet fishes.

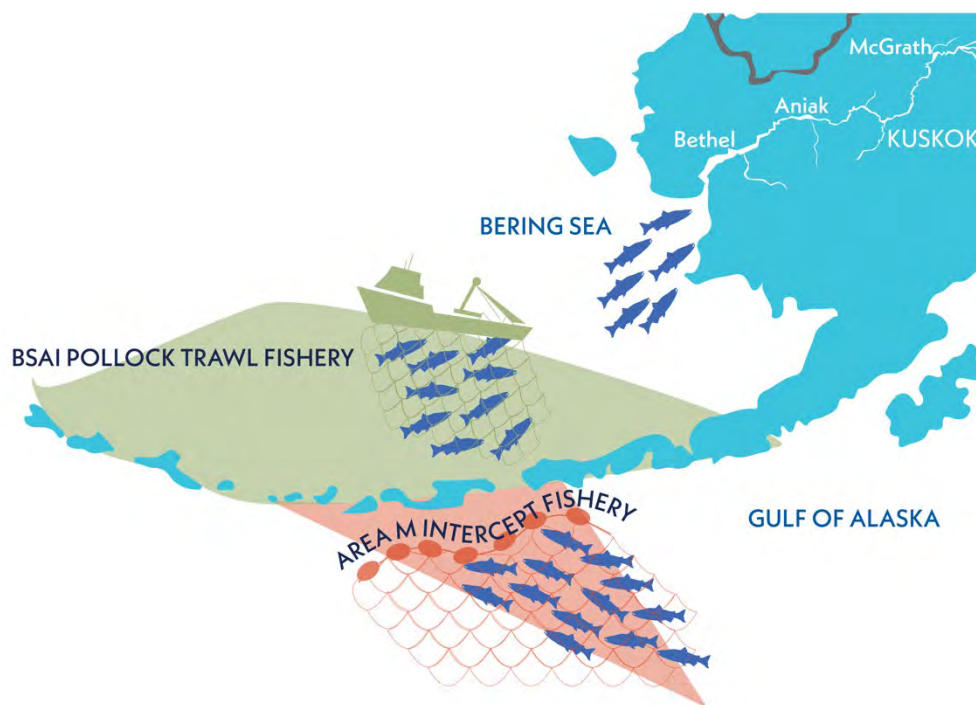


Figure 15. Migratory pathway of Western Alaska chum salmon, including those of Kuskokwim River origin. As they travel between the Gulf of Alaska and Bering Sea to rear or head to their natal rivers to spawn, Western Alaska chum salmon are encountered and removed by the Area M intercept fishery and Bering Sea/Aleutian Island pollock trawl fisheries.

Bering Sea bycatch and Area M June harvests annually remove significant numbers of chum salmon, including Western Alaska chum salmon. Figures 16 and 17, respectively, show total

numbers of historical Bering Sea pollock fishery bycatch and Area M June fishery intercept of chum salmon. In these cases, “total” signifies raw reported numbers of chum salmon removals from all genetic stock reporting groups, including Japanese and Russian hatchery releases, and not just from Western Alaskan wild stocks, as reliable genetic analyses do not date back as far as recorded chum salmon removals.

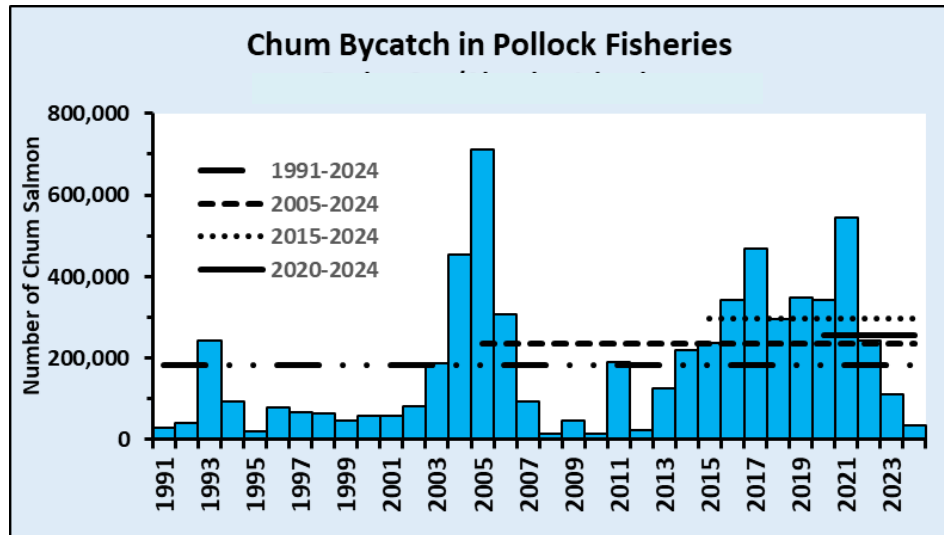


Figure 16. Total chum salmon (all genetic reporting groups, including Western Alaska) bycatch in Bering Sea/Aleutian Islands pollock trawl fisheries, 1991-2024, showing long-term (1991–2024), 20-year (2005–2024), 10-year (2015–2024), and 5-year (2020–2024) averages are also provided. Source: NOAA Fishery Landings and Catch Reports in Alaska 2024.⁹

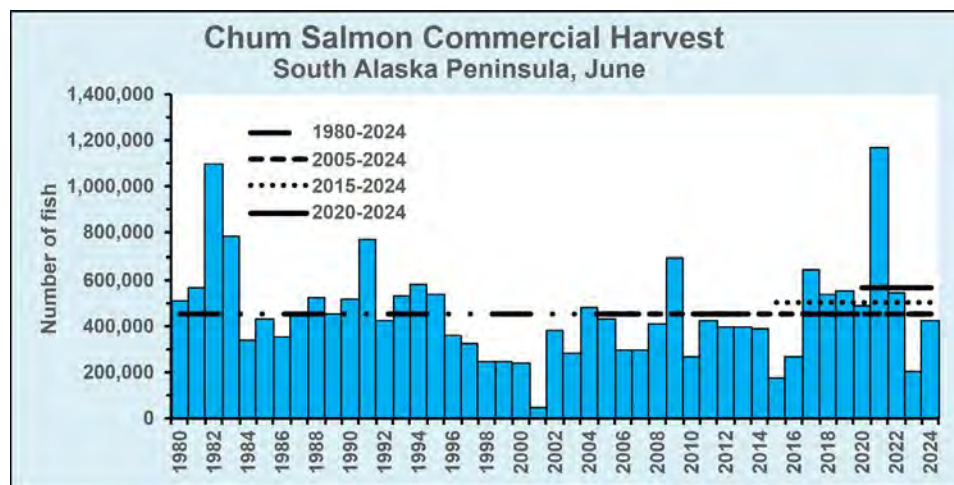


Figure 17. Total chum salmon (all genetic reporting groups, including Coastal Western Alaska) intercept harvest in June Area M fisheries, 1980-2024, showing long-term (1980–2024), 20-year (2005–2024), 10-year (2015–2024), and 5-year (2020–2024) averages are also provided. Note that long-term and 20-year average

⁹ Available at https://www.fisheries.noaa.gov/sites/default/files/akro/chum_salmon_mortality2024.html.

*levels (456,172 fish and 454,006 fish, respectively) are close and overlap on this graph. Sources: Fox et al. 2022; Dann et al. 2023; ADFG 2024 Commercial Harvest Estimates).*¹⁰

The 1991–2024 long-term average Bering Sea chum salmon bycatch from all stock groupings (including Western Alaska stocks, like the Kuskokwim) was 183,200 fish (Figure 16). This was exceeded by the recent five-year (2020–2024; 255,900 fish) and ten-year (2015–2024; 297,100 fish) averages. The three highest years of chum salmon bycatch in the BSAI groundfish fisheries occurred in 2005 (711,500 chum salmon), 2017 (471,400 chum salmon), and 2021 (550,600 chum salmon). Figure 17 shows that since 1980, the average Area M June fishery harvest is 455,500 chum salmon from all stock groupings, including Coastal Western Alaska fish. Similar to Bering Sea bycatch levels, the recent five-year average increased (2020–2024; 566,400 fish). The highest annual harvests of chum salmon from all stock groupings in the Area M June fisheries occurred in 1982 (1,094,000 fish), 1991 (772,700 fish), and 2021 (1,168,600 fish).

Reliable genetic analyses of BSAI bycatch date back to 2011 (pers. comm., P. Barry and W. Larson, NOAA). Geneticists estimate that time-series highs of approximately 65,500 and 65,200 Coastal Western Alaska chum salmon¹¹ were respectively caught as bycatch in 2016 and 2017 (NPFMC 2024:92). With existing information, it is unclear how many Western Alaska chum are of Kuskokwim origin and how many of those would have returned to the Kuskokwim in a given year (i.e. adult equivalents). However, any additional fish removals of Kuskokwim chum salmon stocks affect escapements, harvests, and the sustainability of these stocks. It is possible that years of high Western Alaska chum salmon bycatch specifically contributed to low Kuskokwim chum salmon abundance, escapement, and harvests, including during the recent low period 2020–2023. In other words, what happens in the oceans affects what occurs in freshwater spawning tributaries.

In Area M, Western Alaska chum salmon have historically been intercepted in the highest proportion during the month of June, aligning with chum salmon seasonal migration through these fishing grounds while in route to the Bering Sea or their spawning grounds. On average, 18% to 57% of all chum salmon harvested in the Area M June fishery are of Coastal Western Alaska origin, which includes Kuskokwim chum salmon stocks (Seeb and Crane 1999; Dann et al. 2023). Because genetic analyses in Area M have been inconsistent, Figure 19 shows the potential contributions of the Coastal Western Alaska chum salmon stock grouping harvested in the June Area M fisheries between 1980 and 2024. There is high inter-annual variability in both the number of chum salmon harvested in June and the contribution of Coastal Western Alaska stocks to the total harvest. Based on the limited number of years analyzed for genetic contribution, harvests of Coastal Western Alaska stocks were likely within the range of 197,000–635,000 chum in 1982 and 210,000–678,000 chum in 2021, the peak years of Coastal Western Alaska stock catches in this time series.

¹⁰ Available at

<https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareaakpeninsula.salmonharvestsummary>.

¹¹ Note that we refer here to Coastal Western Alaska stocks specifically because the genetically distinguishable upper/middle Yukon River chum salmon stocks composing the other stock grouping in the general “Western Alaska chum salmon” genetic grouping, would not have returned to the Kuskokwim. Coastal Western Alaska stocks, on the other hand, include Kuskokwim chum salmon stocks.

Over decades, these chum salmon removals accumulate and contribute to the sustained decline in stock abundance. Every chum salmon lost to bycatch or intercept is a salmon that cannot complete its life cycle and spawn, pass on climate resilience genetics to its offspring, help rebuild stock abundance and maintain discrete spawning populations, or support the continuation of subsistence fishing traditions. Reducing the levels of chum salmon bycatch and intercept are ultimately within the control of NMFS, the Council, the BOF, ADF&G, and the fleets themselves.

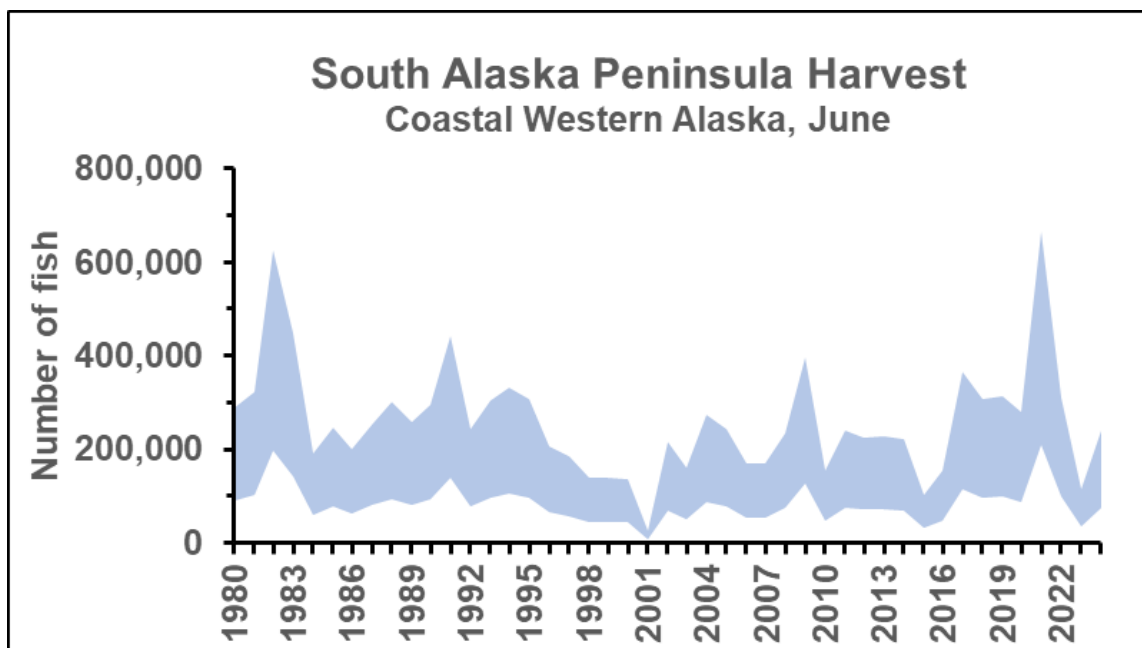


Figure 19. Potential catches of Coastal Western Alaska chum salmon in South Alaska Peninsula fisheries in June, based on genetic studies in 2007–2009 and 2022 (Foster and Dann 2022; Fox et al. 2022; Dann et al. 2023; ADFG Commercial Harvest Estimates 2024).

As stated in Section 4.A. of this appendix, TK holders understand that bycatch and intercept disrespectfully waste fish, and, coupled with argument between user groups, drive salmon declines. This is illustrated in this narrative from Fienup-Riordan et al. 2007:

“In February 1992 [the late Toksook Bay Elder] Paul John spoke before the Alaska Board of Fisheries, opposing the board’s earlier decision to increase the amount of salmon that commercial fishermen are allowed to catch in the Bering Sea (King 1992). At the close of his statement he said he was compelled to illustrate his feelings with a story about a good hunter and a bad hunter. Even though the bad hunter lacked the needed skills to provide for his family, they never went hungry because his responsible wife carefully preserved and stored his meager catch. But the good hunter had a careless wife, and much of his catch spoiled. Pointing his finger at board members, Paul said simply, ‘You are a careless wife.’...”

“Paul John also addressed the decline of the Bering Sea fishery due to wasteful practices: ‘The Kass’at [non-Natives] carelessly handle the fish down below us in the ocean where our food resources grow. As unwanted fish get caught in their nets they throw them back in the water. Our subsistence lifestyle is harmed by their action. This adage, which tells that if something is abused it will dwindle, is certainly the truth. But if

they begin to follow what we say, the numbers can begin to climb. Besides telling people not to waste, they also told them not to fight over it or their number would dwindle.’’
(Fienup-Riordan 2007:23)

However, the same authors note that “[j]ust as conflict can drive animals away, acts of compassion will encourage their return. Paul John testified to the importance of cooperation and listening to one another to resolve resource management issues” (Fienup-Riordan et al. 2007:23). There is hope amongst TK holders, including those in the Kuskokwim, that working together can help rebuild salmon stocks.

➤ **5.C. Impacts to Food Webs, Habitat, and Rivers-to-Seas Ecosystems**

In addition to removing actual chum salmon, large-scale industrial fisheries, particularly pelagic and bottom trawl fisheries in the Bering Sea, have altered food webs and habitat, unbalancing and reducing biodiversity in the rivers-to-seas ecosystems of the North Pacific (e.g. Freese et al. 1999; McConnaughey et al. 2019)

The Bering Sea pollock fishery is a high-volume fishery that can remove significant amounts of biomass from the North Pacific, biomass that would otherwise feed and support the productivity of chum salmon, Chinook salmon, and other species. Removals of chum salmon and low chum salmon abundance also likely affect chum salmon-reliant predators such as killer whales, Stellar sea lions (including populations in the Gulf of Alaska), and Northern fur seals, of which some populations are depleted. Habitat impacts from both pelagic and bottom trawl fisheries exacerbate negative impacts to these ecosystems and food webs (Stratton and Wilson 2023). **Large-scale industrial trawl fisheries have altered North Pacific food webs and habitat, inducing a trophic cascade of negative impacts throughout the marine ecosystem.**

While DEIS Section 4.4.3.2.3 discusses the importance of marine-derived nutrients to the Kuskokwim River ecosystem, particularly focused on organisms that consume returning salmon. The contribution of chum salmon throughout the drainage cannot be overstated in terms of the nutrient/chemical contribution to both the river ecology and the riparian habitat, likely providing a feedback mechanism in which higher salmon returns provide increased nutrient input that enhances river productivity over lower salmon return areas (Helfield and Naiman 2001; Kline et al. 2007; Laroque and Simard 2023).

Because the Kuskokwim’s freshwater ecosystem is connected to that of the North Pacific—especially through anadromous salmon—these impacts ripple out, extending into the headwaters of river systems in the Interior region of Alaska. For instance, TK holders and regional harvesters have observed bears, hungry for salmon, shifting to target young moose, decreasing the abundance of another important traditional food for communities (KRITFC 2024). Many TK holders in the Kuskokwim drainage observed low abundances of whitefish and trout in salmon spawning tributaries in 2022 and linked these species abundance drops with near record-low chum salmon abundance. Impacts to food webs, habitats, and ecosystems are thus cascading across the Arctic, especially when compounded by climate change.

The reduction of bycatch of Western Alaska chum salmon is one mitigable driver of these impacts that could help restore chum salmon abundance and rebalance these ecosystems. Furthermore, a decrease in the amount of net-in-water time of the trawl fleets is likely to have a measurable impact in decreasing the number of chum salmon (and other species) caught as bycatch. The TK holders on the Kuskokwim River understand the relationship between the amount of fishing time and the number of fish left in the ecosystem and thus have often called for “stand downs” by the trawl fleet (and Area M fleet) until salmon stocks recover.

The practice of harvest closures or reductions for species conservation is regularly employed by fisheries managers and subsistence harvesters in the Kuskokwim region. For instance, KRITFC, USFWS, and ADF&G annually implement a “front-end closure” for fishing with drift gillnets during the first 11 days of the month of June. This allows the first Chinook salmon that return to the river, which are those bound for the upper reaches of the drainage, to pass through the lower and middle river without heavy harvests (Smith and Liller 2017). Similarly, during recent periods of chum salmon declines, subsistence fishers on the Kuskokwim River faced closures that protected chum salmon but prevented harvesters from catching abundant sockeye salmon simultaneously migrating upriver.

In a game management context, Kuskokwim harvesters and TK holders often recall the 2004–2009 fall moose hunting moratorium, in which Tribes and local residents drastically limited their moose harvests to successfully restore abundance of Kuskokwim moose populations to harvestable levels. The five-year moose moratorium is often brought up as a model for a fishing moratorium by the BSAI and Area M fleets, in which several years of fleet stand-downs could help rebuild chum (and Chinook) salmon stocks.¹²

It is important to recognize that Kuskokwim communities do not bear these conservation closures painlessly, but heavily sacrifice harvests and traditions necessary to restore and sustain depleted species and to build equity among regional harvest patterns. **Parallel stand-down measures taken in the BSAI fleet would similarly not come without sacrifice by the fleet but may be equally necessary for stock restoration and equity in bearing the burden of conservation during times of scarcity.** Should the fleet sacrifice some of its pollock quota during such a stand-down, they would leave increased numbers of pollock in the Bering Sea. This could significantly benefit juvenile chum salmon that depend upon age-0 pollock as an important prey source, especially when abundance of copepods and other foods have been in a state of decline (Farley et al. 2024; NOAA 2023c).

A reduction in trawl fleet net-in-water time would also decrease the time nets spend dragging the seafloor and destroying critical benthic habitat. This would help this habitat, like slow-growing corals, to rest from continued net impacts, though sustained closures to bottom-contact trawling and changes to bottom-contact trawling practices and policies, including in the pelagic trawl fleet, are likely necessary to allow these delicate habitats to fully recover and support the trophic ecology of the North Pacific (Stratton and Wilson 2023).

¹² It is important to note the intent of these fleet stand-downs would be to rebuild these stocks for terminal fishers in the Kuskokwim and other Western Alaska rivers, and not for the increased take of the local fleets themselves, which deviates from the moose hunting moratorium’s purpose to benefit local harvesters.

➤ 5.D. Hatcheries and Competition

Hatchery salmon releases in the North Pacific are another likely driver of Kuskokwim salmon declines. Hatchery releases increase competition for prey, habitat, and other resources while juvenile chum salmon mature. Figure 20 shows hatchery releases of all salmon species across the North Pacific Rim during 1980–2023. Figures 21 and 22 respectively show hatchery chum and pink salmon releases across the same region. These species are featured here because they are competitor species with wild Kuskokwim chum salmon stocks. **The sheer abundance of hatchery chum, pink, and other salmon in the North Pacific for the last three decades until today undoubtedly has contributed to wild chum salmon declines across the state as these different fish compete for finite space and resources.**

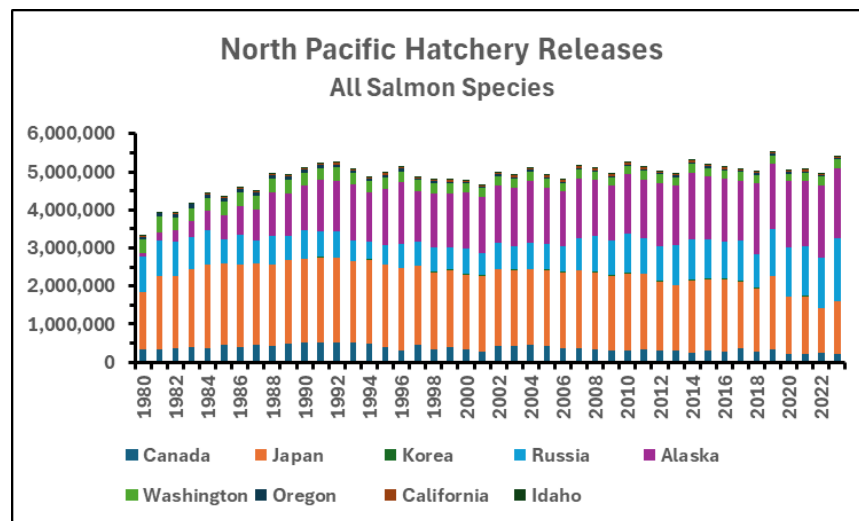


Figure 20. Hatchery releases of all salmon species from hatcheries in areas bordering the North Pacific Ocean, 1980–2023. Source: NPAFC 2024.

Hatchery releases of chum salmon across the North Pacific increased rapidly from the 1960s to the 1990s and have since remained stable, averaging 3.05 billion (range 2.72–3.53 billion) chum salmon released during 1990–2023 (NPAFC 2024). **In the last decade, chum salmon hatchery outputs from Japan have decreased, while those from Russia and Alaska have increased** (Figure 22).

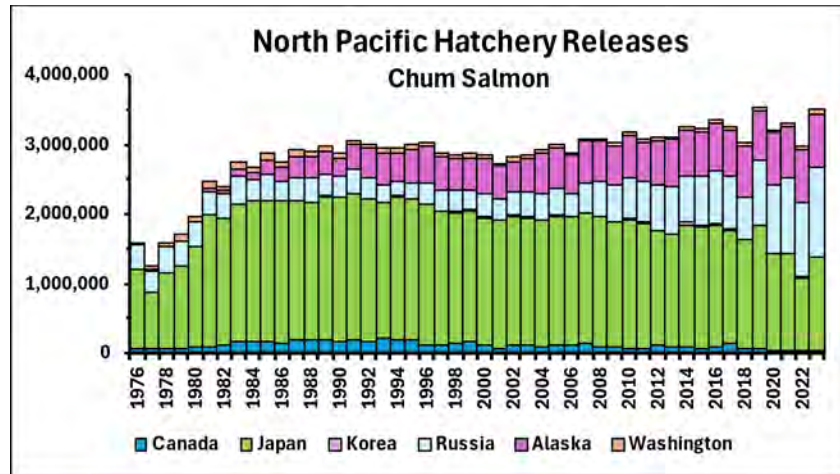


Figure 21. Hatchery releases of chum salmon from hatcheries in areas bordering the North Pacific Ocean, 1976–2023. Source: NPAFC 2024.

Hatchery releases of pink salmon across the North Pacific also increased rapidly during the 1960s to 1990s and have since been relatively stable, averaging 1.35 billion (range 1.12–1.51 billion) pink salmon during 1990–2023 (NPAFC 2024). Alaska’s contribution to pink salmon hatchery production in the North Pacific has increased from 57% in 1990 to 74% in 2023 (Figure 23). **Hatchery pink salmon are voracious eaters and may have a particularly strong negative relationship with wild chum salmon stocks, including those on the Kuskokwim** (AYK SSI 2024; Ruggerone et al. 2021).

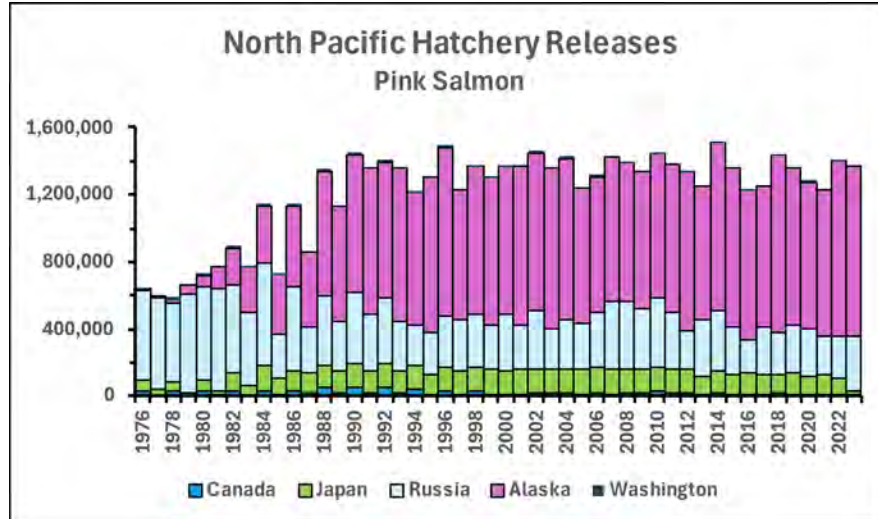


Figure 22. Hatchery releases of pink salmon from hatcheries in areas bordering the North Pacific Ocean, 1976–2023. Source: NPAFC 2024.

Impacts from hatchery releases are mitigable with management and policy intervention. While outside the direct scope of NMFS and this Council, collaboration with the State of Alaska and the U.S. State Department could evaluate whether and to what extent reduced hatchery production by Alaska, other U.S. states, and other countries in the North Pacific may benefit wild Alaskan salmon production.

➤ ***5.E. Erasure of Indigenous Stewardship and Conflicting Management Frameworks***

The erasure of Indigenous salmon stewardship from contemporary fisheries management is a result of the colonization of salmon management and exclusion of Alaska Native people, knowledge systems, and values from management systems. These inequities, and the Western colonial management systems that produced them, have contributed to chum salmon declines as well as the loss of traditional ways of life that are vital to holistic well-being of Indigenous Kuskokwim communities (see DEIS Sections 3.3.3.1.5 and 4.3.7; Lavoie et al. 2025). In other words, **a foundational driver of chum salmon stock depletions is the exclusion of Indigenous people and their values and knowledge systems from modern fisheries management.**

Specific to NMFS' management and the Council process, Western fishery management principles of "Maximum Sustainable Yield" (MSY) and "Optimum Yield" (OY) that form the basis of North Pacific fishery management by NMFS, the Council, and ADF&G and the Magnuson-Stevens Act National Standards Guidelines frame sustainable fisheries management in terms of the maximization of harvest and profit. **This approach and goal directly conflicts with, and contradicts, Indigenous stewardship of traditional foods, which is based on values of sharing in times of abundance and scarcity, taking only what is needed, avoiding all waste, and respecting the dignity and life-gift of all beings, including non-human relatives** (Table 3; Harris and Wasilewski 2004; see also DEIS Section 3.3.3.1.5). These Indigenous stewardship principles—and particularly the Elders and TK holders who instructed harvesters and communities about these principles—guided traditional, pre-contact salmon management within and among communities on the Kuskokwim River, and they continue to guide KRITFC's management strategies today in partnership with YDNWR

Table 3. Values, priorities, and management mechanisms of Indigenous stewardship, KRITFC-YDNWR co-management, and NMFS/Council/ADF&G management frameworks.

	Indigenous Stewardship: Ecosystem-Wide	KRITFC-YDNWR Co-Stewardship: In-River	NMFS/Council/ADF&G Management: Marine
Values & Management Mechanisms	• Taking only what is needed; families monitoring harvests • Sharing in times of abundance and scarcity • Avoiding all waste • Respecting all life; seeing value in each fish that returns • Reliance upon Elder wisdom and Traditional Knowledge	• Precautionary, conservation-based management approach that balances escapement and harvest • Consideration of river-wide harvest needs • Real-time, in-season stock assessment • Reliance upon TK, local knowledge, and Western scientific indicators	• Maximum Sustainable Yield and Optimum Yield • Minimizing bycatch “to the extent practicable” for industry • Consideration of specific area harvest quotas and profits • Pre- and post-season stock assessment and target fishery/bycatch quota setting • Reliance upon quantitative data (including economic data) and Western scientific approaches
Priorities	• Balancing community harvest needs with ecosystem services • Sustainable fisheries, cultures, and ecosystems	• Avoid overfishing • Meet escapement goals • Provide as much local, rural subsistence fishing as can be sustained; harvest restrictions used to meet escapement	• Industry harvest and profit • Sustainable profits • Maximizing yield of target fisheries at expense of non-target species

Moreover, these Indigenous salmon stewardship principles are both community-oriented and ecosystem-based in nature. Communities and fish camps connected by the Kuskokwim River recognize the upstream effects of downstream harvests, and accordingly, value taking only what fish are needed and can be processed while allowing other fish to pass upriver to feed other families and the ecosystem. Traditional salmon stewardship also recognizes the inherent value chum salmon provide for ecosystems, placing equal importance on allowing salmon to reach spawning grounds, thus supporting future generations of fish returns and harvests as well as other non-human salmon consumers (e.g., bears and eagles), as is placed on meeting subsistence harvest needs. These Indigenous stewardship principles thus balance river-wide community harvest needs with those of the ecosystem; in practice, they are lived principles of environmental justice.

The same cannot be said for MSY, OY, and other principles and policies that guide NMFS, the Council, and most other Western management entities. **Profit-driven and -guided management as it currently exists, even while ostensibly operating within the bounds of MSY and OY, does not consider balancing community harvest needs and ecosystem services. Rather, it**

focuses on single, profitable species and industries (e.g., pollock and the trawl fleet) at the expense of other species (e.g., salmon and subsistence users), habitat, and the interconnected rivers-to-seas ecosystem. This management approach thus “sustains” yield for the profitable target fisheries at the expense of other fisheries and ecosystem services. It is dubious whether the level of extraction supported by economically-gear MSY and OY models and analyses will sustain target fisheries in the long-term without adequately accounting for multi-species, ecosystem-based assessments.

Furthermore, it is an environmental injustice that terminal harvesters within the Kuskokwim River are sacrificing their harvests of chum salmon while other user groups (e.g., Bering Sea pollock trawl and Area M salmon fishing fleets) are not. The Council’s current practices and their stated goals of both equity and environmental justice (EEJ) and ecosystem-based management (EBM) are misaligned (NOAA 2023b; NMFS 2024), as are the management policies governing in-river vs. marine salmon management. For instance, conservation-based salmon management principles and EEJ-oriented policies deployed in-river—like attaining escapement goals and prioritizing local, rural subsistence harvests under ANILCA—are not adhered to by marine managers. Kuskokwim River and Western and Interior Alaska chum salmon stocks are thus subjected to two divergent and contradictory management regimes (one in-river and one in the oceans; Table 3). The siloed management frameworks ultimately lead to salmon mismanagement across an ecosystem-wide scale.

The minimization of bycatch “to the extent practicable” is another NMFS/Council/ADF&G practice that undermines and ignores Indigenous stewardship principles that could support the recovery of Kuskokwim River chum salmon stocks. To TK holders on the Kuskokwim River, bycatch is a form of wasting and disrespecting salmon, which are key acts to avoid in Indigenous salmon stewardship because such acts contribute to fish refusing to return to river systems and harvesters in Indigenous stewardship (see DEIS Section 3.3.3.1.5). Kuskokwim TK holders note that wasting salmon must be avoided not only by in-river fishers, but by all who encounter salmon, including pollock trawl vessels in the Bering Sea and fishers in Area M.

Furthermore, Indigenous people are not equitably represented in most fishery management systems, and their values and knowledge systems are not considered equal to Western management practices and values (Esquible et al. 2024; Lavoie et al. 2025). This is a detriment to best management practices; ignores federal and agency policy to include TK as part of best available science (including as required in National Standard 2 and referenced in the Purpose and Need of this action) and to work alongside Tribal Nations to manage traditional foods and subsistence areas (OSTP 2022; NOAA 2023a; NPFMC 2023b); and drives the decline of traditional foods like chum salmon. Without correction, Western, profit-driven systems perpetuate the decline of chum salmon and resulting fishery closures, and low harvests contribute to the loss of traditional ways of life, educating youth, and stewarding salmon and one another (see DEIS Sections 4.4.3.2 and 4.5.1.1).

The erasure of Indigenous salmon management is anthropogenic in nature and can be corrected, particularly through the pursuit of co-management and Indigenous-led management with Alaska Tribal Nations and (inter-)Tribal organizations to facilitate gravel-to-gravel salmon stewardship and conservation. KRITFC defines “gravel-to-gravel”

salmon stewardship as the ecosystem-wide, inter-generational stewardship of salmon at all their life stages, from the time salmon hatch from eggs in freshwater streams, through their rearing in the oceans, until they return as spawners to lay their own eggs in the gravel.

In the years between their hatching from eggs in the gravel to returning to natal streams to lay their own eggs, Kuskokwim River chum salmon cross nearly a dozen different management jurisdictions and divisions. The variations in regulations and policy across salmon habitat do not benefit salmon, and they provide significant hurdles for managers and users to effectively pursue ecosystem-based management (EBM). NMFS, the Council, and ADF&G currently work together for North Pacific fisheries management, and ADF&G leads marine and freshwater salmon management across the state. However, without the involvement of Tribes at the management table, this management system lacks an integrated, ecosystem-wide, gravel-to-gravel stewardship vision that seeks salmon conservation and restoration both in-river and in the ocean.

Tribes have a government-to-government relationship with the federal government, and NMFS, as the federal agency, has a distinctive federal trust responsibility to Tribes and Tribal resources. Furthermore, direct work with Tribal Nations and authorized inter-Tribal entities would help bridge Indigenous and Western knowledge and value systems as well as restore Tribal food sovereignty. Co-stewardship between Tribes and NMFS would enhance inter-governmental relationships, elevate Alaska Native ways of knowing, and rectify differences between Indigenous stewardship and Western management for the benefit of salmon, Alaskans, and the pursuit of stated policy goals of equity and environmental justice and EBM.

6. Research In-Progress To Support Chum Salmon Knowledge

KRITFC would like to highlight the following ongoing research projects which have the potential for improving genetic stock resolution for WAK chum salmon populations and improving real-time chum salmon bycatch avoidance in the Bering Sea:

- A project led by Dr. Wes Larson at NMFS is exploring the feasibility of using genomic methods (whole genome resequencing) to improve resolution of stock structure. If successful, this newly developed tool would allow for more precise estimation of bycatch impacts in drainages across Western Alaska (see Attachment 1).
- A project led by Dr. Curry Cunningham and Dr. Joe Langan at UAF is using quantitative methods such as machine learning to develop much more comprehensive distribution models for Western Alaska chum salmon that integrate environmental variables. The goal of this project is to better understand the distribution of western Alaska chum salmon and what processes influence this distribution to provide more accurate data to the fleet that can be used to attempt to minimize bycatch of this stock (see Attachment 2).
- The Bristol Bay Science and Research Institute is investigating real-time genetic analysis of chum salmon bycatch in the inshore sector during the B-season of the pollock trawl fishery (see Attachment 3; Head et al. 2025).

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Attachment 1: Project Summary: Genomics for Chum Salmon Stock Identification

Contact: Wes Larson (wes.larson@noaa.gov)

Project Summary: Chum salmon runs in Western Alaska have declined dramatically over the past few years, resulting in widespread fisheries closures. It is important to understand all sources of mortality for these stocks to ensure that they can recover as effectively as possible. Chum salmon from western Alaska are primarily intercepted in two marine fisheries before reaching their natal rivers: (1) as bycatch in the Bering Sea pollock fishery and (2) as targeted harvest in South Peninsula salmon fisheries. Genetic data from both fisheries is currently analyzed, but chum salmon from Western Alaska can only be assigned to large stock groups, with the Coastal Western Alaska group including many drainages (Norton Sound, Lower Yukon, Kuskokwim, Nushagak, and other smaller drainages). Improved resolution of stock structure could eventually allow managers to estimate the stock-specific impacts of harvest at a much finer scale.

This project will use whole genome sequencing to create a baseline of genetic diversity by genotyping millions of markers in approximately 80 populations across western Alaska (most tissue samples already available from ADF&G archives) then using that high-resolution baseline to assign unknown individuals back to their population of origin. Whole genome sequencing allows researchers to genotype orders of magnitude more genetic markers than previous techniques, which should greatly increase resolution for differentiating stocks. This work will be guided by local and Indigenous knowledge in the region. Knowledge holders can help identify populations that can be distinguished by outward characteristics, interpret the geographic patterns in genetic structure, and highlight ways in which this information could eventually be used in management. This novel approach represents our best chance to use genetics to solve the longstanding challenge of stock identification for western Alaska chum salmon.

The reporting groups in Western Alaska that are possible to define with the current marker panel are: Kotzebue Sound, Middle Upper Yukon (Yukon Fall run), Upper Kuskokwim, and Coastal Western Alaska (includes Norton Sound, Lower Yukon, Lower Kuskokwim, Nushagak and most of Bristol Bay). With the proposed effort we anticipate that at minimum we will be able to differentiate Norton Sound. We also anticipate being able to differentiate the Lower Yukon from the rest of Coastal Western Alaska. Additionally, we expect to be able to differentiate other fine-scale groups such as the middle Kuskokwim or the Togiak area (e.g., similar groups are possible in Chinook). We hope to be able to differentiate the Lower Kuskokwim and Goodnews Bay from the Nushagak but it is difficult to postulate whether or not that will be possible. Once reporting groups are defined, we will work with fisheries biologists, local knowledge holders, and leadership at state and federal agencies and tribal entities to determine the best course of action for integrating the whole genome stock identification tool into management.

Attachment 2: Project Summary: Stock-Specific Modeling of Bering Sea Chum Salmon

Contact: Curry Cunningham (cjcunningham@alaska.edu)

Project Summary: Recent returns of chum salmon have been poor throughout their range in Alaska. This trend is particularly problematic in western Alaska, where record low chum salmon runs, compounded by low return abundance of Chinook salmon, have threatened a vital component of subsistence food security. While many factors influencing the abundance of western Alaska chum salmon (e.g. trophic interactions, climate and ocean conditions) likely cannot be controlled, mitigating the impacts of prohibited species catch in the US walleye pollock fishery presents a significant opportunity to minimize unnecessary mortality. Prohibited species catch of chum salmon has increased substantially during the past decade, with incidental harvest exceeding 500,000 fish in 2021. Concerns about the impacts of these incidental chum (and Chinook) salmon catches resulted in petitions from regional Tribal organizations for the closure of the 2022 pollock fishery and implementation of a quota for chum salmon prohibited species catch. However, it remains unclear how the spatial distribution of western Alaska chum salmon compares to stocks from other regions (e.g. Asia) and if this vulnerable metapopulation can be avoided by altering spatial or temporal patterns of fishing effort.

In order to address this pressing issue, the proposed research seeks to leverage genetic stock identification efforts focused on salmon caught as prohibited species catch in the Eastern Bering Sea to construct stock-specific spatial distribution models for chum salmon during the fishing season. Two separate model structures will be explored to describe: I) the total PSC rates of chum salmon and II) the stock composition of chum salmon PSC. A wealth of data exists that could be used to parameterize stock-specific distribution models for salmon in the Bering Sea. In addition to the data used to develop haul-level estimates of stock composition, this includes environmental data collected by NOAA and other organizations from in situ observations and remote sensing, data on the number and location of salmon caught as PSC, and age and length data for genotyped individuals. A number of modeling approaches able to characterize spatial correlation and spatiotemporal abundance patterns will be considered for model I, including generalized additive models (GAMs), vector autoregressive spatiotemporal (VAST) models, and spatiotemporal conditional autoregressive (STCAR) models, to determine which is best suited for modeling chum PSC data (1991-2021).

The development of haul-level estimates of chum salmon PSC stock composition, with accurate propagation of the uncertainty in the posterior probabilities of individual stock assignments, will allow for descriptive analyses of past PSC rates across both space and time. Chum salmon PSC in the Bering Sea pollock fishery has been increasing since the early 2010s and seasonal patterns are often punctuated by short, and thus far unpredictable, periods of high catches. This project will generate a new understanding of the stock composition of these PSC patterns and clarify where, when, and to what degree WAK chum salmon have been impacted by pollock fishing activities. Beyond such management insights, characterization of the stock compositions encountered by various fishing events will provide a window into the spatial ecology of chum salmon and how different stocks interact in the marine environment. Results of the descriptive analyses will also inform the structure of the spatiotemporal models developed to predict patterns of chum salmon PSC across the Eastern Bering Sea continental shelf within and among years.

Although the ability of the constructed models to explain nuanced spatiotemporal PSC patterns, and potentially link them to environmental conditions, will need to be determined based upon the nature of the available data, the results will represent a large step forward in understanding and mitigating PSC impacts on WAK chum salmon. Furthermore, the nature of the limitations of these models caused by data availability can be used to inform future genetic stock identification data collection procedures such that predictive capacity can be further expanded. Ultimately, these models will serve as critical tools in understanding the marine ecology of chum salmon and supporting the subsistence harvest that is vital to the food security and culture of western Alaska.

Attachment 3: Project Summary: In-season Western Alaska Chum Salmon Bycatch Genetic Assessment in the Inshore Bering Sea Pollock Fishery¹³

Contact: Jordan Head (jordan@bbsri.org)

Project Summary: The Bristol Bay Science and Research Institute (BBSRI) successfully conducted a research project to quantify the stocks of origin of the chum salmon caught in the inshore pollock B-season in 2024 (Head et. al 2025). The work is funded by a direct Legislative Grant from the State of Alaska, BBSRI, and Coastal Villages Region Fund (CVRF). Chum salmon were sampled at shoreside processing plants in Dutch Harbor and Akutan and analyzed at a Dutch Harbor based genetics lab run by BBSRI personnel. The goal of the project was to demonstrate the feasibility of providing weekly estimates of the stock-specific chum bycatch to industry, fisheries managers, and stakeholders. The information from the project will provide more timely information than the current annual estimates that are typically provided ~8-10 months following the fishing season. Given greater samples sizes needed for weekly estimates, the project will provide additional temporal and spatial resolution of when and where Western Alaska chum salmon are caught in the fishery. The work used widely accepted salmon genetic research methods, and the stock of origin “reporting groups” mirrored those currently provided to the North Pacific Fishery Management Council by NOAA’s genetics laboratory under the direction of Drs. Wes Larson and Patrick Barry. BBSRI worked closely with NOAA personnel and this project will augment (and not replace) the work done by its lab. NOAA produced the stock composition estimates for this project and both organizations worked together to generate in-season and postseason reports. The project will operate again in 2025 and there are plans to keep it operational into the future.

Project Goal: Produce weekly in-season estimates of the stock-specific chum salmon bycatch in the inshore B-season Bering Sea pollock fishery in 2024 and 2025.

Project Objectives:

- Sample chum salmon from processing plant landings for scales (age), Sex, Length, and fin tissues in proportion to the catch during the B-season pollock fishery.
- Use standard genetic analysis methods using Single-Nucleotide-Polymorphisms (SNPs) to provide stock-specific estimates of the origins of chum salmon caught in the Pollock fishery on a weekly basis from June through September or October 2024 and 2025.
- Age chum salmon to estimate the age-specific catch of chum salmon in the Pollock fishery in 2024 and 2025.
- Determine whether this type of project could provide adequate information to support voluntary or regulatory measures to reduce the number of Western Alaska chum salmon.

BBSRI will work closely with ADF&G, NOAA, industry, and regional stakeholders to accomplish the objectives above. In 2024, project results were not be made public during the season to provide time to master any challenges expected in the first year of a project of this nature, but all results were provided in the annual report (Head et. al 2025). Project results in 2025 will be made public as they are obtained within the season at [bbsri.org/inseason-data](https://www.bbsri.org/inseason-data).

¹³ More information about the project can be found at <https://www.bbsri.org/inseason-chum-genetics>.

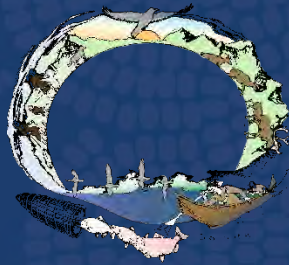
Timeline:

- October 2023 – May 2024
 - Project planning and preparation.
- June – October 2024, 2025
 - Sample the Bering Sea inshore pollock B-season and, with NOAA’s collaboration, produce weekly estimates of stock-specific and age-specific chum salmon bycatch.
- September 2024 – May 2025
 - Update to the NPFMC in October and/or December 2024
 - Prepare the annual report. Prepare for the 2025 season.
- 2025 B-Season
 - Publicly release in-season stock composition reports, available in-season at <https://www.bbsri.org/inseason-data>.
- October 2025 – February 2026
 - Update to the NPFMC in October and/or December 2025
 - Prepare final report.

Benefits of this work:

- *Timeliness of information* – This project will provide weekly estimates within the days following the week that chum salmon are captured. In 2025, data will be publicly available during the B-Season at <https://www.bbsri.org/inseason-data>.
- *Facilitate meaningful communication among stakeholders* – Project results will dramatically shorten the 8- to 10-month period between when the chum salmon are caught, and when results are available. Currently, only raw chum catch is available to industry and upriver users during the fishing season. The lag to stock of origin stifles information-rich dialogue. Project results will facilitate informed conversations among industry, managers, and Western Alaska residents.
- *Greater temporal and spatial resolution of the origin of chum bycatch* – This project will analyze up to 3 times as many fish as is currently done. The existing NOAA program produces annual estimates by 2 or 3 temporal strata and limited single-season spatial strata. Greater numbers analyzed will facilitate a better understanding of the temporal and spatial distribution of Western Alaska chum salmon caught in the inshore pollock fishery than is currently available. Whether this information is used and in what ways to manage fishing effort in-season will only be known once obtained and considered. For example, if there is little spatial or temporal homogeneity, the utility to inform fishing effort locations will be less than if there is heterogeneity in space or time and Western Alaska salmon catch can be predicted and/or detected in time to assist the industry with avoiding W. Alaska chum salmon.

Notes: This project is not intended or expected to inform or affect day-to-day fishing vessel movements. Rather, this project is designed to simply provide weekly accounting of stock-specific chum bycatch. Cumulating weekly Western Alaska chum catches across the season from generalized areas will keep the industry informed as to the degree of harvest within a given season and such information might affect the behavior of the fleet in some limited ways.



Tanana Chiefs Conference

Appendix 9A – We Are Salmon People: Traditional Knowledge and the Cultural, Health, and Economic Impacts of Chum Salmon Decline

*Supplemental Materials for the Draft Environmental Impact Statement (DEIS) on Chum
Salmon Bycatch in the Bering Sea Pollock Fishery*

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1 COMMUNITIES IN OUR REGION

1.1.1 Who We Are

The Tanana Chiefs Conference (TCC), also known as Dena' Nena' Henash or "Our Land Speaks," is a non-profit intertribal organization that serves 42 member Tribes, including 39 villages and 37 federally recognized Tribes across Interior Alaska. Our service area covers approximately 235,000 square miles—about 37% of Alaska—spanning six culturally and geographically distinct subregions: Yukon Koyukuk, Yukon Tanana, Lower Yukon, Upper Kuskokwim, Yukon Flats, and Upper Tanana. Each community maintains deep-rooted relationships with the land, water, and ecosystems that sustain their ways of life. The region's Athabascan peoples are linked not only by shared history and kinship but also by strong subsistence traditions, language continuity, and place-based ecological knowledge.

The governance of TCC is guided by a Full Board of Directors representing each member Tribe, an Executive Board, and the Office of the Traditional Chief. TCC's mission is to provide a unified voice in advancing sovereign Tribal governments and promoting physical and mental wellness, education, and socioeconomic development. Our history is one of advocacy and resistance. Long before TCC's formal establishment in 1962, Interior Alaska Tribes engaged with the U.S. government to protect burial grounds, safeguard hunting and fishing rights, and demand notice of federal actions affecting Indigenous peoples. TCC was born from this legacy and continues to operate as a political and cultural force defending Alaska Native self-determination.

"Salmon are a crucial element of our ecosystems, and integral to our cultures, identities, well-being, food security and social relationships. We live in a reciprocal and respectful relationship with salmon. We are Salmon People!"
— Tanana Chiefs Conference

1.1.2 Our History

The Tanana Chiefs Conference (TCC) was officially formed in 1962, but its origins trace back more than a century to a pivotal moment in Alaska Native political advocacy. In 1915, a group of Tribal Chiefs from across Interior Alaska convened to protect a sacred burial ground in Nenana threatened by the construction of the Alaska Railroad. Chiefs from Tanana (Ft. Gibbon), Crossjacket, Tolovana, Minto, Chena, and Salchaket were present, along with Judge James Wickersham. This meeting marked the beginning of a formal relationship between Athabascan Tribes and the federal government.



At the heart of this early advocacy were the enduring priorities of Alaska Native leaders: the protection of lands, the preservation of hunting and fishing rights, and the promotion of employment, education, and health care in their communities. Julius Pilot of Nenana firmly insisted that Tribal leaders be notified of all federal actions affecting their peoples—an early articulation of the principle of Tribal consultation.

The threat to Native lands intensified following Alaska's statehood in 1959. Although the Alaska Statehood Act acknowledged Native land rights, the State of Alaska quickly advanced development plans that posed serious risks

to Tribal homelands and traditional lifeways. In response, Al Ketzler, Sr. of Nenana organized a landmark meeting of 32 villages in Tanana in June 1962. It was from this gathering that the modern form of the Tanana Chiefs Conference emerged. The organization was formally incorporated in 1971.

As TCC's first president, Ketzler helped unify a statewide coalition of Alaska Native leaders. Their advocacy led to a critical decision in 1966 by the Secretary of the Interior Stewart Udall to suspend state land selections until Native claims could be addressed. Following an intense period of advocacy—during which Ketzler and dozens of other Alaska Natives lived and worked in Washington, D.C.—Congress passed the Alaska Native Claims Settlement Act (ANCSA), granting more than 44 million acres of land and nearly \$1 billion in compensation to Alaska Natives through a newly established corporate structure.

1.1.3 Tribal Nations of Our Region

Acknowledgment: Traditional place names are deeply rooted in oral traditions and may differ in spelling or pronunciation across dialects and regions. Each variation reflects the richness and diversity of Indigenous languages.

The Tribes of the Tanana Chiefs Conference (TCC) region is organized across six distinct subregions, each with its own unique cultural and geographic identity.

THE UPPER TANANA SUBREGION

NORTHWAY – K'EHTHIIGN
TETLIN – TEEŁAY
TANACROSS – TAATS'ALTĒY
DOT LAKE – Kelt'AADDH MENN'
HEALY LAKE – MENDEES CHEEG
TOK – TRADITIONAL NAME NOT READILY AVAILABLE
EAGLE – TTHEE T'ÄWDLENN

THE YUKON FLATS SUBREGION

ARCTIC VILLAGE – VASHRAJĪ K'Q̄Q̄
VENETIE – VĪJĪHTAJĪ
CHALKYITSIK – JAŁGIITSIK
FORT YUKON – GWICH'YAA ZHEE
CIRCLE – DANZHIT KHÄNLAJĪ
BEAVER – TS'AAHUDAANEKK'ONH DENH
BIRCH CREEK – DEENDUU
CANYON VILLAGE – TRADITIONAL NAME NOT READILY AVAILABLE

THE YUKON KOYUKUK SUBREGION

HUSLIA – TS'AATEYHDENAADKK'ONH DENH
KOYUKUK – MENEELGHAADZE' T'OH
NULATO – NOOLAAGHE DOH
KALTAG – GGAAŁ DOH
GALENA – NOTAALEE DENH
RUBY – TLAA'OLOGHE

THE LOWER YUKON SUBREGION

ANVIK VILLAGE – GITR'INGITH CHAGG
GRAYLING VILLAGE – SIXNO' XIDAKAGG
SHAGELUK VILLAGE – SISAALA', ŁEGGJITNO'
HOLY CROSS VILLAGE – DELOY CHET&/OR
INGRIRRALLER

THE UPPER KUSKOKWIM SUBREGION

MCGRATH – TOCHAK'
NIKOLAI – EDZENO
TAKOTNA – TOCHOTNO'
TELIDA – TILAYDI
MEDFRA – TRADITIONAL NAME NOT READILY AVAILABLE

THE YUKON TANANA SUBREGION

MINTO – MENOK'OGET (NEW MINTO)
NENANA – TOGHOTTHELE
MANLEY HOT SPRINGS – TOO NAALEŁ DENH

1.1.4 Languages of our Region

The Tanana Chiefs Conference (TCC) region is home to a remarkable diversity of Indigenous languages, each reflecting a distinct cultural worldview and relationship with the land. The primary languages spoken across the region are Athabascan languages, which belong to the broader Na-Dené language family—one of the largest Indigenous language families in North America. These languages have been spoken on this land for thousands of years and continue to be central to the identity, memory, and survival of Alaska Native peoples.

Each of our languages contains regionally unique dialects and expressions that reflect the ecology, seasonal cycles, and spiritual relationships of the people who speak them. While closely related, these languages are not mutually intelligible, underscoring the cultural complexity and richness of Interior Alaska.

Our languages are far more than systems of communication—they are vessels of cultural continuity. Embedded within each word are generations of observations about salmon, moose, rivers, plants, medicines, and sacred places. Language transmits not only traditional knowledge but also spiritual values, land ethics, and community responsibilities. To speak one's Native language is to see and relate to the world in a fundamentally Indigenous way.

For example, many words and place names describe precise ecological functions—such as a bend in the river known for fish spawning, or a ridge where caribou crosses in the fall. Others encode moral teachings, kinship responsibilities, or proper conduct in harvesting and sharing. Language holds the wisdom of ancestors and the resilience of survival through colonial suppression, boarding schools, and state efforts to erase Indigenous identity. In many communities, Elders emphasize that language is medicine—it connects young people to identity, grounds them in a sense of belonging, and protects cultural sovereignty. Understanding the land through the lens of Indigenous language shapes how we respond to ecological change, how we teach the next generation, and how we maintain reciprocal relationships with the natural world. Language, like salmon, is a keystone of our cultural ecosystem.

NAME	CHINOOK SALMON	CHUM SALMON
COMMON	<i>King Salmon</i>	<i>Dog Salmon</i>
SCIENTIFIC	<i>Oncorhynchus tshawytscha</i>	<i>Oncorhynchus keta</i>
CENTRAL YUPIK	<i>taryaavuk</i>	<i>teggmaarrluk</i>
DEG HIT'AN	<i>ggath</i>	<i>nalay</i>
HOLIKACHUK	<i>ggath</i>	<i>nalay</i>
KOYUKON	<i>gal</i>	<i>nulaga</i>
LOWER TANANA	<i>gath or gał</i>	<i>nulaghi, gath or k'edenadyoyi</i>
MIDDLE TANANA	<i>tuuge che'e</i>	<i>nuleghi</i>
TANACROSS	<i>tuug delt'el chox</i>	*
UPPER TANANA	<i>ts'ernah'</i>	*
AHTNA	<i>luk'ee'e</i>	<i>luk'ae seyi</i>
GWICH'IN	<i>luk choo</i>	<i>khii</i>
HAN	<i>tr'ojä', luk cho</i>	<i>tth'ay</i>
NORTHERN TUTCHONE	<i>gyo</i>	<i>thi'</i>
SOUTHERN TUTCHONE	<i>gyū</i>	<i>thi'</i>
TAGISH	<i>gēs</i>	*
TLINGIT	<i>t'á</i>	<i>tīl'</i>
KASKA	<i>gēs</i>	*

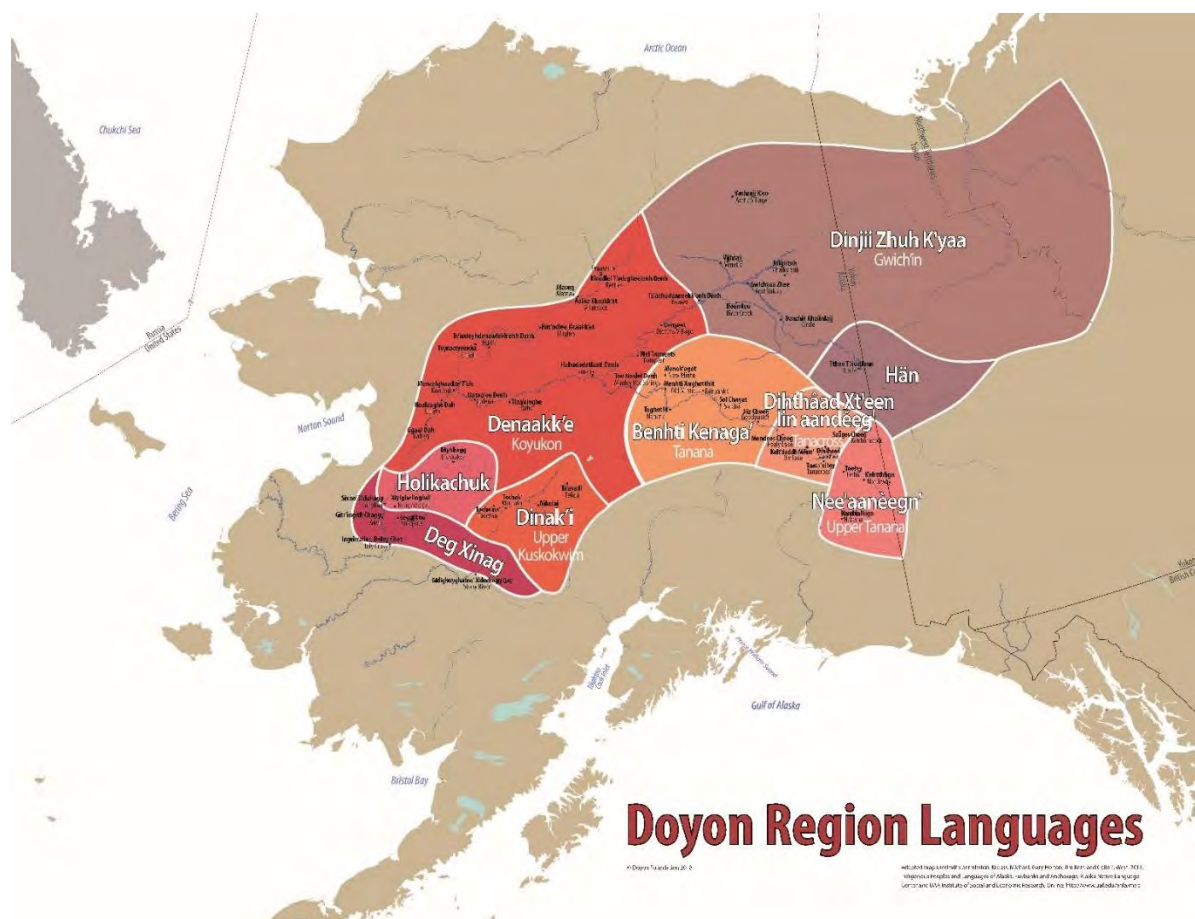
* – name not available

From the Yukon River Salmon Agreement Handbook
<https://www.yukonriverpanel.com/publications/yukon-river-salmon-agreement/>

1.1.5 Learn More About Our Lands and People

To gain a deeper understanding of the Tanana Chiefs Conference, including the cultural traditions, historical milestones, and present-day work of our member Tribes, we encourage you to explore the following resources.

Communities in Our Region
<https://www.tananachiefs.org/about/communities/>
 Tanana Chiefs Conference History
<https://www.tananachiefs.org/about/our-history/>
 Tanana Chiefs Conference – Village Contacts
<https://www.tananachiefs.org/contact/village-contacts/>
 University of Alaska - Languages of Alaska
<https://www.uaf.edu/anla/collections/map/>
 U.S. Dept. of the Interior – Indian Affairs - Tribal Leaders Directory
<https://www.bia.gov/service/tribal-leaders-directory>



Doyon Language Revitalization Program - <https://doyonfoundation.com/language/>

2 TRADITIONAL KNOWLEDGE AND METHODOLOGY IN SALMON MANAGEMENT

Disclaimer on the Traditional Knowledge Section

The explanation of Traditional Knowledge (TK) provided in this section is intended to offer a general overview of core methods relevant to salmon stewardship as understood within the Tanana Chiefs Conference (TCC) region. This content has been shaped by input from TK holders and community members across the TCC area; however, it does not represent the full diversity or depth of knowledge held by all Tribal Nations within the region. Additionally, it does not reflect the perspectives, practices, or governance systems of Tribes in other parts of Alaska or beyond.

Traditional Knowledge is inherently place-based, culturally specific, and held collectively by Indigenous communities. The examples shared here are illustrative and do not encompass the full range of beliefs, seasonal protocols, or ceremonial teachings associated with Indigenous stewardship. Any formal incorporation of TK into research, policy, or resource management must be done in direct collaboration with recognized knowledge holders and must adhere to appropriate Tribal protocols, including processes of free, prior, and informed consent..

2.1.1 Foundation of Traditional Knowledge

Traditional Knowledge (TK)—sometimes referred to as Traditional Ecological Knowledge (TEK)—is a sophisticated and multi-generational Indigenous knowledge system that integrates lived experience, oral history, and stewardship of place. In the TCC region, TK is transmitted through practice, storytelling, ceremony, and daily interaction with land and water. It encompasses spiritual, ecological, and social dimensions of knowledge and guides seasonal harvesting, animal behavior tracking, habitat assessment, and environmental forecasting.

TK is validated through seasonal cycles, continuity of practices, and long-term observation. It is inherently adaptive, with new insights layered into cumulative memory. This body of knowledge includes detailed understandings of salmon spawning behavior, migration timing, freshwater habitat characteristics, fat content, flesh quality, and relationships between fish health and environmental change.

The late Reverend Chief David Salmon, a respected Gwich'in Elder and the first Traditional Chief of TCC, exemplified the practice and transmission of TK. His teachings identified sacred salmon sites in the upper Draanjik River, such as Nee'inlii and Nèhdljì Ni'inlii—spring-fed tributaries that remain ice-free and critical for salmon incubation and fry emergence. He explained how salmon communicate through the natural world—not by dates or measurements, but by signs such as the arrival of cranes, butterfly migrations, watercolor, and ice behavior.



Chief Salmon's insights demonstrate that TK is not symbolic; it is science rooted in experience. His teachings emphasized respectful harvest, returning the first salmon, sharing with Elders and the vulnerable, and refraining from fishing when salmon are scarce. These

teachings continue to shape community practices and are foundational to Indigenous salmon governance across Interior Alaska.

Traditional Knowledge recognizes salmon as relatives and teachers—not commodities. Stewardship is practiced with reverence, and decisions are guided by responsibilities to maintain abundance and balance across generations.

2.1.2 Intergenerational Knowledge Transfer and TK Holders

Traditional Knowledge (TK) is passed down through generations via oral tradition, shared experience, and relational teaching. Unlike formal education systems, TK transmission occurs through lived interaction with the environment, storytelling, mentorship, observation, and reciprocal responsibility. It is a lifelong process that unfolds within families, communities, and ceremonial practices, where knowledge is not only taught but embodied and modeled.

Expert TK holders are typically Elders, seasoned hunters and fishers, plant gatherers, and ceremonial leaders who have accumulated knowledge over decades of consistent practice. These individuals are recognized within their communities for their deep understanding of local ecology, spiritual relationships with the land, and ability to teach others with humility, patience, and precision. A knowledge holder's credibility is built through attentiveness to the land, ability to adapt to environmental changes, and their commitment to sharing that knowledge in culturally appropriate ways.

TK is often passed along through direct participation in seasonal activities, where youth and adults alike learn by doing—listening to stories that explain protocols, watching Elders interpret signs in nature, and engaging in harvesting, processing, and preparation rituals. Storytelling, repetition, and observation are critical tools for reinforcing ecological memory and teaching environmental ethics.

In many communities, knowledge is also passed along by kinship obligation. A grandmother may be responsible for teaching her grandchildren the protocols of fish distribution. An uncle may train a nephew in the correct way to prepare a net, when to check water levels, or how to spot changes in river patterns that signal fish migration. These knowledge exchanges are specific to place and rooted in respect, discipline, and the reciprocal relationship between people and their environment.

2.1.3 Traditional Knowledge vs. Local Knowledge: A Distinction of Depth, Sacredness, and Responsibility

While both Traditional Knowledge (TK) and local knowledge are rooted in lived experience and observation of the environment, they differ in origin, structure, and cultural meaning.

Local knowledge often refers to the practical, experience-based understanding individuals develop through daily life in a specific place. This may include awareness of local wildlife behavior, seasonal changes, or environmental shifts observed over a person's lifetime. Local knowledge can be held by anyone with sustained experience in a region, including newcomers and non-Indigenous residents.

Traditional Knowledge (TK), by contrast, is a sacred, collective, and intergenerational knowledge system held by Indigenous peoples. It is grounded in millennia of ancestral presence, transmitted through oral traditions, ceremonial practices, spiritual teachings, and lived stewardship. TK is not just a way of knowing—it is a way of being that integrates ecological insight with moral, cultural, and spiritual responsibilities.

TK is not owned by individuals but held in trust by communities and passed down through Elders, knowledge keepers, and ceremonial leaders. It encompasses not only how salmon migrate or when rivers thaw, but also how to act in relation to those beings—with humility, gratitude, and respect.

In Alaska Native communities, the right to hold and share Traditional Knowledge comes with responsibilities: to protect it, to pass it on with integrity, and to live in accordance with the values it teaches. Any incorporation of TK into policy, science, or management must honor its sacredness, protect its context, and be guided by the consent and leadership of Indigenous knowledge holders.

As environmental disruptions continue to reshape harvesting practices, the role of TK holders remains essential. They serve as memory-keepers, interpreters of change, and educators who ensure that Indigenous knowledge systems remain adaptive, intact, and central to community well-being.

2.1.4 Decision-Making Rooted in Traditional Knowledge

Traditional Knowledge (TK) serves as a foundational guide in natural resource decision-making at the local level. These decisions are grounded in generations of place-based experience and are shaped by cultural teachings, environmental indicators, and communal responsibility. TK informs how communities assess seasonal timing, evaluate environmental conditions, and determine when and how to engage in harvesting practices.

On the ground, Tribal members observe river clarity, temperature shifts, animal migrations, and changes in plant life to anticipate salmon returns or determine when to begin or pause harvesting. Community leaders, often guided by Elders and experienced harvesters, make decisions about where to set nets, which fish to retain, and when to reduce harvest pressure based on these observations. Decisions are made in consultation with family networks, Traditional Councils, and cultural leaders who carry deep knowledge of local conditions and long-term ecological patterns.

Traditional Knowledge also guides habitat protection. For instance, areas known to contain cold-water springs or historic spawning beds are avoided or protected during vulnerable times. Travel routes may be redirected to reduce erosion or disturbance in sensitive habitats. Materials for nets or shelters are chosen with knowledge of what is renewable, durable, and least disruptive to the land.

2.1.5 The Role of Emotional Intelligence and Storytelling in Traditional Knowledge

Traditional Knowledge (TK) is not limited to empirical observations or ecological facts—it is also deeply rooted in emotional intelligence, relational awareness, and the transmission of values through storytelling. Within the TCC region and across many Indigenous cultures, TK represents a holistic system that integrates intellectual, emotional, spiritual, and practical ways of knowing (Kassam, 2009; Reid et al., 2021).

Storytelling is one of the most effective methods for transmitting Traditional Knowledge. Through oral histories, parables, and personal accounts, Indigenous peoples encode complex ecological, ethical, and spiritual teachings into narratives that are transmitted intergenerationally. Stories are often nonlinear and layered, meant to be interpreted differently as individuals grow in maturity and experience (Lynn et al., 2013).

For example, stories about the salmon's upstream migration are not only biological descriptions but moral teachings—about persistence, sacrifice, renewal, and returning home. Other stories reflect collective memory, such as cautionary tales of overharvest that resulted in famine, teaching restraint and long-term thinking. These narratives embed ecological awareness within a framework of social responsibility and cultural identity (Reid et al., 2021; Burgess et al., 2008).

Storytelling also plays a central role in processing grief and environmental change. As salmon runs have declined in the Yukon River, Elders across the TCC region have shared stories that reflect not only sorrow, but resilience and the duty to continue protecting salmon. In this way, storytelling becomes a vehicle for both emotional expression and community resilience—linking the present to the past and preparing for the future (Silliman et al., 2022).

Learning in TK systems is not abstract—it is embodied, relational, and place-based. A child may learn to understand the river not through models or charts, but by sitting with an Elder who teaches them to listen, observe, and reflect. Through shared presence, memory, and emotional attunement, knowledge is transmitted in ways that foster both understanding and feeling (Kassam, 2009; McGreavy & Ranco, 2020).

Emotional intelligence and storytelling are not supplemental to Traditional Knowledge—they are essential components. They shape how knowledge is formed, how it is remembered, and how it guides behavior. Recognizing these dimensions is critical to any sincere and effective effort to incorporate TK into environmental and salmon stewardship frameworks.



“My Elders told me when I was little to not bother the salmon or else they won’t come back. You only bother them if you plan to take them. If you bother them, they won’t return. You stress them out and they forget. That’s what’s been happening for decades, people won’t stop bothering them and they’re not returning.”

- Benedict Jones, Elder and Traditional Knowledge Holder, Koyukuk

3 HEALTH AND WELLBEING IMPACTS

3.1.1 Health Data and Disparities

While comprehensive post-2020 health statistics are still in development, preliminary data and community observations indicate widening health disparities in rural Alaska Native communities affected by the chum salmon crash. Surveys conducted by the Alaska Tribal Health Consortium (ANTHC) and local Tribal health entities have

reported rising food insecurity rates in Western and Interior Alaska, particularly since 2020. In some Yukon River villages, many households have reported cutting meal portions or skipping meals altogether due to the unavailability of subsistence fish (ANTHC, unpublished data; YRITFC, 2024).

Though exact quantitative indicators remain pending publication, the trend is clear: Alaska Native communities in the Yukon River drainage are facing disproportionate burdens of hunger and nutrition-sensitive illness. Compared to the general U.S. population, these communities are more likely to experience elevated rates of food insecurity, diet-related chronic diseases, and limited access to high-quality replacement foods.

The chum salmon collapse occurred in parallel with the COVID-19 pandemic (2020–2021), compounding its impacts. Many communities in the TCC region lost access to store supplies during the pandemic due to weather, transportation shutdowns, or workforce shortages. At the same time, their traditional food security systems—such as summer fish camps and community freezers—were effectively suspended due to fishery closures and health restrictions. This overlap of crises removed both store-bought and subsistence food options, creating what local health aides described as a “nutritional emergency.”

While formal surveillance data on conditions like anemia, micronutrient deficiency, and child growth impairment are still being compiled, anecdotal evidence from community health workers points to increased incidences of malnutrition, weakened immune responses, and developmental health concerns in children. For example, several Tribal providers reported heightened vulnerability to infectious disease and behavioral health challenges in villages where families had not harvested salmon for multiple years.

These trends underscore the urgent need for integrated public health responses that recognize subsistence food access as a social determinant of health. The decline in salmon is not only an ecological and cultural crisis—it is a significant health equity issue for Alaska Native populations.

3.1.2 Declining Salmon Harvests and the Loss of a Primary Food Source

By the late 2010s, Chinook salmon runs on the Yukon River had been in steady decline for more than a decade. According to the Alaska Department of Fish and Game (ADF&G), subsistence harvests of Chinook fell below the Amount Necessary for Subsistence (ANS) every year after 2013 (NPFMC, 2022). Between 2016 and 2019, subsistence users along the Yukon harvested an annual average of only 20,000 to 40,000 Chinook—well below the early 2000s average of 50,000 to 60,000, and far beneath historical norms (NPFMC, 2022). Although summer chum salmon harvests remained relatively stable during this period—averaging 75,000 to 85,000 fish per year—the overall availability of salmon as a subsistence food source had already declined significantly (NPFMC, 2022).

During these years, Tribal communities consistently voiced concern that the returning Chinook were not only fewer, but smaller and less fatty than in previous decades—reducing their nutritional value and weakening their cultural and ceremonial roles. While some limited Chinook fishing resumed in 2019, it was not enough to reverse growing food insecurity or restore traditional practices. Families adapted by relying on food-sharing networks, targeting other species, and drawing from stored supplies, but stress on both diet and culture was already visible in many villages.

The situation worsened dramatically between 2020 and 2023, when Yukon River salmon runs collapsed entirely. According to NOAA Fisheries and ADF&G, the crashes were primarily caused by marine heatwaves and broader ocean ecosystem disruptions that severely reduced salmon survival during their marine life stage (NOAA Fisheries, 2022). By 2021 and 2022, there was virtually no harvestable surplus of either Chinook or chum salmon—leading to full closures of subsistence fishing across the drainage (U.S. Department of the Interior, 2022; Alaska Beacon, 2023).

While the period from 2016 to 2019 had already brought hardship—marked by reduced Chinook harvests and growing reliance on chum salmon as a fallback—there remained a fragile buffer of nutritional and cultural

continuity. By contrast, the 2020–2023 period constituted an acute crisis. With both salmon runs at record lows and full closures in place, subsistence harvests dropped by more than 90% compared to the previous decade.

The collapse forced communities to undergo an abrupt dietary transition. Many Alaska Native households lost access to their primary wild protein source and had no choice but to turn to store-bought alternatives—foods that are often less nutritious, more expensive, and culturally disconnected. This sudden shift triggered cascading effects on physical health, food security, and cultural continuity throughout the TCC region.

As one Tribal member testified, this moment represented *“a complete shift in our ability to survive in the way we were taught.”* The loss of traditional food, combined with the loss of opportunity and identity, has left lasting impacts that will require long-term recovery, support, and a commitment to food sovereignty and ecological restoration.

3.1.3 Food Security and Nutritional Disparities

Even before the complete collapse of salmon harvests, a study by the Alaska Department of Fish & Game found that only 60–65% of households in subsistence-reliant Yukon and Kuskokwim River communities were food secure—significantly below the statewide average. The remaining households faced low or very low food security, marked by skipped meals, smaller portions, and greater dependence on processed foods. Since 2020, with the near-total loss of traditional salmon harvests, these conditions have sharply worsened, compounding nutritional stress and deepening food insecurity across the region.

Only about 25% of the TCC-affiliated villages are connected to the road system, and some communities lack stores altogether. In these areas, families rely heavily on subsistence harvests and intermittent deliveries of staple foods, which are subject to weather delays and high freight costs. Village stores, where they exist, offer limited selections of perishable or nutrient-rich items. Prices for fresh fruits, vegetables, and quality proteins are elevated, often prohibitively so for households on fixed incomes. As a result, traditional foods are not only culturally and nutritionally preferred—they are economically essential. When salmon are unavailable, families report turning to cheaper alternatives such as white bread, ramen noodles, and canned meat—foods that provide calories but few nutrients, further exacerbating health disparities in remote Alaska Native communities.

“Nobody has fish in their freezer right now. Nobody” - Giovanna Stevens. Stevens Village, 2021

3.1.4 Physical and Mental Health Impacts

Tribal health organizations and community leaders have consistently warned that the loss of salmon has “negative health consequences” for rural Alaska Native populations (Alaska Beacon, 2023). Dan Winkelman, president of the Yukon-Kuskokwim Health Corporation, testified in 2023 that the absence of salmon is “not just negatively affecting our culture and well-being but our good health” (Alaska Beacon, 2023). While his comments were specific to his region, they reflect a broader reality across the Yukon watershed, including within TCC’s jurisdiction. Alaska Native populations already experience disproportionately high rates of diabetes, cardiovascular disease, and other nutrition-sensitive conditions. The loss of traditional foods such as chum salmon compounds these risks, especially in communities with limited access to affordable or healthy alternatives.

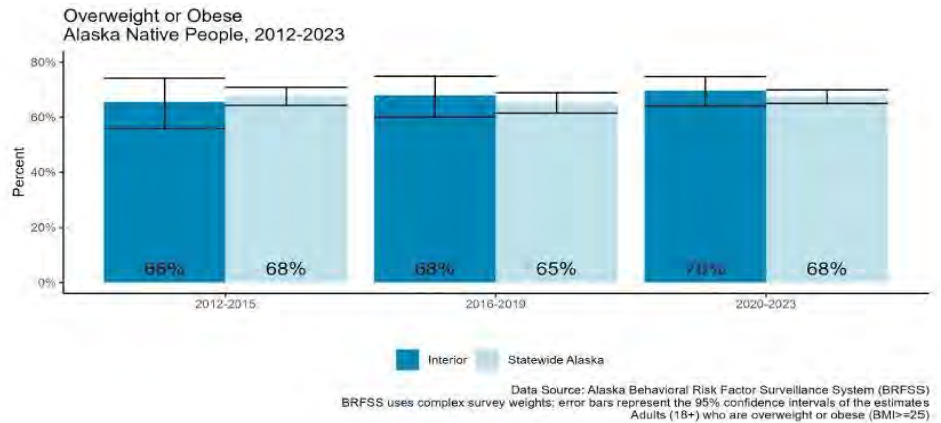
The inability to participate in our Traditional Ways of Life due to salmon scarcity contributes to collective grief, anxiety, and cultural disorientation. Elders and parents express deep sorrow at not being able to take their children to fish camp. The loss of these practices undermines the sense of purpose, identity, and community cohesion that traditionally accompanies seasonal subsistence activities. Mental health professionals within TCC report growing symptoms of cultural depression, especially in younger generations who are disconnected from their heritage.

Public health programs in the region have noted increases in diabetes screenings, signs of nutrient deficiency, and childhood growth concerns. Local caregivers describe children arriving at school fatigued or unfocused. Adults,

particularly Elders, report worsening joint pain and chronic conditions due to poor diet. Some residents express fear of needing to leave their home communities to access healthier food and medical care.

“Patients feel sadness and frustration when they cannot enjoy the subsistence foods that are culturally meaningful to them.” - Katie Garrity, RD, LD, TCC Diabetes & WIC Program

Residents from Yukon River communities in the TCC region have reported that being *“forced to deviate from our traditional ways of life... only amplifies our unwellness”* (Alaska Beacon, 2023). The abrupt cessation of fish camps, summer harvest routines, and winter food preparation has resulted in a collective loss of identity and purpose—elements that are integral to mental health and cultural resilience.



Youth are among the most vulnerable to the mental and emotional toll of the salmon collapse. For generations, fishing has been more than a food source—it has been a foundation for identity, purpose, and belonging. With multiple consecutive years of harvest closures, young people have been cut off from vital cultural practices that once grounded them in community, family, and the land. Tribal leaders report growing concern over the emotional distress this loss causes: youth feel disconnected, uncertain, and disempowered. The absence of salmon not only disrupts the transmission of knowledge and values—it leaves a void in the rhythm of life that once supported mental well-being. As one young leader shared, *“Our young people aren’t able to fish anymore”*—a reality that contributes to anxiety, depression, and a deepening sense of cultural dislocation (Webcenter Fairbanks, 2023).

“All summer and fall, I've listened to parents, grandparents, and Elders grieving over the absence of fish. Their eyes show deep sorrow as they recount motoring long distances for little or no catch, unable to bring their children to fish camp. Many families, unable to access traditional foods, turn to costly junk food, which does nothing for healthy growth or respect for food origins. Kids are growing disconnected, anxious, and increasingly unfamiliar with their cultural heritage. They worry, 'Our kids won't know how to live anymore.'” - Karen Kallen-Brown, LPC, CDC-II, TCC Child & Family Mental Health Clinician

These cultural and emotional losses are not abstract—they are tied directly to increased risks of mental health issues. The physical and social rituals surrounding chum salmon harvests traditionally acted as protective factors against depression, addiction, and isolation. Without access to this way of life, Tribal leaders and health workers have warned of compounding public health crises across rural Interior Alaska.

“When our source of salmon disappeared, it was a weird depression that could not be explained in a clinical setting but there were signs. What do you do now in mid-June and July?” – Katie Kangas, Ruby

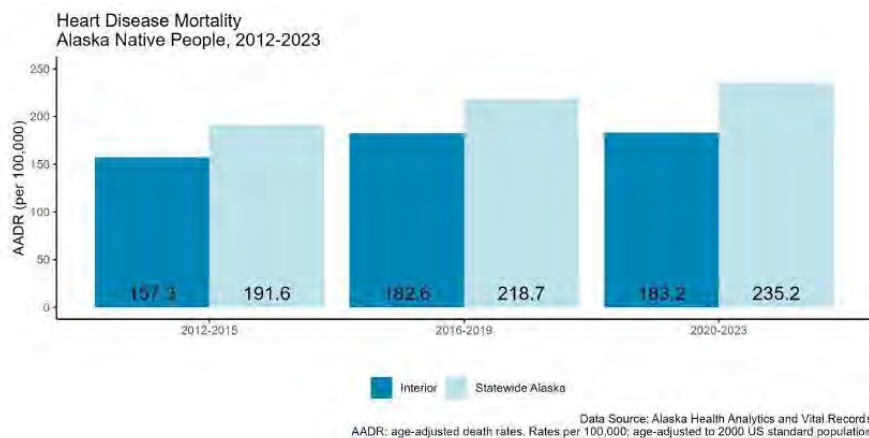
Salmon has long served as a nutrient-dense and cardioprotective food, helping to prevent obesity, diabetes, and heart disease in Indigenous communities (Alaska Beacon, 2023). With subsistence fishing closures and severely

restricted harvests in recent years, many families in Yukon River villages have been forced to rely on store-bought foods that are more energy-dense than nutrient-dense—often high in saturated fats, salt, and sugar. As Winkelman explained, this dietary shift has led to “unhealthy weight gain and increased rates of chronic disease” (Alaska Beacon, 2023).

Subsistence fishing also supports physical activity and overall wellness. Harvesting, cutting, and drying salmon require daily outdoor labor and movement across the summer and fall seasons. The decline of salmon has therefore removed not only a key food source, but also a lifestyle element that supported physical health, particularly for Elders and middle-aged adults. Health providers in the region have expressed concern that without fishing, sedentary behavior is likely to increase, along with related chronic conditions (Alaska Beacon, 2023). Elders and Tribal leaders have consistently voiced concerns that salmon harvesting provides more than food—it is also traditional exercise, cultural education, and a social anchor. Its absence erodes both physical health—by reducing outdoor physical labor—and social health—by diminishing the occasions that bring families together (YRITFC, 2024). According to elder testimony, the salmon decline has *“taken away an activity that provided physical health through being outside and doing physical labor, as well as a social activity around which communities gather”* (YRITFC, 2024).

Further compounding the nutritional gap is the growing concern over the quality and safety of replacement foods. Some studies and community reports have raised issues about mercury and other contaminants present in lower-cost processed proteins (such as canned meats or imported seafood), which have become more common in village diets. In contrast, wild Yukon River salmon is known for its purity, omega-3 content, and even traditional medicinal uses—such as using salmon oil as a skin salve and dietary supplement.

By 2023, local health aides and physicians across the TCC region were beginning to observe increased cases of malnutrition in children, reports of micronutrient deficiencies, and emerging signs of health decline linked to recent dietary changes. Though comprehensive data collection is still underway, the overall trend is clear: ***The decline of chum salmon has placed Alaska Native communities at greater risk of nutrition-related illness and has undermined decades of work aimed at restoring health equity in the region.***



3.1.5 Loss of Cultural Continuity, Ceremonial Practice, Spiritual Connection, and Community Well-Being

The decline of chum and Chinook salmon runs on the Yukon River has had far-reaching impacts not only on nutrition and food security, but on the cultural integrity, identity, and overall well-being of Alaska Native communities throughout the Tanana Chiefs Conference (TCC) region. Salmon are not just a staple food—they are foundational to Indigenous language, tradition, spirituality, and the seasonal rhythms that structure life. The sudden absence of salmon from 2020 to 2023 disrupted a complex web of cultural practices that have long defined community life and intergenerational knowledge transfer. This disruption is not only painful—it is detrimental to the collective health and cultural continuity of the region’s Tribes.

For time immemorial, summer fish camps have been central to the Alaska Natives traditional ways of life in Interior Alaska. These camps are not only subsistence sites but vital spaces of teaching, social cohesion, and cultural reinforcement. They are where Elders pass on ancestral knowledge, children learn harvesting skills, and families uphold their stewardship responsibilities. With fisheries closed and salmon unavailable, many communities were forced to cancel fish camps entirely, halting these longstanding practices. Families that would normally come together to catch, cut, smoke, and share salmon were unable to do so. This loss is more than an interruption—it is a rupture in the continuity of Indigenous lifeways and knowledge systems.

Community members and Tribal leaders have repeatedly voiced that being unable to engage in salmon harvests has led to widespread grief, emotional stress, and a growing sense of cultural disconnection. These effects are especially severe for younger generations. Youth who have come of age during this crash have missed critical opportunities to participate in subsistence traditions, weakening their cultural identity and eroding their sense of belonging. One young leader from the Yukon Flats shared, “Our young people aren’t able to fish anymore,” a statement that captures deep fears that traditional lifeways are slipping away with each lost season (Webcenter Fairbanks, 2023).

“When we can’t fish, we can’t fulfill our responsibilities to the salmon spirit. That’s a wound we carry.”

— Elder from Fort Yukon, quoted in TCC Regional Testimony, 2024

Elders have also expressed growing concern over the long-term consequences of this cultural disruption. Testimony compiled in 2024 by the Yukon River Inter-Tribal Fish Commission reveals a collective worry that *“our knowledge, our health, and our connection to the river are being lost with the fish”* (YRITFC, 2024). The absence of salmon reverberates through spiritual ceremonies, communal meals, and everyday expressions of language and values tied to the land and water. This void undermines the shared practices that have long served as pillars of mental, emotional, and social well-being in Alaska Native communities.

Wellness is not divided into separate categories—it is holistic and relational. Mental health, physical health, spiritual well-being, and ceremonial practice are deeply intertwined. Salmon are central to this balance. The physical act of harvesting fish supports exercise and nutrition; the spiritual reverence



Helen, Faith and Kathleen Peters cut fish at Rampart Rapids -
Photo courtesy of Stan Zuray

for salmon reinforces gratitude and humility; the ceremonial use of salmon strengthens community bonds and ancestral continuity. When salmon disappear, these dimensions cannot be isolated—loss in one domain ripples into all others. Without salmon, people lose not only a vital food source, but the structure of seasons, the rhythm of teachings, the grounding of prayer, and the sense of purpose that ties individuals to family, land, and spirit.

Salmon are not merely food—they are medicine, kin, and spiritual beings. In many Yukon River communities, the first salmon of the season is honored through ritual offerings, including the respectful return of bones to the water, to ensure the return of future runs. These ceremonies express deep respect and reinforce an ethic of reciprocity, gratitude, and spiritual stewardship. The inability to perform such ceremonies is not only a disruption—it is experienced as a spiritual violation. Anthropologist Fikret Berkes and Mina Kislalioglu Berkes describe these types of relationships as part of a “sacred ecology”—a worldview in which humans are part of, not separate from, nature. Without salmon, this sacred connection is weakened, and the relational responsibilities embedded in ceremonial life are left unfulfilled.

This loss of access also threatens the transfer of Traditional Ecological Knowledge (TEK), a cumulative body of knowledge, practice, and belief transmitted through generations via lived experience, storytelling, and observation. As Berkes (1999) writes, TEK depends on continuous engagement with the environment. When the practice stops, the knowledge fades. Fish camps are classrooms where language, ecological wisdom, spiritual teachings, and survival skills are taught through doing—not through written curricula. The absence of reliable salmon runs has disrupted this system of teaching and learning. Young people grow up without learning to fish, smoke, or prepare salmon. Elders, in turn, lose opportunities to mentor and fulfill their roles as cultural transmitters. This erosion of intergenerational transmission has profound consequences for cultural continuity and identity formation.

Wellness, in this context, is not divided into separate categories—it is holistic and relational. Mental health, physical well-being, spiritual grounding, and ceremonial practice are deeply interconnected. Salmon are central to this balance. The physical act of harvesting supports movement and nutrition. Reverence for salmon fosters spiritual humility and connection. Ceremonial use strengthens community bonds and moral responsibilities. When salmon disappear, these dimensions cannot be compartmentalized—loss in one ripples into all others. Without salmon, people lose not only sustenance, but the structure of seasons, the rhythm of teachings, the grounding of prayer, and a vital sense of place, purpose, and identity.

The decline of salmon has created a compounding crisis—one of cultural loss and diminished well-being. The health of the land, the health of the salmon, and the health of the people are inseparable. The erosion of one threatens the vitality of all.

“The enduring distress from the violence manifests as intergenerational trauma and significant cultural loss, described as holocaust and genocide against Indigenous peoples.” -
Lavoie et al., 2025, p. 6

4 SUBSISTENCE ECONOMY IMPACTS

“We are people of the river; we cannot fade away. The Yukon is our lifeline for subsistence and survival.” — William Silas, *The Northland News*, April 1988

4.1.1 Subsistence Harvest Losses

Prior to the crash, Yukon River villages within the TCC region harvested approximately 70,000 to 85,000 chum salmon annually for subsistence (ADF&G, 2022). These fish represented a primary protein source, a foundation for intergenerational cultural education, and a pillar of local economies. In contrast, after the crash, subsistence harvests fell dramatically, with only 3,618 chum harvested in 2024 for the entire river system (ADF&G, 2024). The U.S. Department of Commerce and Alaska state officials estimated that the loss in subsistence salmon value totaled \$28.6 million for the 2020–2021 period, and another \$25.85 million in 2022 alone (ADF&G, 2022).

Households that traditionally relied on salmon were forced to replace it with store-bought foods, which in remote villages like Kaltag cost up to \$34 per pound for meat (Voice of America, 2021). TCC alone spent over \$573,000 to import more than 90,000 pounds of salmon for distribution in 2021, a cost previously absorbed by local harvests (TCC, 2022). Fuel expenditures also surged as villagers traveled hundreds of miles—sometimes to Norton Sound—to fish, with some round trips costing over \$500 in fuel (KYUK, 2021).



The crash also devastated local economies. Commercial fishing in the Yukon generated millions in revenue pre-2020; by 2021, the total commercial revenue loss reached over \$5.7 million (ADF&G, 2022). Employment at fish processing plants, such as the Kwik'Pak facility, was suspended, and youth employment programs in villages like Emmonak were halted (Anchorage Daily News, 2021). Loss of commercial income also reduced the ability of households to purchase fuel, hunting supplies, and groceries, compounding the subsistence crisis (BIA, 2022).

Relief funds have only partially filled the gap. CARES Act and disaster payments offered \$3,000–\$6,000 per household, but these payments lagged behind rising household food and energy costs (NOAA, 2023). TCC and its member tribes continue to highlight these disparities in policy forums and disaster response negotiations (TCC, 2023).

While subsistence salmon are culturally priceless, government agencies have quantified their replacement value for disaster assessments. The Alaska Department of Fish & Game (ADF&G) estimated that the value of the subsistence salmon fishery loss in the Yukon was approximately \$28.63 million for the 2020–2021 period (Pacific States Marine Fisheries Commission [PSMFC], 2022). For 2022 alone, ADF&G valued the subsistence shortfall at \$25.85 million (ADF&G, 2022). These estimates are consistent with the scale of the collapse. Losing roughly 80,000 chum salmon (at an average of 8 pounds each) equates to over 640,000 pounds of wild protein—translating to \$3.2 to \$6.4 million in lost food value annually, assuming \$5 to \$10 per pound replacement costs. In many rural areas, the actual market replacement cost would be much higher due to freight and access limitations.

The 2020 subsistence harvest was estimated to be 62% below the 2015–2019 average (ADF&G, 2021), which prompted an emergency disaster designation. As TCC President Brian Ridley testified, Indigenous families along the Yukon are being "stripped of their food security," and the nutritional impacts—such as increased malnutrition—are now measurable as traditional foods disappear from family diets (TCC, 2023). The chum crash represents an annual economic loss of millions of dollars in subsistence food, which villages are now forced to replace with high-cost alternative

4.1.2 Economic and Cultural Impacts on Dog Mushing Traditions

Traditionally, chum salmon served as the primary winter feed for sled dogs in Alaska's Interior. For generations, mushers along the Yukon River relied on the annual salmon harvest to provide a high-protein, affordable food source essential for maintaining strong, healthy dog teams. With salmon declines accelerating between 2020 and 2023, mushers are now forced to purchase commercial feed—often exceeding \$100 or more per 40-pound bag. This shift has proven financially unsustainable for many rural households. As a result, some mushers have had to reduce their dog teams or give up mushing altogether, ending centuries-old family traditions.

The financial impact of the chum salmon decline is only part of a larger cultural and intergenerational loss. Dog mushing is not simply a form of transportation—it is a cultural institution deeply embedded in the identity of many villages, including Tanana, Fort Yukon, Allakaket, Huslia, Galena, and Nulato. For Alaska Native communities, mushing represents independence, environmental skill, resilience, and stewardship. The loss of dog teams weakens community bonds and reduces opportunities for Elders to pass on traditional knowledge about dog care, land travel, and seasonal rhythms. In this way, the decline of mushing closely parallels the decline of salmon—both are indicators of cultural erosion tied to environmental disruption.

Historically, Alaska Natives have used dog teams for thousands of years across the Yukon River region. For groups such as the Athabascan, Inupiat, and Yup'ik, sled dogs were essential for survival—enabling hunting, trapping, trade, and later mail delivery in remote villages. In the 19th and early 20th centuries, the importance of dog teams increased with the rise of the fur trade and gold prospecting. Native mushers guided travelers, transported furs to trading posts, and connected isolated settlements. Even after the arrival of snowmachines and airplanes in the mid-20th century, many families in the Yukon continued to raise and race dogs, maintaining ancestral traditions and ties to the land.



Effie Kokrine of Tanana Racing, 1952 - Photo retrieved from University of Alaska Fairbanks. (n.d.). Effie Kokrine's dog mushing slideshow. Jukebox Project.

Today, mushing is more than heritage—it is an ongoing expression of self-reliance, environmental knowledge, and cultural pride. Events like the Iditarod and local village races honor this tradition, but many mushers in the TCC region are struggling to keep it alive amid rising costs and declining resources. As commercial dog food becomes the only available option, its high cost—especially in remote, fly-in villages—makes it inaccessible for many subsistence users. In places without roads or grocery stores, where salmon once provided both dog food and human sustenance, this economic pressure is especially acute.

The loss of sled dogs has deep emotional and cultural consequences. For generations, the seasonal rhythm of fishing, processing salmon, and feeding dogs connected families to their surroundings and to each other. Without salmon, mushers lose not only a vital resource, but a key aspect of their identity and responsibility. The knowledge of how to train, feed, and travel with dogs is not easily replaced—and the intergenerational transfer of these skills is breaking down as fewer youth grow up with dog teams in their homes.

In response to this decline, some mushers have turned to snowmachines. While they offer faster transportation, snowmachines come with high up-front costs, require frequent repairs, and rely on gasoline—which is expensive and difficult to access in remote areas. This technological shift adds a new financial burden while further distancing mushers from the traditional knowledge and relational care embedded in mushing.



For many, the shift from dog teams to mechanized travel represents not just a change in tools—but a loss of meaning. Dog mushing is a living practice rooted in Indigenous knowledge, care for animals, and the seasonal cycles of the river. Its decline mirrors broader threats to cultural continuity posed by environmental instability, economic inequality, and the loss of subsistence resources like salmon.

In sum, the decline of chum salmon has created a ripple effect—undermining not just food systems, but the economic, cultural, and spiritual viability of dog mushing. Preserving this practice will require not only ecological recovery but economic and cultural support that recognizes the deep interdependence between Alaska Native lifeways and the land.

George Attla Jr, aka Huslia Hustler, 1976

4.1.3 Additional Costs to Obtaining Alternative Subsistence Resources

In addition to buying food, subsistence users have responded to the salmon crash by intensifying other subsistence activities—often requiring greater fuel use for boats, ATVs, and snowmachines. Salmon fishing on local rivers typically involved short trips and moderate fuel use. Now, many Yukon households undertake significantly longer journeys to find meat and fish. In 2021, for example, several Yukon River residents traveled to Norton Sound—hundreds of miles away on the Bering Sea coast—where subsistence chum fishing remained open (KTOO, 2021). One elder from Emmonak shared, “I had to go 100 miles north just to get my subsistence needs,” referring to his trip to fish in Norton Sound. Each round trip cost him approximately \$500 in fuel and supplies, and after two trips he caught about 100 chum salmon—roughly \$10 per fish (KTOO, 2021). He added, “It’s expensive, but cheaper than groceries in Emmonak” (KTOO, 2021). This example illustrates how villagers are now effectively paying a premium to harvest whatever salmon they can find. Many others from the Yukon delta did the same; observers in Norton Sound reported seeing “the whole delta of the Yukon” fishing there, with hundreds of Yukon nets in the water (KTOO, 2021).

Interior communities unable to reach the coast have instead turned to hunting moose, caribou, and freshwater fish such as whitefish to compensate for the loss of salmon (KTOO, 2021). This shift has further increased fuel usage. Boats on the Yukon are now frequently used to access distant hunting camps or remote tributaries. In St. Mary’s, a lower Yukon village, residents reported “supplementing their diet with extra groceries, more whitefish, and... extra game meat” (KTOO, 2021). These activities often require significant amounts of gasoline, which in rural Alaska has reached very high prices—often \$6 to \$10 per gallon (Tanana Chiefs Conference [TCC], 2022; Bureau of Indian Affairs [BIA], 2022). In 2022, the price of gasoline in St. Mary’s reached \$9 per gallon (BIA, 2022). For families traveling 50 to 100 miles more than in prior years, this results in hundreds of dollars in additional fuel expenses per season. TCC’s 2022 economic report emphasized that the cost of living—especially fuel and food—in off-road villages was already exorbitant before the salmon crash and noted that “high prices for fuel and [food] make things harder for people” trying to meet their subsistence needs (TCC, 2022). In short, fuel expenditures have significantly increased as villagers travel farther and more frequently in search of alternative subsistence

resources. These costs, along with increased wear-and-tear on equipment and time taken from other economic activities, represent yet another financial strain directly tied to the collapse of chum salmon populations.

4.1.4 Increased Spending on Store Food and Supplies

With salmon unavailable, households have been forced to purchase more groceries—a heavy financial burden in remote Alaska. Store-bought foods in bush villages are extremely expensive. For example, in the interior village of Kaltag (on the Yukon River), a gallon of milk costs about \$10, and a pound of steak was recently \$34 (Voice of America, 2021). These prices—three to four times urban averages—reflect high freight costs and limited local supply chains. Traditionally, Yukon families offset such costs by harvesting their own wild fish and game. Now, the loss of a major subsistence resource like chum salmon translates into hundreds or even thousands of dollars in additional grocery expenses per family.

“We have to watch our people because there will be some who will have no food about midyear. We can't afford to buy that beef or chicken.” - Christina Semaken, Kaltag 2021

One Yukon fishery manager noted that “a household here needs about a thousand pounds of fish” annually for food (Anchorage Daily News, 2021). Without salmon, that protein must be sourced from elsewhere. At rural food prices—often exceeding \$30 per pound for meat—1,000 pounds of replacement protein could cost over \$30,000, a prohibitive figure for villages where per capita incomes often remain below that threshold (Tanana Chiefs Conference [TCC], 2023). Even when families don't purchase all of this replacement food (with some substitution through hunting), many have reported significantly higher grocery bills since 2020. TCC leaders have emphasized that “when subsistence users are unable to harvest, they face extremely high prices at the grocery store” (Alaska Department of Fish & Game [ADF&G], 2022).

Tribal organizations and the State of Alaska have intervened to mitigate food shortages, effectively quantifying the cost of lost subsistence access. In mid-2021, the State spent \$75,000 to purchase 12,500 pounds of chum salmon from outside processors for Lower Yukon communities—about \$6 per pound delivered (Anchorage Daily News, 2021). By August 2021, approximately 90,000 pounds of salmon had been flown into the Yukon Delta via cargo plane to address food insecurity (Anchorage Daily News, 2021).

TCC and its member Tribes have also allocated significant resources to support village food security. TCC spent, on average annually, \$573,174 to deliver over 90,000 pounds of salmon to communities during the fishery closures (ADF&G, 2022). Cumulatively, TCC and Tribal partners spent up to \$1.96 million, since 2020, purchasing salmon from commercial fleets to ensure that cultural practices—especially among elders and youth—could continue despite harvest bans (TCC, 2023). These expenses, typically covered by Tribal coffers or emergency relief funds, represent costs that would not have existed under normal subsistence harvest conditions.

Many families have adapted by switching to more affordable but nutritionally inferior foods such as ramen, rice,



and canned meats. Unfortunately, this transition has been associated with negative health outcomes. Public health officials report a 24.6% increase in diet-related illnesses, such as diabetes, in Yukon River villages during the post-crash years (TCC, 2023). Some communities have responded by coordinating bulk food purchases or wild food-sharing networks, but these efforts only partially offset the loss. In upriver villages without road access, even basic grocery staples now consume a growing share of household budgets. One assessment found that feeding a family of four in Fort Yukon using store food

costs nearly twice as much as in Fairbanks—underscoring the financial strain on interior communities (Alaska Resources Library and Information Services [ARLIS], 2019).

4.1.5 Tribal and Government Responses

The magnitude of the chum salmon crash prompted formal disaster designations at both state and federal levels. In 2021 and again in 2022, the State of Alaska requested federal Fishery Disaster declarations for the Yukon River salmon fisheries. These were approved by the U.S. Department of Commerce/NOAA, unlocking relief funds. For example, Congress appropriated approximately \$14 million in disaster relief for Western Alaska for 2020–2021, of which \$12.55 million was allocated to Yukon subsistence users, with a smaller portion directed to commercial losses (Pacific States Marine Fisheries Commission [PSMFC], 2022). This is translated to direct payments to affected households. Under the CARES Act relief program, Yukon subsistence families received roughly \$3,000 to \$6,000 per household in the first round of relief (Bureau of Indian Affairs [BIA], 2022). A second round of aid for 2021–2022 losses, estimated at \$40 million statewide, was in development as of 2023 (BIA, 2022).



While helpful, these payouts only offset a fraction of the true subsistence value lost and often arrived too late to meet immediate needs. Tribal leaders emphasized that “we are captured when we need [help]”—with relief lagging behind surging fuel costs and empty fish racks (BIA, 2022).

The Tanana Chiefs Conference (TCC) and its member Tribes have played a central role in advocating for systemic change. TCC co-authored portions of the forthcoming Chum Salmon Bycatch Environmental Impact Statement to highlight the social and economic devastation facing Yukon–Kuskokwim communities (TCC, 2023a). Their advocacy underscores that Indigenous communities are suffering “devastating” impacts while other sectors—such as Bering Sea pollock trawlers—continue to profit (TCC, 2023a).

Tribal resolutions have called for more restrictive bycatch limits and disaster assistance that recognizes subsistence and cultural loss—not just commercial impact (Alaska Department of Fish & Game [ADF&G], 2023). Many Tribal governments have conducted surveys to document economic hardship, including fuel costs, dietary change, and income loss, as part of comprehensive development planning (TCC, 2023b). These data are being used to seek funding for long-term recovery, including proposals for community freezers, fuel subsidies, and support for cultural camps to ensure traditional fishing knowledge is not lost (ADF&G, 2023).

Some Tribes have distributed store vouchers or bulk food to elders and hard-hit households using CARES Act relief (Anchorage Daily News, 2021). The Bureau of Indian Affairs also hosted Tribal consultations to hear firsthand about how the crash has increased reliance on state and federal aid (BIA, 2022). Tribal leaders testified that the collapse has triggered “millions of dollars [in costs] just to keep...our livelihood” afloat via emergency measures (BIA, 2022). Both BIA and USDA food assistance programs have expanded in the Yukon since 2020, reflecting the cost of replacing lost salmon with store-bought foods.

The economic disruption from the chum salmon collapse is ongoing through 2025. While 2023 and 2024 saw slightly improved chum returns, runs remain far below historic averages, and fishery managers continue to prioritize escapement and conservation over harvest (TCC, 2024). As a result, both subsistence and commercial fishing opportunities are expected to remain limited. This means villages face another season of food insecurity, rising expenses, and foregone income.

TCC's 2022–2026 Comprehensive Economic Development Strategy (CEDS) identifies the 2020–2021 salmon crashes as a regional disaster and calls for economic diversification (TCC, 2023b). Strategies include building local food systems, expanding harvest of other wild species, and developing employment in land stewardship and cultural tourism. Yet, as one Fort Yukon leader put it, “In the tribal villages, our people are livid... We have a right to this resource” (Voice of America, 2021).

The quantitative toll is clear: an estimated \$20–30 million in lost subsistence food value over the past five years, millions in lost commercial income, significantly increased fuel and grocery costs, and sustained damage to local economies. These impacts affirm what Yukon River Tribes have declared: *this is not merely an ecological crisis, but a socio-economic emergency for Alaska Native communities.*

The financial resources expended on salmon replacement could instead support long-term food security infrastructure such as regional cold storage, local fish hatcheries, hydroponic systems, or culturally appropriate food sovereignty programs. Instead, emergency funding creates a cyclical dependency on federal assistance. This diverts both Tribal labor and capital away from capacity building efforts and reinforces environmental injustice by placing the burden of collapse recovery onto the very communities most impacted by mismanagement in marine fisheries.

4.1.6 Cost of Declining Fish Camps

Fish camps along the Yukon River are a cornerstone of cultural life for TCC Tribes, serving not only as seasonal harvest sites for salmon but also as vital spaces for intergenerational learning, food security, and cultural continuity. These camps—comprised of cabins, smokehouses, fish racks, boats, and storage areas—require regular upkeep and maintenance. However, the prolonged salmon crash has prevented many families from returning to their fish camps, leaving them unused for four to five years. During this time, the cost of repair has escalated dramatically, with estimates ranging from \$10,000 to \$25,000 per camp. These rising costs are driven by a combination of increased fuel prices, high transportation costs for materials, damage from weather and disuse, and limited availability of labor and time. With so few salmon available, families can no longer justify these investments, leading to the abandonment of camps and the slow degradation of both physical infrastructure and the cultural knowledge and practices embedded in these places. The cost of repairing and maintaining these camps has grown significantly due to several compounding factors:

Rising Material Costs: Building materials such as treated lumber, nails, tarps, mesh, and fuel-resistant containers have increased in price across rural Alaska. Most materials must be flown in or transported by barge or snowmachine, often from hundreds of miles away, significantly raising overall expenses.

Fuel and Transportation: River travel to fish camps requires large volumes of fuel, which in some remote communities now costs \$7–\$12 per gallon. Transporting equipment, tools, and repair materials often requires multiple trips, adding up to hundreds or even thousands of dollars in fuel costs alone.

Labor and Time Constraints: Many families rely on informal labor to maintain and operate fish camps. With reduced use, traditional maintenance cycles have been interrupted, and catching up after years of disuse requires intensive effort. Rebuilding rotted racks, collapsed roofs, or weather-damaged smokehouses can take weeks of labor that must be squeezed into short seasonal windows.

Damage from Disuse and Weather: Without regular upkeep, cabins and smokehouses suffer from rot, mold, erosion, vandalism, and animal damage. In some areas, permafrost thaw and shifting riverbanks have accelerated structural decay. Boats and motors, left idle for years, often require costly mechanical work or replacement.

Opportunity Cost and Risk: With the uncertainty of salmon returns, many families cannot justify the upfront investment of \$10,000 to \$25,000 per camp just to prepare for a season that may not yield enough fish. This deters reinvestment and results in further loss of infrastructure.

Fish Camp Cost Breakdown



As fish camps deteriorate, so too does the social and cultural function they serve. The loss of these places erodes not only physical infrastructure, but also the knowledge systems, family bonds, and language practices passed down through generations on the river. Rebuilding fish camps is about more than construction—it is about repairing the fabric of Indigenous life along the Yukon.

4.1.7 Cultural and Financial Impacts of Increased Trespassing

Reduced use of fish camps due to declining fish stocks has led to an increase in trespassing and vandalism, as these once-vital spaces fall into disuse and become susceptible to unauthorized activity. With fewer families able to maintain these camps, they are left unprotected, making them vulnerable to trespassers and increasing the risk of property damage. Reports of trespassing have steadily grown, with incidents documented at 43 in 2022, rising to 62 in 2023, and further escalating to 84 in 2024 (Monroe, A. 2024). This trend highlights the vulnerability of fish camps, which traditionally function as community hubs and cultural sites, fostering stewardship and community presence. The increase in trespassing and vandalism not only damages physical property but also deepens the emotional and cultural loss experienced by families who are no longer able to safely return to these meaningful spaces.

The financial implications of trespassing on unused fish camps are multifaceted, with effects that go beyond immediate repair costs to include legal expenses, lost potential revenue, and reduced access to critical natural resources. Often, trespassers damage or steal essential camp equipment, such as fishing nets and boats, leading to significant replacement costs for owners. For communities with limited resources, these expenses can heavily strain budgets, gradually depleting vital assets for fishing and subsistence activities.

Efforts to enforce trespass regulations also present financial challenges for Alaska Native communities. Legal costs for consultations, signage, and potential actions against repeat trespassers consume resources that could otherwise support essential services. For many Alaska Native corporations and village councils, limited funds for ongoing enforcement restrict the capacity to protect these lands effectively.



Chief Rhonda Pitka's grandmother's fish camp, which has been abandoned for four years due to a lack of salmon on the Yukon River. Christian Thorsberg/USFWS

Unused fish camps present a potential financial opportunity for cultural tourism, as they could attract tourists and stakeholders. Fish camps, even without active fishing, can attract tourism by offering cultural heritage tours, traditional skills workshops, nature observation, and immersive educational programs, allowing visitors to experience Alaska Native customs, ecological stewardship, and the historical significance of these sites. However, as trespassing and vandalism

have increased, the costs to repair these camps have compounded, making it increasingly challenging to transform

them into revenue-generating infrastructure. This ongoing damage not only raises maintenance expenses but also deters potential partners, leading to missed income opportunities and higher costs to secure and restore these sites

Ecological impacts from unauthorized access further compound the issue. Trespassers may cause environmental degradation, including littering, fire damage, and overfishing, which reduces the future productivity of these sites. This ecological damage can have a long-term impact on local fish stocks, leading to lower revenue potential and necessitating costly restoration efforts to return the sites to productive use.

Moreover, the degradation of culturally significant lands due to trespassing compromises the intrinsic and cultural value of these sites. For Alaska Native communities, fish camps are deeply tied to heritage, and damage to historical landmarks and traditional fishing grounds results in social and cultural losses. Trespassing diminishes the potential for cultural tourism, educational programs, and heritage conservation funding, further undermining valuable income sources.

The ongoing risk of trespassing also affects property insurance, as repeated incidents increase premiums or deductibles, making coverage financially prohibitive for some communities and further limiting resilience

4.1.8 Subsistence Harvests vs. Amounts Necessary for Subsistence (ANS) and Replacement Distributed Amounts

The Alaska Board of Fisheries has established the Amount Necessary for Subsistence (ANS) for chum salmon to define the estimated number of fish required annually to meet the needs of households engaged in traditional harvesting. These benchmarks are not merely biological targets but reflect the cultural, dietary, and seasonal expectations of Tribal communities across the region.

For the Yukon River drainage, the ANS ranges are as follows¹:

- Summer Chum Salmon: 83,500 – 142,192 fish
- Fall Chum Salmon: 89,500 – 167,900 fish

In recent years, actual harvests have fallen drastically short of these thresholds due to poor salmon returns and regulatory closures aimed at conserving declining stocks. The fall chum subsistence harvest, for example, estimated at only 6,990 fish in 2023, a fraction of the minimum ANS and down from a 5-year average (2018–2022) of 27,507 fish (ADF&G, 2024).

These harvest shortfalls have created an ongoing crisis in food security and cultural survival. In many communities, subsistence fishing has been nearly non-existent since 2021. Emergency distributions of alternative fish species have been organized by Tribal governments and non-profits, but these replacement efforts cover only a small fraction of historical household need and cannot replace the cultural importance of harvesting one's own salmon.

Based on recent efforts, the annual costs of sourcing, transporting, storing, and distributing replacement salmon to Yukon River communities are estimated to range from \$500,000 to over \$1 million, varying with fuel prices, salmon availability, and seasonal demands (NOAA Fisheries, 2022). However, reliance on salmon imports is financially and environmentally unsustainable in the long term. High distribution costs and increased fishing pressure in other areas could worsen salmon scarcity, prompting initiatives to diversify food sources and increase local storage capacity. Despite these efforts, limited funding and geographic isolation pose substantial barriers. With ongoing

¹ Source: Alaska Board of Fisheries, 2001–2024 regulatory cycles – Also see Appendix XX: YUKON RIVER PATTERNS OF SUBSISTENCE USES OF CHUM SALMON 1990-2023

instability in salmon populations, there is an urgent need for support focused on habitat restoration and co-managed efforts to restore local stocks.



Tanana culture camp in 2016. By Stephanie Quinn-Davidson

For the Yukon River Tribes and the Tanana Chiefs Conference (TCC), the annual average expenditure to distribute salmon reaches \$1.96 million, combined. This recurring expense diverts funds from essential services like healthcare, education, and infrastructure.

For subsistence-dependent communities along the Yukon River, the continued inability to meet salmon harvest needs represents not only a cultural loss but also an unsustainable financial burden. As families are forced to purchase expensive store-bought foods or travel farther to harvest alternative species, local economies—already stretched thin—face mounting pressures. Yet state and federal funding sources have proven unreliable or slow to materialize in times of crisis.

The TCC, and its member Tribes, have increasingly turned to federal disaster relief programs, primarily administered through NOAA Fisheries and the Pacific States Marine Fisheries Commission (PSMFC). These funds are intended to provide support in the wake of fishery disasters, offering some compensation for lost subsistence and commercial fishing opportunities. However, this support is neither automatic nor timely. It requires a formal federal disaster declaration, multi-year agency reviews, and a lengthy distribution process that places Tribes and rural communities in a financially precarious position.

Critically, the disaster declarations made for Yukon River salmon fisheries in 2020, 2021, and 2022 have still not resulted in any direct financial relief reaching most Tribal communities as of mid-2025. These funds, while approved in principle, remain tied up in administrative processes at the federal and state levels. In the meantime, families continue to go without salmon, local food programs remain underfunded, and Tribes are left scrambling to maintain emergency fish distributions and food security measures without certainty of reimbursement or support.

This lag in funding further undermines the ability of Tribal governments and inter-Tribal organizations to plan for long-term mitigation, restoration, and distribution efforts. Without predictable support, Tribal entities cannot scale traditional food sharing programs, fund repairs to fish camp infrastructure, or support elders and families who can no longer fish.

The reliance on post-hoc disaster declarations as a substitute for stable, equitable subsistence policy places Indigenous communities at a structural disadvantage. It reflects a reactive rather than preventative approach to food insecurity and ignores the unique vulnerabilities of Alaska Native communities who have stewarded and depended upon salmon for generations.

“To provide protein, sustenance, and heritage, we are now supporting commercial fisheries by buying salmon for our people; in 2022 we distributed over 90 thousand pounds of salmon including purchase, shipping, charters, storage, and packaging, and in 2023 we distributed another 90 thousand pounds.” - Chief Chairman, Brian Ridley, Tanana Chiefs Conference

5 IN-RIVER RESTORATION PAST, CURRENT AND FUTURE RESTORATION EFFORTS

The following list of in-river restoration efforts is not all-encompassing and should not be interpreted as a complete representation of the stewardship taking place throughout the Yukon River watershed. Many traditional, Indigenous-led restoration practices—such as cultural protocols, spiritual caretaking, seasonal observation, and intergenerational knowledge transfer—are ongoing but may not be documented within Western scientific frameworks. These practices are central to the health of the river and salmon systems but are often unrecorded in agency databases or technical reports. In addition, not all environmental factors influencing salmon recovery—such as permafrost degradation, cumulative land use impacts, or shifting marine conditions—are fully represented in this summary. The omission of these efforts and factors is a limitation of the reporting format, not a reflection of their significance or effectiveness.

5.1.1 Yukon River Basin Salmon Habitat Restoration and Environmental Recovery Efforts

The Yukon River and its vast network of tributaries support culturally, and ecologically important salmon runs that have declined sharply in recent years (ArcticToday, 2021a). Indigenous communities in Alaska and Canada rely on Yukon salmon for subsistence, but in some areas, Chinook (king) and chum salmon returns have reached historic lows, prompting fishery closures and a regional subsistence food crisis (ArcticToday, 2021a, 2021b). Multiple stressors are responsible for these declines—including habitat degradation from historic mining, barriers to fish migration, pollution, and accelerating climate change. In response, government agencies, Tribal organizations, and local communities are undertaking numerous in-river restoration projects to rehabilitate salmon habitat and overall river health. These efforts range from restoring damaged streams and removing migration barriers to addressing pollution and adapting to climate-related impacts on the watershed.

5.1.2 Major Habitat Restoration Projects in Tributaries

Several projects are underway to restore spawning and rearing habitats in Yukon River tributaries that were degraded by historic mining and development. These projects typically involve re-contouring stream channels, removing mining debris or contaminated sediment, and replanting native vegetation to restore natural river functions.

Nome and Wade Creek Stream Rehabilitation (Upper Yukon): In 2023, the Bureau of Land Management (BLM) partnered with the Salcha-Delta Soil and Water Conservation District and Trout Unlimited to restore fish habitat in Nome Creek and Wade Creek, both tributaries of the upper Yukon River (BLM, 2023a). Historic gold dredging had straightened these streams and deposited tailings, degrading important fish spawning areas (NPS, 2023a; BLM, 2023a). The restoration project involves reshaping thousands of feet of stream channel and improving riparian vegetation to recover water quality and instream habitat conditions (BLM, 2023a, 2023b). This work is part of the U.S. Department of the Interior’s “Gravel to Gravel” initiative, funded through the Bipartisan Infrastructure Law, which targets salmon habitat improvements throughout the Yukon–Kuskokwim region (BLM, 2023a). By reversing the impacts of legacy mining, these efforts aim to support subsistence and wild salmon fisheries in the upper basin (BLM, 2023b).

Coal Creek Salmon Habitat Restoration (Yukon–Charley Rivers): The National Park Service (NPS), in collaboration with the Tanana Chiefs Conference and other partners, is leading a large-scale restoration of Coal Creek in the Yukon–Charley Rivers National Preserve to address over 100 years of damage from dredge mining (NPS, 2023a, 2023b). Mining had transformed Coal Creek’s meandering channel into a straightened ditch, reducing habitat complexity and increasing flood risk (NPS, 2023a). Beginning in 2024, restoration crews will reestablish natural meanders, replant willows along the banks, and create deeper pools to support salmon habitat while also controlling erosion (NPS, 2023b, 2023c). These changes are expected to reduce turbidity, mitigate flooding, and reintroduce spawning habitat for Chinook salmon, which have largely disappeared from the creek (NPS, 2023d). This project, also funded by the Bipartisan Infrastructure Law, is one of the first habitat restoration efforts of its kind in the preserve and includes strong Tribal involvement through the Tanana Chiefs Conference (NPS, 2023c).

Fortymile & Birch Creek Watershed Restoration (Planned): BLM has designated the Fortymile and Birch Creek Wild and Scenic Rivers as a Restoration Landscape, eligible for significant federal investment in habitat rehabilitation (BLM, 2023b). Over the next 5–10 years, approximately \$5 million from the Inflation Reduction Act will be used to enhance ecosystem resilience, address legacy sedimentation from placer mining, and improve overall fish habitat (BLM, 2023b). Restoration activities will include stream re-contouring and sediment removal, similar to methods being applied in Nome and Wade Creeks. This landscape-level approach aims to heal upstream tributary processes that feed into the broader Yukon River system, benefiting salmon populations over time.

Though still early in implementation, these tributary projects are expected to deliver measurable habitat benefits. In other parts of Alaska, restored stream segments have shown recolonization by salmon and increased spawning activity within just a few seasons. In Coal Creek, success metrics will include reduced flooding, lower turbidity, and ultimately, the return of spawning Chinook salmon to a reach that had lost nearly all its fish (NPS, 2023d).

5.1.3 Fish Passage Improvements and Barrier Removal

Another major focus of Yukon River restoration is removing barriers to fish migration. Many streams throughout the basin are obstructed by culverts or other infrastructure that prevent salmon from reaching essential spawning and rearing habitat. Since 1999, the Alaska Department of Fish & Game (ADF&G) has surveyed more than 2,500 road-stream crossings statewide and found that nearly half significantly hinder fish passage (ADF&G, 2023a). The most problematic are undersized or perched culverts that generate excessive water velocities or physical drop-offs, blocking juvenile and weaker-swimming salmon from moving upstream (ADF&G, 2023a).

To address these barriers, ADF&G and its partners have launched a broad culvert replacement initiative. Statewide, at least 33 fish passage projects have replaced problematic crossings with fish-friendly designs—such as larger culverts or bridges—reopening more than 78 miles of salmon streams and nearly 2,000 acres of lake habitat (ADF&G, 2023b). While the Yukon River region has fewer road crossings than more developed areas of Alaska, culvert improvement projects are ongoing in key locations.

Emmonak Slough Fish Passage Project (Lower Yukon): In 2024, the U.S. Fish & Wildlife Service (USFWS) awarded \$500,000 through Bipartisan Infrastructure Law (BIL) funding to support fish passage restoration in Emmonak Slough, near the mouth of the Yukon River (USFWS, 2024a). The slough and its tributaries are vital to all five Pacific salmon species, but culverts and debris had been restricting access to off-channel spawning and rearing habitat (USFWS, 2024a). This project involves replacing or retrofitting outdated culverts, removing debris, and conducting a community-led streambank cleanup and revegetation to restore natural flow regimes (USFWS, 2024a). Local residents are actively engaged in prioritizing barrier removals and monitoring project outcomes (USFWS, 2024b). The result will be a reconnected aquatic corridor, improving access to habitat while also reducing flood risks at road crossings.

This effort is part of the broader “Gravel to Gravel” initiative, which links fish habitat restoration with local resilience and community stewardship (USFWS, 2024c). The policy environment for fish passage is strong—especially under the Bipartisan Infrastructure Law, which dedicates funds specifically for culvert improvements in Alaska (USFWS, 2024d). Additional technical and financial assistance is provided through the National Fish Passage

Program (USFWS) and the Alaska Sustainable Salmon Fund (administered by ADF&G), which help identify and prioritize high-impact restoration sites (NOAA Fisheries, 2023).

5.1.4 Environmental Stressors Affecting River Health and Restoration Responses

Climate change is imposing new challenges on the Yukon River's ecosystems, and restoration efforts are increasingly designed to account for these impacts. Key climate-driven stressors affecting the river and salmon include rising water temperatures, permafrost thaw, and altered hydrology.

Warming Water Temperatures: The Yukon River is experiencing more frequent summer periods above 18°C—a temperature threshold beyond which salmon begin to show signs of physiological stress (USGS, 2020). Monitoring during the 2016–2017 Chinook runs found that over half (54%) of sampled salmon showed biomarkers of heat stress while migrating (USGS, 2020). Warm water increases salmon metabolic rates, often resulting in pre-spawning mortality or death en route to spawning grounds (Columbia Climate School, 2022). During recent heatwaves, community observers in the Koyukuk River region (a Yukon tributary) reported salmon die-offs likely linked to thermal stress and low oxygen conditions (NPR, 2021). In response, restoration projects are incorporating climate adaptation by enhancing cold-water refugia. For example, re-meandering projects like those on Coal Creek, along with planting streambank vegetation, help create deeper pools and shaded areas that stay cooler during warm periods (NPS, 2023a). Protecting groundwater-fed side sloughs and channels—often cooler than surface water—is also a priority for salmon refuge during high-temperature events.

Permafrost Thaw and Erosion: Much of the Yukon Basin is underlain by permafrost that is now degrading rapidly due to climate warming. Thawing permafrost causes hillslopes to slump and collapse into waterways, increasing turbidity and disrupting channel morphology (Yukon Climate Change Secretariat, 2021). Mapping in the Beaver River basin (a Yukon tributary in Canada) identified numerous retrogressive thaw slumps contributing heavy sediment loads that threaten to bury salmon spawning beds (Yukon Climate Change Secretariat, 2021). Thaw is also mobilizing contaminants: one study projects that permafrost degradation could double mercury levels in the Yukon River by the end of the century under high-emissions scenarios (ArcticToday, 2021a). Mercury, a neurotoxin, bioaccumulates in fish and could pose risks to food safety and human health by 2050 (ArcticToday, 2021b). To mitigate these risks, Tribal and federal programs are stabilizing vulnerable banks through revegetation, while water chemistry monitoring by the Yukon River Inter-Tribal Watershed Council (YRITWC) and USGS tracks rising mercury and sediment (ArcticToday, 2021b; Anthropocene Alliance, 2022).

Altered Hydrology and Flooding: Environmental change is also shifting the Yukon's hydrology, with earlier spring melt, stronger summer storms, and changes to base flows in tributaries. Rapid thaw can drain upland wetlands or create waterlogged zones, disturbing salmon habitat availability. In parts of the Yukon Flats, entire lakes have drained suddenly due to thaw-related subsidence, while downstream communities are experiencing more severe floods and riverbank collapse (Polar Journal, 2023). Some lower Yukon villages are now facing relocation due to these climate-induced erosion events (NOAA Office for Coastal Management, 2022). Restoration initiatives aim to reduce vulnerability by restoring natural floodplains and stabilizing banks. For instance, the Coal Creek project reduces flood risk to historic park infrastructure while enhancing fish habitat (NPS, 2023b). In the Yukon Delta village of Kotlik, NOAA funded a nearly \$4 million project to restore and protect coastal wetlands that buffer storm surge and prevent bank failure (NOAA Office for Coastal Management, 2022). These nature-based solutions serve dual purposes—enhancing ecosystem resilience while safeguarding community infrastructure.

5.1.5 Addressing Pollution and Legacy Mining Contamination

Mining contamination has long impacted the Yukon River ecosystem, and cleanup or mitigation is now a critical component of restoration. The Yukon watershed has a history of both large-scale industrial mines and countless small placer operations. These have left a legacy of tailings piles, contaminated sediments, and, in some cases, toxic waste that leaches into waterways. Restoration initiatives are tackling these issues through site remediation and pollution prevention.

On the U.S. side, many historic gold dredge sites—such as those along Nome Creek and Coal Creek—left behind mercury and fine sediment. Early 20th-century placer mining often used mercury to extract gold, and some of this mercury remains in streambeds. Restoration projects like the Bureau of Land Management’s (BLM) Nome/Wade Creek effort work to recontour these streambeds and flush or stabilize contaminated sediments (NPS, 2023). At Coal Creek, project plans include isolating and reducing erosion from historic dredge tailings, thus preventing downstream releases of heavy metals (NPS, 2023). These efforts improve both water quality and fish habitat.

On the Canadian side, the Faro Mine in Yukon Territory represents one of the most extreme examples of legacy contamination. Once the world’s largest open-pit lead–zinc mine, Faro was abandoned in 1998, leaving 70 million tons of tailings and 320 million tons of waste rock that pose serious acid drainage and metal leaching risks (Crown-Indigenous Relations and Northern Affairs Canada [CIRNAC], 2023a). A massive remediation project—co-led by Canada and Yukon First Nations, particularly the Selkirk First Nation—is currently underway. As part of this effort, engineers realigned North Fork Rose Creek in 2020 to divert clean water away from contaminated sites and reduce acid runoff into the Pelly River, a key Yukon tributary (CIRNAC, 2023b). New water treatment facilities are also being constructed to ensure that mine runoff is purified before it reaches salmon-bearing streams (CIRNAC, 2023b).

While Faro’s remediation aims more at damage prevention than habitat restoration, it is crucial for safeguarding water quality in the upper Yukon basin. Throughout the watershed, smaller abandoned mine sites are also being assessed and prioritized for cleanup. For example, in 2021, the Yukon River Inter-Tribal Watershed Council (YRITWC) secured nearly \$300,000 from the EPA to assess contamination at legacy sites in rural villages, including abandoned fuel tanks, dumps, and old mining equipment (U.S. Environmental Protection Agency [EPA], 2021).

Other pollution sources—including military installations and historic industrial activity—have introduced contaminants such as PCBs and fuels. YRITWC, guided by a 50-year vision of a “drinkable Yukon River,” has led the removal of hundreds of tons of solid waste, including batteries and vehicles, from riverside communities (Anthropocene Alliance, 2022). Their Water Stewardship Program also conducts water quality testing for heavy metals, hydrocarbons, and other toxins, helping prioritize future cleanup actions (Anthropocene Alliance, 2022).

6 RESOURCES TO DEEPEN UNDERSTANDING AND SUPPORT INDIGENOUS STEWARDSHIP

Indigenizing Salmon Fisheries in Alaska

This interactive StoryMap explores the integration of Indigenous knowledge and practices into Alaska’s salmon fisheries management. It emphasizes the importance of Indigenous stewardship, highlighting the cultural and ecological significance of salmon to Native communities. The resource showcases efforts to revitalize traditional fishing methods and governance systems to promote sustainable fisheries.

<https://storymaps.arcgis.com/stories/43ae5f7ae3b84a85889e7b8ada4561f0>

Alaska Native Perceptions of Food, Health, and Community Well-Being: Challenging Nutritional Colonialism

This academic work examines how Alaska Native communities perceive food, health, and well-being, introducing the concept of “nutritional colonialism.” It discusses the impact of colonial food systems on Indigenous diets and health, advocating for a return to traditional foods and practices to improve community health outcomes.

https://www.proquest.com/docview/1651257757/9051ED17DADB413DPQ/1?fbclid=IwY2xjawFeeXJleHRuA2FlbQI xMAABHRBHxchVpo8Syf6mhDQxotzpcVnuX6rWJv-wKPb0TvNnt6e4nwQjmbuP8A_aem_F-TJel3zD8bMO9Acrr7E_Q

Native Land Digital

Native Land Digital is an interactive mapping platform that identifies Indigenous territories, languages, and treaties worldwide. It serves as an educational tool to acknowledge and respect Indigenous lands, encouraging users to learn about the histories and cultures of Native peoples associated with specific regions

<https://native-land.ca/>

Reckoning with Coloniality: Trawl Fisheries Governance and the Fight for Equity and Environmental Justice in Alaska

This scholarly article critiques the governance of trawl fisheries in Alaska, highlighting systemic marginalization of Alaska Native voices. It argues that current management practices perpetuate colonial structures, leading to environmental injustices and advocating for equitable inclusion of Indigenous perspectives in fisheries governance <https://academic.oup.com/fisheries/advance-article/doi/10.1093/fshmag/vuaf022/8096397>

Incorporating Indigenous Rights and Environmental Justice into Fishery Management: Comparing Policy Challenges and Potentials from Alaska and Hawaii

This comparative study analyzes how Indigenous rights and environmental justice are integrated into fishery management in Alaska and Hawaii. It identifies policy challenges and proposes frameworks for incorporating Indigenous knowledge and participation in sustainable fisheries management.

https://www.researchgate.net/publication/257389547_Incorporating_Indigenous_Rights_and_Environmental_Justice_into_Fishery_Management_Comparing_Policy_Challenges_and_Potentials_from_Alaska_and_Hawaii

Yukon River Joint Technical Committee Report

These reports, produced by the Yukon River Joint Technical Committee, provide annual reviews and outlooks on salmon fisheries in the Yukon River. They include data on fish populations, harvests, and management strategies, serving as a resource for stakeholders involved in the conservation and management of Yukon River salmon.

<https://www.yukonriverpanel.com/publications/yukon-river-joint-technical-committee-reports/>

Tanana Chiefs Conference – Tribal Resource Stewardship Department

The Tribal Resource Stewardship Department of the Tanana Chiefs Conference focuses on protecting and managing natural resources vital to Interior Alaska Native communities. It encompasses programs related to hunting, fishing, climate change, and co-management councils, aiming to ensure sustainable practices and uphold tribal sovereignty. *To review earlier appendices, please visit this page.*

<https://www.tananachiefs.org/tribal-resources-stewardship-program/>

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APPENDIX 9B: YUKON RIVER PATTERNS OF SUBSISTENCE USES OF CHUM SALMON, 1990-2023

November 1, 2024

This report was jointly developed by Tanana Chiefs Conference and the Yukon Inter-Tribal Fish Commission to provide insight into the diversity of salmon use along the Yukon River Drainage

Produced by Jim Simon, PhD, Principal Anthropologist



APPENDIX 9B

YUKON RIVER PATTERNS OF SUBSISTENCE USES OF CHUM SALMON, 1990-2023

INTRODUCTION

The Yukon River Inter-Tribal Fish Commission (YRITFC) first was established by its member tribes in 2014. Upon ratification of revisions to the YRITFC Constitution in 2023, now more than 40 federally recognized tribal governments are active voting members of YRITFC. Since 2014, YRITFC has been administered as a program within the Tanana Chiefs Conference (TCC) with plans for YRITFC to eventually become a stand-alone organization independent of TCC.

In 2023, with revisions occurring in May 2024, YRITFC member tribes designated 9 distinct geographic territories within the Yukon Fisheries Management Area to ensure broad geographic representation in governance and data representation throughout the region (Figure A1). Several Yukon River communities include tribal citizens of more than one federally recognized tribal government.

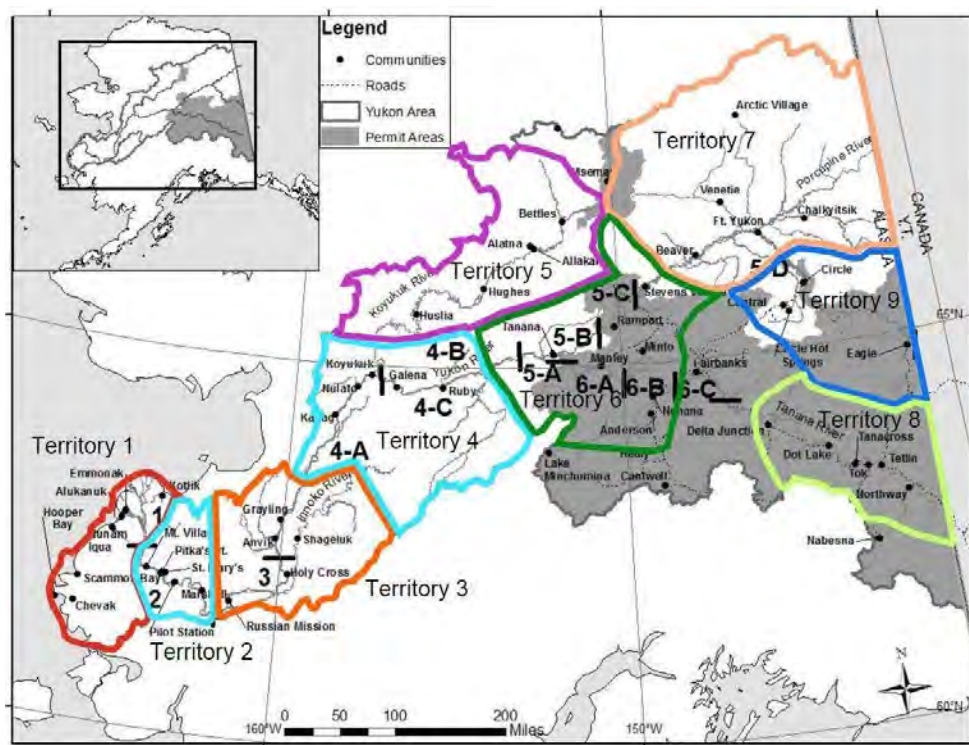


Figure A1. YRITFC preliminary Territorial boundaries (shaded areas indicate where subsistence fishing permits are required; non-shaded areas represent where post-season household surveys document annual fish harvests).

Moving from the communities along the coast of the Yukon Delta and around the mouths of the Yukon River and then upriver, YRITFC member tribes and other tribal communities served by YRITFC are listed in Table A1. Not all listed federally recognized tribes are currently active voting members of YRITFC.

Data presented in this report are limited to those available for Alaska tribal communities.

Table A1. Tribal Communities Served by Yukon River Inter-Tribal Fish Commission by YRITFC territories.

Territory 1:	Territory 2:	Territory 3:
Alakanuk Traditional Council	Algaaciq Native Community (St. Mary's)	Anvik Tribal Council
Native Village of Bill Moore's Slough (Kotlik)	Asa'carsarmiut Tribal Council (Mountain Village)	Grayling IRA Council
Chevak Traditional Council	Native Village of Marshall	Holy Cross Traditional Council
Chuloonawick Native Village (Emmonak)	Ohogamiut Traditional Council (Marshall)	Shageluk IRA Council
Emmonak Tribal Council	Pilot Station Traditional Village	Iqugmiut Tribal Council (Russian Mission)
Hamilton Tribal Council (Kotlik)	Pitka's Point Traditional Council	
Native Village of Hooper Bay	Yupiit of Andreafski (St. Mary's)	
Village of Kotlik		
Nunam Iqua Traditional Council		
Paimiut Traditional Council (Hooper Bay)		
Scammon Bay Traditional Council		
Territory 4:	Territory 5:	Territory 6:
Kaltag Tribal Council	Alatna Traditional Council	Manley Village Council
Koyukuk Tribal Council	Allakaket Traditional Council	Native Village of Minto
Louden Tribal Council (Galena)	Evansville Tribal Council (Bettles/Evansville)	Nenana Native Village Council
Nulato Tribal Council	Hughes Village Council	Rampart Tribal Council
Ruby Tribal Council	Huslia Tribal Council	Stevens Village IRA Council
		Tanana Tribal Council
Territory 7:	Territory 8:	Territory 9:
Arctic Village Traditional Council	Dot Lake Village Council	Circle Village Council
Beaver Village Council	Healy Lake Village Council	Eagle IRA Council
Chalkyitsik Village Council	Northway Traditional Council	(Other Canadian First Nations of the Yukon River, which are eligible to join YRITFC)
Denduu Gwich'in Tribal Council (Birch Creek)	Tanacross Village Council	
Gwichyaa Zhee Gwich'in Tribal Government (Fort Yukon)	Tetlin IRA Council	
Old Crow (Yukon Territory)		
Native Village of Venetie Tribal Government		

METHODS

The Role of Yukon River Chum in the Overall Subsistence Economies of Yukon River Tribal Communities

ADF&G occasionally collects subsistence resource harvest data at the household level and summarizes data results at the community level based upon household community of residence. ADF&G Subsistence staff conduct door-to-door surveys to document for a particular year all subsistence harvests of fish, wildlife, and plants in addition to harvest search areas, resource sharing patterns, household income and demographics among other information categories to develop community profiles that serve to represent the overall subsistence economy of participating communities for a particular study year. Each resource harvested is converted to usable/edible pounds so that different resources harvested are comparable. Comprehensive subsistence household survey projects are relatively limited as compared to the annual door-to-door surveys conducted each fall to document subsistence salmon harvests following the bulk of the year's salmon fishing opportunities. Comprehensive surveys provide opportunities to understand the relative contribution and importance of salmon to the overall subsistence economy in a community.

During the period 1980-2021, ADF&G Subsistence staff conducted comprehensive subsistence surveys in 41 communities of the Yukon Fisheries Management Area in Alaska representing a total of 61 community-data-years given that 18 Yukon River drainage communities had comprehensive subsistence research conducted more than once. Of the 61 community-data-years, 27 were conducted between 1980 and 1990 and 34 were conducted during the period 2008-2021. During the latter period, subsistence harvests of Yukon River Chinook salmon, for example, fell below the Alaska Board of Fisheries established “amounts reasonably necessary for subsistence uses” finding in all years except 2019. Therefore, comprehensive survey results in 56% of the data years were during years of poor Chinook salmon returns to the Yukon River. As a result, data from the 1980s and 1990s are combined with more recent comprehensive data in those cases where more than one data point exists for a particular community to better understand long-term patterns of use and reliance on fish and wildlife and to avoid problems associated with shifting baseline syndrome (e.g., Alleway et al. 2023). Results of this research are summarized below including text descriptions and pie chart graphics for each YRITFC territory.

Among the nine geographic territories identified by YRITFC, subsistence harvest and uses of chum salmon differ from one part of the river to another. TCC and YRITFC prepared subsistence harvest composites using comprehensive subsistence harvest surveys collected by ADF&G over a broad period of time (1980-2021).¹ ADF&G provides harvest numbers that are also converted into usable or edible pounds so that individual resource categories or species of harvest can be compared with others to better understand a particular community's or YRITFC territory's subsistence patterns of harvest and use or subsistence economies.

Representing the best available information on the role of salmon species in the overall subsistence economies of Yukon area communities, these generalized subsistence harvest composition metrics help to show the overall importance of individual salmon species to community economies and ways of life in the various geographic territories of the Yukon watershed in Alaska. The data are summarized by YRITFC

¹ All data is sourced from <https://www.adfg.alaska.gov/sb/CSIS/>; see also Andrews (1988), Brown et al. (2014, 2015, 2016), Brown and Kostik (2017), Case and Halpin (1990), Coleman et al. (2023), Fall et al. (2012), Godduhn and Kostick (2016), Holen et al. (2012), Ikuta et al. (2014), Ikuta et al. (2016), Kofinas et al. (2016), Marcotte (1986), Marcotte (1990), Marcotte and Haynes (1985), Marcotte et al. (1991), McDavid and Cunningham (2020), Park et al. (2020), Sumida (1988), Sumida (1989), Sumida and Andersen (1990), Trainor et al. (2020a, 2020b), Wheeler (1993), Wilson and Kostick (2016), and Wolfe (1981).

territory to provide an overview of the varying composition of wild food harvests along the Yukon River drainage and coastal areas, with a particular focus on the reliance of summer chum salmon and fall chum salmon for subsistence purposes. The results of these studies show that salmon provide a large portion of the total subsistence food supply in Yukon River communities in Alaska and that the role salmon contributes to community and territorial subsistence economies generally increases as one progresses upriver. However, based upon differences in species availability, salmon species life histories, and the variable distribution of chum salmon stocks throughout the Yukon River drainage, different YRITFC territorial regions have dramatically different patterns of subsistence harvest and use patterns.

Yukon River Salmon Use Rates by Household and Per Capita by YRITFC Territory

ADF&G collects subsistence salmon harvest data following much of the salmon fishing season (post-season) in communities where subsistence salmon fishing permits are not required. These post-season subsistence salmon harvest surveys are conducted by ADF&G Commercial Fisheries staff through door- to-door surveys to document salmon harvests at the household level and summarizes data results at the community level based upon household community of residence. ADF&G integrates the results of the post-season surveys with subsistence fishing permit data to provide a comprehensive annual overview of subsistence salmon harvests and uses for subsistence purposes. Methods employed to develop community subsistence salmon harvest estimates are detailed in the annual post-season survey program annual reports from which the 1990-2023 data presented here originate.²

² Holder and Hamner (1991), Bromaghin and Hamner (1993), Holder and Hamner (1995, 1998a, 1998b), Borba and Hamner (1996, 1997, 1998, 1999, 2000, 2001), Brase and Hamner (2002, 2003), Busher and Hamazaki (2005), Busher et al. (2007, 2008), Jallen et al. (2012a, 2012b), Busher et al. (2009), Jallen and Hamazaki (2011), Jallen et al. (2012c, 2012d, 2015, 2017a, 2017b, 2017c), Padilla et al. (2021, 2023a, 2023b, 2023c), and Padilla and Hamazaki (2024). Preliminary subsistence uses and total number of household data for 2021-2023 provided by email from Andrew Padilla on August 16, 2024.

In 2021, Chinook salmon and summer chum salmon harvests for Holy Cross and Shageluk were together reported as "Other District 3" harvests due to confidentiality concerns because so few households fished. As a result, the combined harvest of 9 Chinook salmon and 32 summer chum salmon were divided equally between the two communities at 4.5 Chinook salmon and 16.0 summer chum for Holy Cross and 4.5 Chinook salmon and 16.0 summer chum for Shageluk. Similarly, because of confidentiality concerns due to the low number of households that fished for salmon, the 2021 Chinook salmon harvest and subsistence use for Anvik, Grayling, Kaltag, Nulato, Koyukuk, and Ruby were reported together as "Other District 4" for a total of 12 Chinook salmon. As a result, the aggregated harvest of Chinook salmon was assigned as 2.0 Chinook salmon per community. Anvik and Grayling are part of Territory 3 while Kaltag, Nulato, Koyukuk, and Ruby are part of Territory 4. Similarly, in 2021, because of the small number of Manley households that fished, Manley harvest was aggregated with "Other District 5" harvests for a total of 22 Chinook salmon and 5 summer chum salmon used for subsistence, which included harvests by fishing households from Anchorage, Douglas, Eagle River, and Wasilla. As a result, 4.4 Chinook salmon and 1.0 summer chum salmon were assigned to Manley by dividing the 22 Chinook and 5 summer chum reported by the five communities reflected in the Other District 5 category. Similarly, the 2021 coho salmon harvest and subsistence use for Manley was aggregated with "Other District 6" harvests for a total of 4 coho salmon, which included harvests by fishing households from Anchorage, Delta Junction, Lake Minchumina, Tok, and Wasilla. As a result, 0.67 coho salmon was assigned to Manley by dividing the 4 coho reported by the six communities reflected in the "Other District 6" category.

In 2022, Chinook salmon harvests and uses for Grayling, Kaltag, Nulato, Koyukuk, Galena, and Ruby were aggregated together due to confidentiality concerns associated with the few numbers of households that fished in each community. As a result, the 75 Chinook salmon were apportioned among these six communities at 12.50 fish each. Similarly, Chinook salmon harvest and use data for Manley and Minto were aggregated with Other District 6 data, which included Anchorage, Delta Junction, Lake Minchumina, Tok, and Wasilla. The one Chinook salmon harvested by these 7 aggregated communities was apportioned to each community as 0.14 Chinook salmon. In 2022, summer chum salmon harvests and uses for Grayling, Kaltag, Nulato, Koyukuk, Galena, and Ruby were aggregated

TCC and YRITFC have jointly developed a database of subsistence salmon use information, which includes salmon harvested under subsistence fishing regulations as well as salmon harvested in commercial fisheries that were retained for home use and salmon harvested in Yukon River test fisheries and distributed to communities for subsistence uses.³ These data are summarized by YRITFC tribally-defined territories below and include harvest rates used for subsistence by household and per person for each of the nine YRITFC territories, including salmon use information for territories outside the TCC region (e.g., the lower Yukon River within the Association for Village Council Presidents (AVCP) service area).

This database does not contain harvests by residents of the Fairbanks North Star Borough, residents of Alaska communities outside YRITFC membership and service⁴, nor Upper Tanana tribal communities of Territory 8. Communities in the uppermost reaches of the Tanana River in Alaska (YRITFC Territory 8) are associated with subsistence fishing permit requirements and local subsistence salmon fishing opportunities are limited; therefore, residents of Territory 8 sometimes travel elsewhere to subsistence fish for salmon and their Yukon River or Tanana River salmon harvests are documented in a category that includes other Alaskan communities and are not specified by community. Furthermore, some residents of Territory 8 travel to the Copper River to subsistence fish for salmon or participate in the Chitina Subdistrict personal use salmon fishery such that those harvests are documented elsewhere. As a result, YRITFC Territory 8 annual subsistence salmon use information cannot be derived from existing Yukon River salmon harvest data and therefore are not included here.

Household salmon use rates are based upon the total number of households identified by ADF&G staff for each participating community in the post-season subsistence salmon harvest survey program and reported

together due to confidentiality concerns associated with the few numbers of households that fished in each community. As a result, the 56 summer chum salmon were apportioned among these six communities at 9.33 fish each. Similarly, fall chum salmon and coho salmon harvest and use data for Manley and Minto were aggregated with Other District 6 data, which included Anchorage, Delta Junction, Lake Minchumina, Tok, and Wasilla. The 7 fall chum salmon and 12 coho harvested by these 7 aggregated communities was apportioned to each community as 1.0 fall chum salmon and 1.71 coho salmon.

In 2023, Chinook salmon and summer chum salmon harvests and uses for Nulato and Ruby were aggregated together into the "Other District 4" category due to confidentiality concerns associated with the few numbers of households that fished. As a result, the 3 Chinook salmon and 134 summer chum salmon reported were apportioned between the two communities at 1.5 Chinook salmon and 67 summer chum salmon each for Nulato and Ruby. Similarly, coho salmon harvest and use data for Manley were aggregated with Other District 6 data, which included Anchorage, Delta Junction, Lake Minchumina, and Tok. The 5 coho salmon harvested by these 5 aggregated communities was apportioned as 1.0 coho salmon for each community.

³ Hooper Bay and Scammon Bay along the Bering Sea Coast within the Yukon Fisheries Management Area were not included in the post-season subsistence salmon survey program until 1992, therefore data for these communities were lacking for 1990 and 1991. As a result, the 1992-1994 average harvests were used to estimate salmon harvests in Hooper Bay and Scammon Bay for 1990 and 1991.

⁴ In 2016, ADF&G began reporting Nenana subsistence salmon harvests combined with Healy, Alaska, which is not a tribal community and therefore not a member of the YRITFC Territory 6. However, because it is not possible to separate the two communities' harvests, the human population and number of households estimated for Healy have been added to Nenana data from 2016 forward so that household and per capita subsistence salmon harvest and use metrics can be developed for Territory 6. Similarly, in 2016, ADF&G began reporting Circle salmon harvest information combined with Central, Alaska, another non-tribal community not part of YRITFC Territory 9. Therefore, since 2016 Central harvest, human population, and number of household data have been included in Territory 9 data presentations. Data are similarly aggregated for Allakaket, Alatna, and Bettles (Territory 5), Huslia and Hughes (Territory 5), Rampart and Stevens Village (Territory 6), Fort Yukon and Birch Creek (Territory 7), and Venetie and Chalkyitsik (Territory 7) since 2016. However, because each is a YRITFC tribal community located in the same YRITFC territory, no database accommodation or adjustment is warranted.

in the annual technical reports. For communities not part of the program due to subsistence fishing permit requirements, total number of households are based upon decadal US Census data and the relationships between community populations and the number of occupied households and the Alaska Department of Labor (ADOL) annual community population estimates. Per capita salmon use rates rely similarly on decadal US Census human population estimates by Census Designated Places and annual ADOL community population estimates.⁵

Evaluating trends in household and per capita salmon use rates serves to more objectively compare salmon use patterns among YRITFC Territories because these data compensate for varying community population sizes and the number of households from one part of the watershed to another as well as changes in a particular community through time. Salmon use rates per person (per capita) data provide another perspective on YRITFC territorial use patterns that account for the differing household sizes and the availability of housing in Yukon River tribal communities.

RESULTS

Comprehensive subsistence harvest surveys provide information on the role of chum salmon in the overall subsistence economy of rural Yukon River communities and is summarized in Table A2. Patterns of reliance and use of summer chum salmon differ from those associated with fall chum salmon, which likely result from life history differences among these stocks, variations in resource availability in different parts of the watershed, and variations among Yukon River indigenous cultures and ways of life. For example, summer chum salmon typically do not migrate all the way to the Canadian border and become less palatable for human food as they reach spawning grounds and exhaust their fat reserves. This pattern contrasts with higher quality of fall chum salmon migrating to Canada.

For example, Table A2 illustrates that summer chum salmon did not contribute substantially to the subsistence economies of YRITFC Territories 8 and 9 whereas fall chum salmon contributed more than 74% of the total subsistence harvests of the Territory 9 communities of Circle and Eagle in 2017. Conversely, fall chum salmon proportionally contribute less to the subsistence economies of lower river territories where summer chum salmon contribute more to the overall subsistence economy than other salmon except Chinook salmon. Based upon available data, the middle river (e.g., YRITFC Territories 4-6) utilizes both summer chum salmon and fall chum salmon to a greater extent than Chinook salmon whereby chum salmon contribute 47% to 52% to the overall subsistence economy of Territories 4, 5, and 6. Territory 7 (e.g., Yukon Flats communities) rely on chum salmon for 35% of their total subsistence harvests, which when considered along with a 22% dependency on Chinook salmon, demonstrates that more than 57% of Territory 7's subsistence economy is dependent upon chum and Chinook salmon alone.

⁵ https://live.laborstats.alaska.gov/pop/estimates/data/TotalPopulationPlace_1990to1999.xls;
https://live.laborstats.alaska.gov/pop/estimates/data/TotalPopulationPlace_2000to2010.xls;
https://live.laborstats.alaska.gov/pop/estimates/data/TotalPopulationPlace_2010to2020.xls;
<https://live.laborstats.alaska.gov/pop/estimates/data/TotalPopulationPlace.xlsx>.

Table A2. Overview of the role of chum salmon in the total subsistence economy of tribally defined Yukon River YRITFC territories.

Proportions of Total Subsistence Harvests (%)	Territory 1	Territory 2	Territory 3	Territory 4	Territory 5	Territory 6	Territory 7	Territory 8	Territory 9
Chinook Salmon	7.00	10.51	13.96	13.21	4.09	10.19	22.50	0.71	11.57
Summer Chum Salmon	6.04	10.23	11.55	36.23	29.67	14.41	12.62	0.00	0.00
Fall Chum Salmon	0.03	2.30	4.27	11.09	3.48	37.87	20.77	0.00	74.24
Unknown Chum Salmon	9.51	9.81	0.00	0.03	17.80	0.00	1.64	0.14	0.00
Coho Salmon	1.78	2.37	2.94	1.68	0.15	8.14	0.17	3.46	0.00
Other Salmon	1.59	0.91	0.21	0.26	0.15	0.49	0.12	5.10	0.11
Non-Salmon Fish	24.68	34.37	19.00	8.93	15.07	15.35	10.24	42.82	1.41
Large Land Mammals	12.86	17.37	36.78	24.49	23.97	9.54	23.71	32.19	10.33
Small Land Mammals	1.79	3.70	6.20	2.10	1.79	1.66	3.57	7.10	0.34
Marine Mammals	26.09	3.53	0.18	0.00	0.00	0.00	0.00	0.00	0.00
Birds and Eggs	5.75	3.18	3.61	1.08	2.86	1.43	4.13	4.64	0.90
Marine Invertebrates	0.11	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Vegetation	2.76	1.69	1.29	0.89	0.97	0.93	0.53	3.84	1.08
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The pattern of chum salmon, and salmon overall, contributing approximately half or more of the total subsistence economies of Territories 4, 5, 6, 7, and 9 contrasts with Territories 1, 2, and 3 where 15%, 22%, and 16% of their total subsistence harvests comprise chum salmon and all salmon combined represent 26%-36% of the overall subsistence economies of these lower river and coastal territories. It is also important to note that commercial salmon fisheries in the lower river have contributed important income that is often reinvested into their subsistence economy (e.g., Wolfe 1981), which is not accounted for in comprehensive subsistence harvest survey data reported here.

The lesser dependence of Territories 1-3 on salmon for subsistence uses, and particularly chum salmon, is not because residents of the lower river are not equally dependent upon salmon to meet important food security, cultural, and spiritual needs, but rather because they also have a pattern of utilizing marine mammals and non-salmon to a greater extent than territories further upriver. For example, marine mammals contribute to only the subsistence economies of Territories 1-3 as marine mammals are largely unavailable to residents upriver in Territories 4-9. Similarly, non-salmon fish harvests are greatest in Territories 1-3 where a variety of non-salmon species are more abundant and more widely available, except for Territory 8 where non-salmon fishes contribute 43% of the total subsistence economy of Upper Tanana communities in the absence of local salmon stocks available for subsistence fishing.⁶ The number of fish species available for subsistence fishing along with their abundances decline as one moves upriver from the Bering Sea Coast and lower Yukon River into Interior Alaska and these representative subsistence harvest composition data reflect these patterns.

Yukon River Patterns of Salmon Used for Subsistence, 1990-2023

Annual post-season subsistence salmon harvest and use surveys provide comparable information from 1990 to the present and are useful in understanding the change patterns of salmon use throughout the Yukon River drainage in Alaska.

Figure A2 illustrates the number of Yukon River salmon used for subsistence from 1990-2023 focusing on Chinook salmon, summer and fall chum salmon, and coho salmon.⁷ Overall, salmon available from

⁶ Tribal communities in Territory 8 have long considered themselves as whitefish people.

⁷ While pink salmon may have become more significant sources of salmon used for subsistence in coastal waters and the lower Yukon River given salmon fishing closures to conserve Chinook and chum salmon, historically, pink salmon have not been used for subsistence in significant quantities within the TCC region of Interior Alaska. For example, in the period 2000-2010, average pink salmon harvests were 154 fish in District 4 and 28 fish in District 5, which together encompass YRITFC Territories 3-7 and 9 (Jallen et al. 2012c:Appendix B8). Average pink salmon

subsistence fishing, test fisheries distributions, and retained from commercial fishing for subsistence uses has declined significantly since 1990. While tribal elders and other long-time Yukon River fishing households have noted that salmon abundance and subsistence harvests began to decline well before 1990, the data reported here demonstrate the previous salmon crash of Chinook and chum salmon in the late 1990s and early 2000s with its resulting

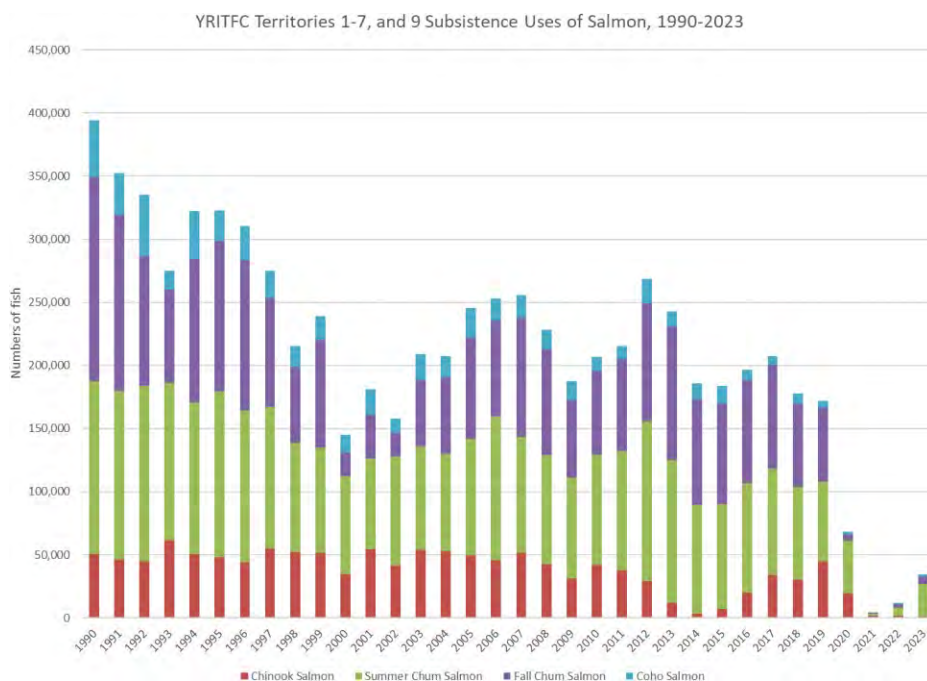


Figure A2. Yukon River salmon used for subsistence, including Chinook, summer chum, fall chum, and coho salmon, 1990-2023.

impacts on salmon availability for subsistence uses. Also of note is that the post-2000 “recovery” of Yukon River salmon populations failed to restore subsistence salmon uses to levels experienced in the 1990s.

Much of the decline in Yukon River salmon subsistence uses related directly to Chinook salmon. Subsistence uses of Yukon River Chinook salmon used to approach 50,000 fish annually in the 1990s. For example, the 1990-1994 five-year average number of Chinook salmon used for subsistence by YRITFC Territories was 50,631 fish and 50,082 fish during the subsequent five-year period of 1995-1999. Then, in 2000, only 34,447 Chinook salmon were used for subsistence followed by 2002 (41,368 fish), 2005 (49,364), 2006 (45,824), 2008 (42,718), and 2009 (31,111). Subsistence uses of Chinook salmon exceeded 50,000 fish in 2001, 2003, 2004, and 2007. The average number of Chinook salmon used was 47,322 fish in 2000-2004 and 44,094 fish in 2005-2009. The five-year averages dramatically declined for the 2010-2014 and 2015-2019 periods with 24,747 fish and 27,167 Chinook salmon used for subsistence,

harvests from 2010-2020 in District 4 was 27 fish and in District 5 six fish (Padilla and Hamazaki 2024:Appendix C5). As a result, pink salmon are not considered in this report.

respectively. In 2020, YRITFC territorial uses of Chinook salmon was 19,566 fish, with a 2021-2023 average of only 1,463 Yukon River Chinook salmon available for subsistence uses.

Summer Chum Salmon

Declines in the availability of summer chum salmon also contributed to the overall decline in the number of Yukon River salmon used for subsistence as depicted in Figure A3.

The 1990-2023 average number of summer chum salmon annually used for subsistence was 88,965 fish among all YRITFC territories. The 1990-1994 average number of summer chum salmon used for subsistence was 131,165, which declined to an average of 106,781 fish during the subsequent 1995-1999 period, reflecting the impacts of the weak returns of chum salmon in 1997 and 1998. The 2000s represented further declines in summer chum salmon uses for subsistence with a 2000-2004 average of 79,170 fish and a 2005-2009 average of 92,845 fish. The 2010-2014 average number of Yukon River summer chum salmon available for subsistence use was 101,664 fish reflecting the relatively high harvests of 2012 and 2013 both of which exceeded 110,000 fish. The 2015-2019 average dropped to 78,253 summer chum salmon used for subsistence followed 41,575 in 2020 and the catastrophic collapse of chum salmon in 2021 with only 1,304 fish available for subsistence uses and 2022 with 6,745 summer chum salmon used.

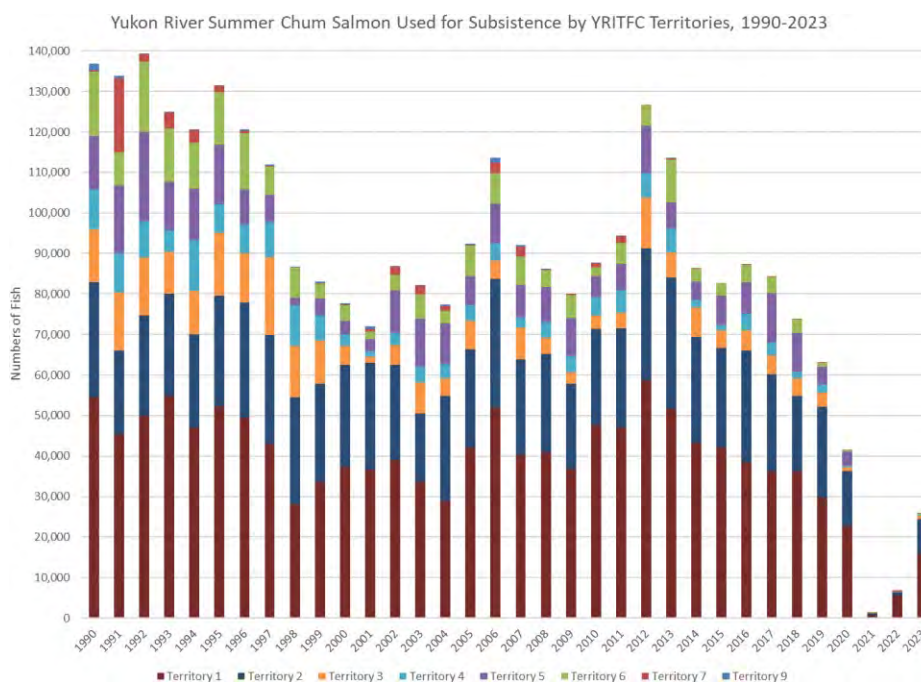


Figure A3. Yukon River summer chum salmon used for subsistence, by YRITFC Territory, 1990-2023.

Yukon River summer chum salmon returns were reported to have improved somewhat in 2023, but only 25,804 summer chum salmon were available for subsistence uses.

Figure A4 and Figure A5 illustrate summer chum salmon household use rates, while Figure A6 and Figure A7 illustrate the number of summer chum salmon used per person within YRITFC Territories, all of

which serve to further demonstrate the overall decline in summer chum salmon availability for subsistence uses.

Figure A4 reflects the total number of summer chum salmon per household used for subsistence by YRITFC territories each year from 1990-2023 demonstrating a declining trend since 1990 as well as the recent collapse of chum salmon returns to the Yukon River. Figure A5 represents those same data but rather than stacking the number of salmon per household for each territory to reflect the entire river, each Territory's household use rate is charted individually by a line so that each territory's patterns of use might be more clearly distinguished from one another.

Household patterns of summer chum salmon use

During the period of 1990-2023, the number of Yukon River summer chum salmon used for subsistence per YRITFC territorial households declined from a high of 407 summer chum salmon used for subsistence per household in 1992 to a low of 2.19 fish per households in 2021. The 1990-1994 average was 346.48 summer chum used per household, which declined to an average of 257.95 fish per household in 1995-1999, an average of 181.37 summer chum used per household in 2000-2004, an average of 217.79, 199.66, and 150.82 fish per household in 2005-2009, 2010-2014, and 2015-2019 periods, respectively. In 2020, only 75.08 summer chum salmon

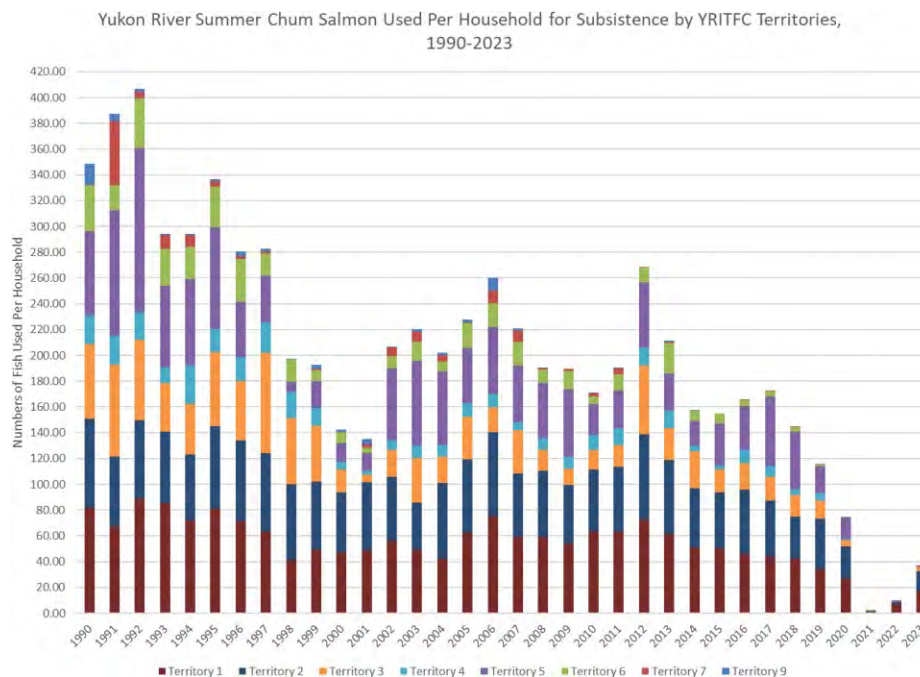


Figure A4. Yukon River summer chum salmon used for subsistence per household, by YRITFC Territory, 1990-2023.

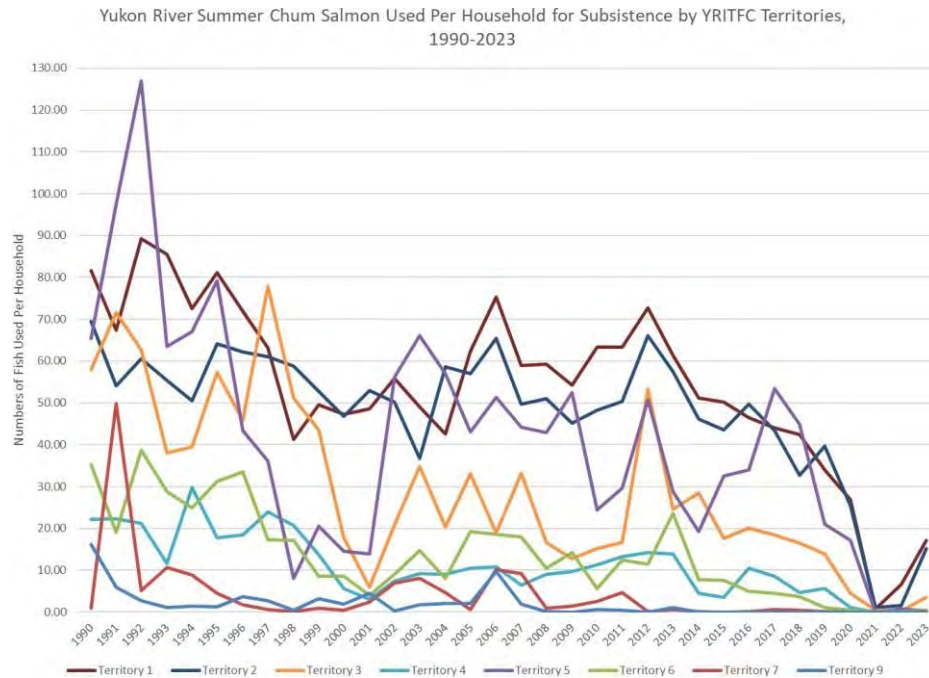


Figure A5. Yukon River summer chum salmon used for subsistence per household, by YRITFC Territory, 1990-2023.

were used for subsistence per household river wide, followed by 2.19 fish per household in 2021, 9.47 fish per household in 2022, and 36.94 summer chum salmon used per household in 2023.

Household use rates of Yukon River summer chum salmon varied dramatically for some territories more than others. In the early 1990s, for example, typically the highest number of summer chum salmon used per household for subsistence were from YRITFC Territories 1 (Bering Sea Coast), 2 (Lower Yukon River) and 5 (Koyukuk River). The highest household rate of summer chum salmon use throughout the time series was 127.04 fish per household within Territory 5 of the Koyukuk River in 1992. The second highest rate of 97.52 summer chum salmon per household was in 1991 also from Koyukuk River communities that comprise YRITFC Territory 5. The 1990-1994 average household use rate for summer chum salmon for Territory 5 was 84.09 fish per household, which exceeded all other territories for this period, followed by Territory 1 with an average of 79.23 summer chum salmon used for subsistence per household, then Territory 2 at 57.97 and Territory 3 at 53.92 fish per household. During the next five-year period, 1995-1999, Territory 5's household use rate dropped in rank to fourth at 37.43 fish per household compared to 61.37, 59.77, and 55.15 summer chum salmon used for subsistence per household by Territories 1, 2, and 3, respectively. Consistently ranking fifth in number of summer chum salmon harvested per household in the 1990s was Territory 6, followed by Territory 4. Territory 7's summer chum salmon household use rate was an average of 15.10 fish per household in 1990-1994 and 1.57 in 1995- 1999. Territory 9's summer chum salmon use rate was an average of 5.42 fish per household in 1990- 1994 and 2.24 fish per household in the 1995-1999 period.

Territory 5 subsistence uses of summer chum salmon per household returned to the highest rate among all territories in 2002 at 56.15 fish, followed by Territory 1 with 55.81 fish per household, Territory 2 with 50.11 fish per household, and Territory 3 with 20.88 fish per household. The year 2003 represented a

similar pattern with 66.08 summer chum used per household in Territory 5, 49.01 fish per household, 36.78 fish per household, 34.71 fish per household for Territories 1-3, respectively. However, during the 2000s, Territory 5 ranked third highest for uses of summer chum salmon per household with a 2000-2004 and 2005-2009 average of 41.51 and 46.77 fish per household, respectively. Territory 1's 2000-2004 average household use rate was 48.63 summer chum salmon per household and 2005-2009 average household use rate was 62.00 fish per household. Territory 2's respective rates were 49.04 fish per household and 53.66 summer chum per household. Territory 3 consistently ranked fourth in household use rates in the 2000s, followed by Territories 6, 4, 7, and 9.

In the 2010s, Territory 5 consistently ranked third in household use rates of summer chum salmon following Territories 1 and 2 except for 2012 and 2014 when Territory 3's household rates exceeded those of Territory 5 such that Territory 3 ranked third those years and Territory 5 ranked fourth. Territories 6, 4, 7, and 9 consistently ranked below the other territories. The 2010-2014 average household summer chum salmon use rate for Territory 6 was 12.12 fish used per household compared to Territory 4's average of 11.42. However, the 2015-2019 average for Territory 6 was 4.37 fish used per household whereas the average during the same time period for Territory 4 was 6.57 summer chum salmon used per household.

Per capita patterns of summer chum salmon use

Yukon River summer chum salmon rates of subsistence use per person illustrated in Figure A6 demonstrate similar patterns of decline across the watershed as those for household rates (cf. Figure A4). Figure A7, however, illustrates that uses of summer chum salmon per capita consistently were highest among the residents of YRITFC Territory 5 within the Koyukuk River drainage except following the weak chum salmon returns of 1997 and 1998. Throughout the 1990-2023 period, the highest use of summer chum per capita documented was 45.47 fish per person in Territory 5 in 1992 with a 1990-1994 five-year average of 30.70 fish per person, followed by Territory 1 (15.82 fish per person), Territory 3 (12.94 fish per person), Territory 2 (11.48 fish per person), Territory 6 (10.75 fish per person), Territory 4 (5.66 fish per person), Territory 7 (5.31 fish per person), and Territory 9 (2.13 summer chum salmon per person). In 1997, Territory 5 per capita uses of summer chum salmon ranked second with 13.09 fish per person, following Territory 3's 19.62 fish per person used for subsistence. In 1998, Territory 5 per capita use rate dropped in rank to sixth at 3.39 summer chum salmon used per person, following Territory 3's

12.57 fish per person, Territory 2's 11.48 fish per person, Territory 1's 7.65 fish per person, Territory 4's 6.81 fish per person, and Territory 6's 6.37 fish per person. In 1998, Territory 9 used 0.19 summer chum salmon per person and Territory 7 used 0.04 fish per person. However, despite the reductions in Territory 5's per capita uses of summer chum salmon following the weak returns of chum salmon in 1997 and 1998, the 1995-1999 average for Territory 5 overall remained the second highest use rate at 13.81 fish per person following Territory 3's average of 14.15. Territory 2 ranked third with 11.88 fish per person and Territory 1 ranked fourth with 11.59 fish per person, followed by Territory 6 (7.77 fish per person), Territory 4 (5.38 fish per person), Territory 9 (0.87 fish per person), and Territory 7 (0.52 fish per person).

In the 2000s, the Koyukuk River's Territory 5 once again had the highest uses of Yukon River summer chum salmon per capita except for the years 2000 and 2001 when Territory 5 ranked third after Territory 2 and Territory 1. The 2000-2004 average uses of summer chum salmon per person was 13.52 fish per person for Territory 5, followed by Territory 2 (10.24 fish per person), Territory 1 (9.49 fish per person), Territory 3 (4.89 fish per person), Territory 6 (3.38 fish per person), Territory 4 (1.88 fish per person), Territory 7 (1.28 fish per person), and Territory 9 (0.86 summer chum salmon used for subsistence per person). The 2005-2009 five-year averages demonstrated that Territory 5 remained the territory with the highest per capita uses of summer chum salmon (15.38 fish per person), followed by Territory 1 (11.36

fish per person), Territory 2 (10.52 fish per person), Territory 6 (6.22 fish per person), Territory 3 (6.04

fish per person), Territory 4 (2.74 fish per person), Territory 7 (1.29 fish per person), and Territory 9 (1.13 fish per person).

During the five-year period 2010-2014, the ranking of territories with the highest per capita uses of Yukon River summer chum salmon varied considerably from year to year. However, on average, Territory 1 ranked first (12.44 fish per person), followed by Territory 2 (11.15 fish per person), Territory 5 (10.93 fish per person), Territory 3 (7.73 fish per person), Territory 6 (4.84 fish per person), Territory 4 (3.87 fish per person), Territory 7 (0.61 fish per person), and Territory 9 (0.18 fish per person). The subsequent five-year period of 2015-2019 resulted in average per capita uses of summer chum salmon once again ranking Territory 5 at the highest levels of use with 12.59 fish per person, followed by Territory 2 (9.03 fish per person), Territory 1 (8.39 fish per person), Territory 3 (4.66 fish per person), Territory 4 (2.15 fish per person), Territory 6 (1.78 fish per person), and 0.10 fish per person used by Territory 7. Territory 9 had no documented per capita uses of summer chum salmon during the 2015-2019 period.

The years 2020-2023 witnessed the worst returns of summer chum salmon to the Yukon River documented in recent history. The four-year average per capita uses of summer chum salmon for

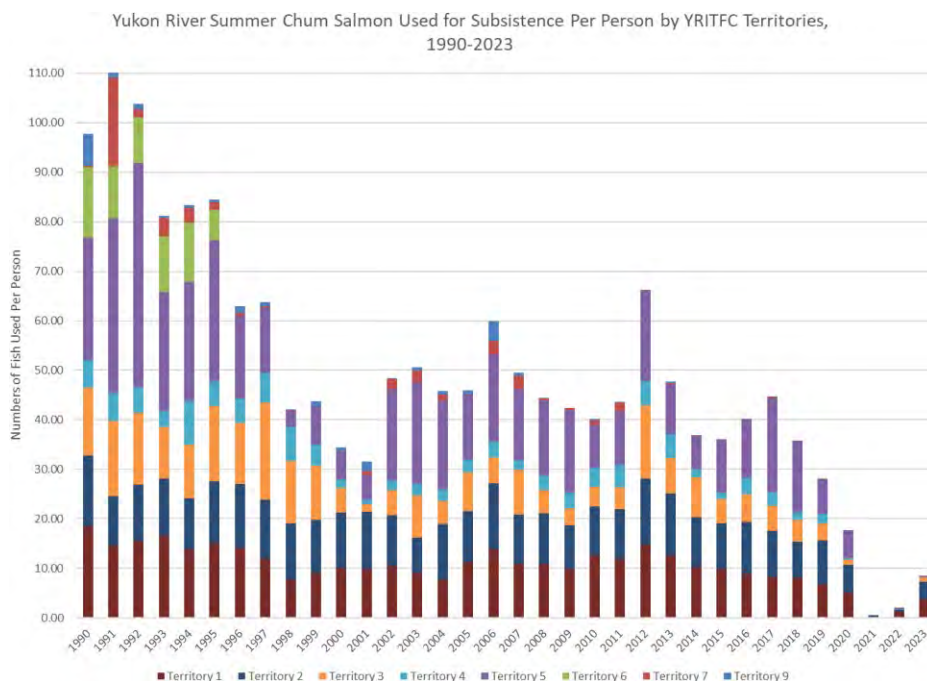


Figure A6. Yukon River summer chum salmon used for subsistence per person, by YRITFC Territory, 1990-2023.

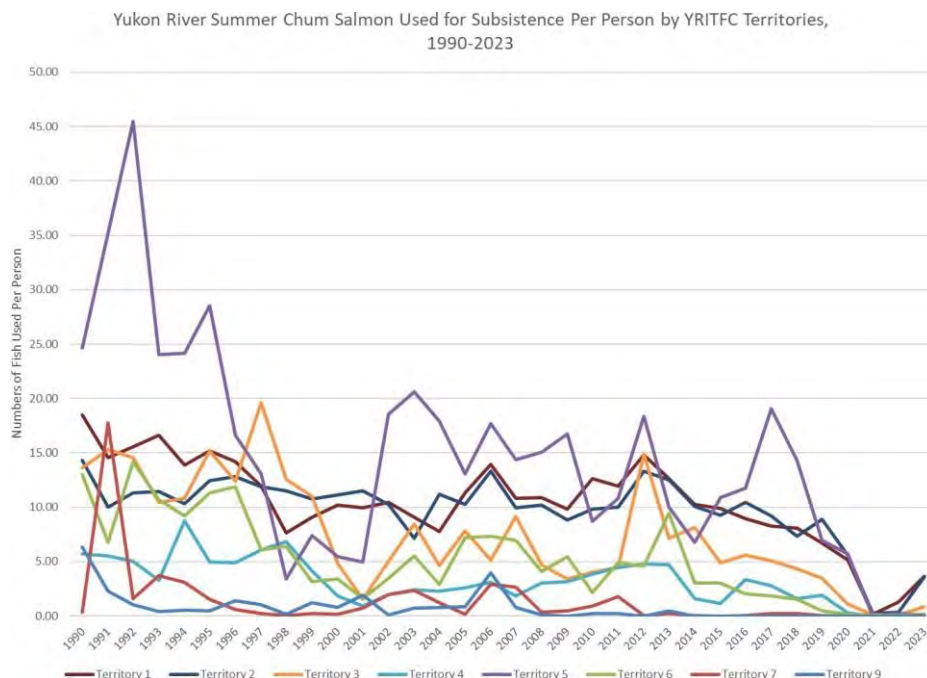


Figure A7. Yukon River summer chum salmon used for subsistence per person, by YRITFC Territory, 1990-2023.

the Alaska portion of the Yukon River totaled only 7.24 fish per person. Territory 1 ranked highest with an average use of 2.55 summer chum salmon per person, followed by Territory 2 (2.44 fish per person), Territory 5 (1.50 fish per person), Territory 3 (0.52 fish per person), Territory 4 (0.13 fish per person), and Territory 6 (0.10 fish per person). There were no documented uses of summer chum salmon in Territories 7 and 9 during the 2020-2023 period.

Fall Chum Salmon

Declines in the availability of fall chum salmon also contributed to the overall decline in the number of Yukon River salmon used for subsistence as depicted in Figure A8.

The 1990-2023 average number of fall chum salmon annually used for subsistence was 72,021 fish among all YRITFC territories. The 1990-1994 average number of fall chum salmon used for subsistence was 118,266, which declined to an average of 94,047 fish during the subsequent 1995-1999 period, reflecting the impacts of the weak returns of chum salmon in 1997 and 1998. The 2000s represented further declines in fall chum salmon uses for subsistence with a 2000-2004 average of only 37,101 fish and a 2005-2009 average of 79,386 fish. In 2002, only 18,489 Yukon River fall chum salmon were used for subsistence, representing the lowest uses on record since 1990 until the most recent chum salmon collapse beginning in 2020. In 2000, only 19,086 and in 2001 only 34,657 fall chum salmon were used for subsistence representing the second and third lowest fall chum salmon uses on record prior to 2020. The collapse in the number of fall chum salmon used for subsistence in the early 2000s was followed by modest recovery of fall chum salmon uses beginning in 2003 when the total number of fall chum salmon

used for subsistence once again exceeded 50,000 fish until the most recent crash beginning in 2020. Since 1996, the

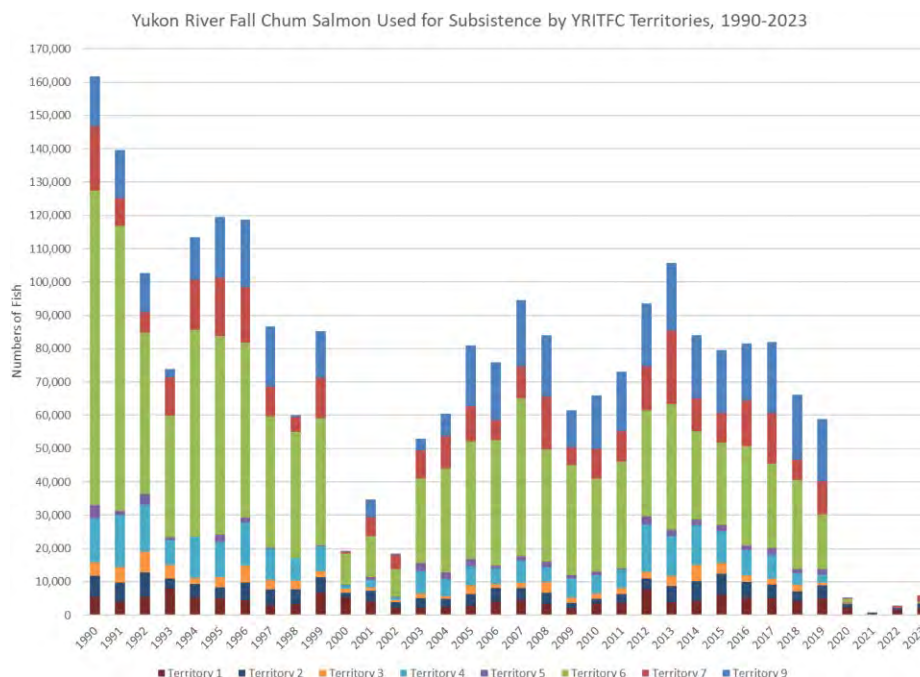


Figure A8. Yukon River fall chum salmon used for subsistence, by YRITFC Territory, 1990-2023.

number of fall chum salmon used for subsistence exceeded 100,000 fish only once in 2013 with 105,716 fish, which nevertheless failed to reach the 1990-1994 average of 118,266 fall chum salmon used for subsistence across the watershed.

The 2010-2014 average number of Yukon River fall chum salmon used for subsistence was 84,438 fish and the 2015-2019 average was 73,616 fall chum salmon. In 2020, only 5,128 fall chum salmon were used for subsistence throughout the Yukon River drainage, followed by 704 fall chum salmon in 2021, 2,657 in 2022, and 5,947 in 2023.

Figures A9 and A10 illustrate fall chum salmon household use rates, while Figures A11 and A12 illustrate the number of fall chum salmon used per person within YRITFC Territories, all of which serve to further demonstrate the overall decline in subsistence uses of fall chum salmon punctuated by the collapses in 2000-2002 and 2020 to the present.

Household patterns of fall chum salmon use

Figure A9 reflects the total number of fall chum salmon per household used for subsistence by YRITFC territories each year from 1990-2023. Figure A10 represents those same data but rather than stacking the number of salmon per household for each territory to reflect the entire river, each Territory's household use rate is charted individually by a line so that each territory's patterns of use might be more clearly distinguished from one another.

During the period of 1990-2023, the number of Yukon River fall chum salmon used for subsistence per YRITFC territorial households declined from a high of 491 fall chum salmon used for subsistence per

household in 1990 to a low of 1.15 fish per households in 2021. The 1990-1994 average was 363.38 fall chum used per household, which declined to an average of 339.46 fish per household in 1995-1999, an average of 116.88 fall chum used per household in 2000-2004, an average of 318.86, 321.29, and 247.67 fish per household in 2005-2009, 2010-2014, and 2015-2019 periods, respectively. In 2020, only 8.28 fall chum salmon were used for subsistence per household river wide, followed by 1.15 fish per household in 2021, 5.07 fish per household in 2022, and 11.14 fall chum salmon used per household in 2023.

Household use rates of Yukon River fall chum salmon varied dramatically for some territories more than others. Territory 9, for example, typically demonstrated the highest territorial uses of fall chum salmon throughout most of 1990-2023 time series with dramatic declines in household rates of use in 1993, 1998, 2000-2002, and the most recent period beginning in 2020 consistent with weak chum salmon returns to the Yukon River in those years. YRITFC Territory 6 typically demonstrated the second highest uses of fall chum salmon per household following Territory 9 except in 1990, 1991, 1993, 1994, 1998, 2000, 2002- 2004, and 2020-2023 when Territory 6's household rates of fall chum salmon use exceeded those of Territory 9. The years when Territory 9 uses of fall chum salmon ranked second were years of poor fall chum salmon returns to the Yukon watershed, except for 1990, 1991, and 1994, which demonstrates how poor salmon returns oftentimes disproportionately affect those most dependent on Yukon River fall chum salmon.

Five-year average household use rates of Yukon River fall chum salmon for subsistence provide a general overview of use patterns across YRITFC territories. The average household use of fall chum salmon from 1990-1994 demonstrated the highest use rate occurred in Territory 6 with 147.09 fish per household, followed by Territory 9 with 105.16 fish per household, then Territory 7 (32.58 fish per household), Territory 4 (29.23 fish per household), Territory 3 (17.90 fish per household), Territory 2 (12.75 fish per household), Territory 5 (9.75 fish per household), and

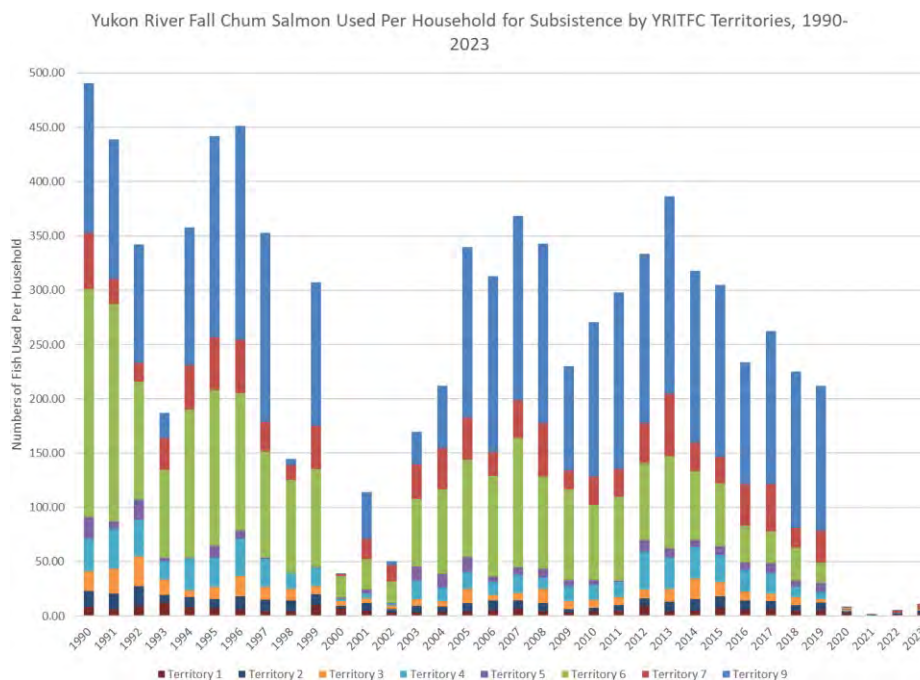


Figure A9. Yukon River fall chum salmon used for subsistence per household, by YRITFC Territory, 1990-2023.

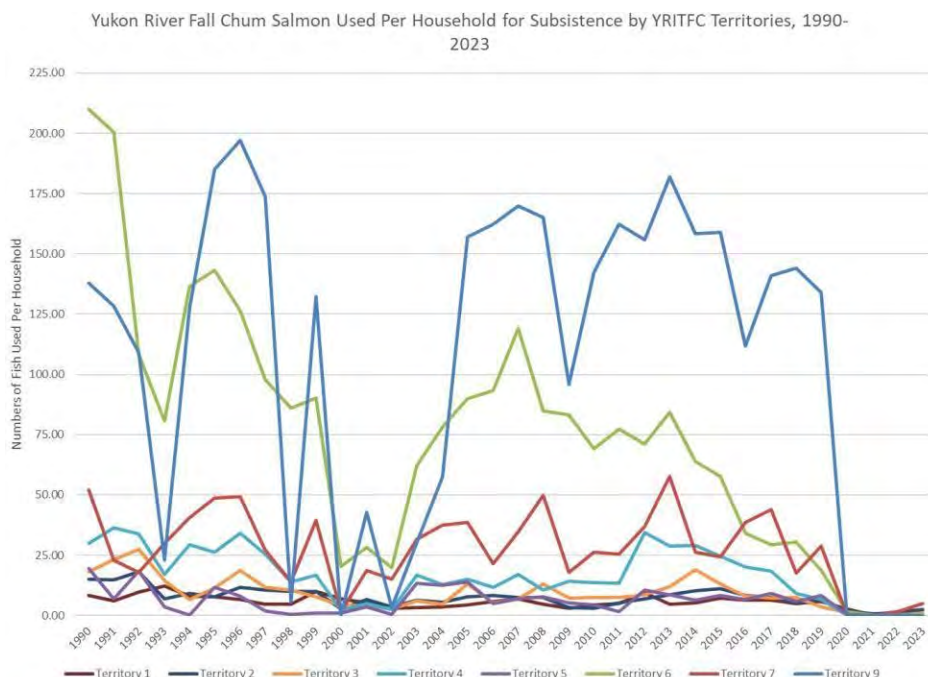


Figure A10. Yukon River fall chum salmon used for subsistence per household, by YRITFC Territory, 1990-2023.

Territory 1 (8.92 fish per household). The 1995-1999 average saw Territory 9 rank first with 138.69 fall chum used per household, followed by Territory 6 (108.65 fish per household), Territory 7 (35.63 fish per household), Territory 4 (23.28 fish per household), Territory 3 (11.97 fish per household), Territory 2 (10.01 fish per household), Territory 1 (6.71 fish per household), and Territory 5 (4.52 fish per household). The 2000-2004 five-year average rates of fall chum salmon used per household illustrated the poor fall chum salmon returns during that period with Territory 6 ranking first with only 41.70 fish per household, followed by Territory 9 (26.77 fish per household), Territory 7 (20.92 fish per household), Territory 4 (7.75 fish per households), Territory 5 (6.15 fish per household), Territory 2 (4.89 fish per household), Territory 1 (4.41 fish per household), and Territory 3 (4.28 fish per household). In the 2005-2009 five-year period, Territory 9 ranked first with 149.98 fish per household used for subsistence followed by Territory 6 (94.05 fish per household), Territory 7 (32.47 fish per household), Territory 4 (13.73 fish per household), Territory 3 (9.13 fish per household), Territory 5 (7.74 fish per household), Territory 2 (6.81 fish per household), and Territory 1 (4.95 fish per household). Territory 9 again ranked first in household use rates of Yukon River fall chum salmon during the subsequent 2010-2014 five-year period with 160.14 fall chum salmon used per household followed by Territory 6 (73.14 fish per household), Territory 7 (34.47 fish per household), Territory 4 (23.90 fish per household), Territory 3 (10.87 fish per household), Territory 2 (6.75 fish per household), Territory 5 (6.28 fish per household), and Territory 1 (5.74 fish per household). The five-year average household use rates during 2015-2019 demonstrated the same ranking of household use rates as the previous five-year period with Territory 9 ranked first with 137.90 fall chum salmon used per household, followed by Territory 6 (34.06 fish per household), Territory 7 (30.64 fish per household), Territory 4 (15.81 fish per household), Territory 3

(7.82 fish per household), Territory 2 (7.74 fish per household), Territory 5 (7.58 fish per household), and Territory 1 (6.12 fish per household). Household rates of fall chum salmon use for 2000-2023 are discussed below.

Throughout the data series 1990-2023, YRITFC Territory 7 household uses of Yukon River fall chum salmon are consistently ranked the third highest typically following Territories 9 and 6 household use rates as demonstrated by the five-year average rates for 1990-1994 (32.58 fish per household), 1995-1999 (35.63 fish per household), 2000-2004 (20.92 fish per household), 2005-2009 (32.47 fish per household), 2010-2014 (34.47 fish per household), and 2015-2019 (30.64 fish per household) where Territory 7 always ranked third on average. However, in 1991, 1992, 1993, 2000, 2003, 2014, 2015, 2017, and the 2019-2023 period, Territory 7 ranked other than third in the number of fall chum salmon used per household. For example, in 1993, 2003, 2017, 2019, and 2022, Territory 7's household use rates of fall chum salmon ranked second across the watershed, exceeding Territory 9's rates in 1993 and 2003 and Territory 6's rates in 2017 and 2019, and exceeding Territory 1's household use rate in 2022. In 2023, Territory 7's uses of fall chum salmon per household was the highest across the YRITFC territories, but with only 4.89 fish used per household.

In 1991, Territory 7 ranked fifth with only 22.83 fall chum salmon used per household following Territory 6 (200.29 fish per household), Territory 9 (128.29 fish per household), Territory 4 (36.23 fish per household), and Territory 3 (23.07 fish per household). In 1992, Territory 7 ranked sixth with only 17.76 fall chum salmon used per household following Territory 9 (109.07 fish per household), Territory 6 (108.27 fish per household), Territory 4 (33.83 fish per household), Territory 3 (27.27 fish per household), and Territory 2 (18.05 fish per household). In 2000, household uses of fall chum salmon in Territory ranked sixth with only 1.51 fall chum salmon per household following Territory 6 (20.27 fish per household), Territory 1 (6.82 fish per household), Territory 3 (4.08 fish per household), Territory 2 (2.63 fish per household), and Territory 4 (2.12 fish per household). In 2014 and 2015, the household use rate of fall chum salmon of 26.21 fish and 24.26 fish, respectively, ranked fourth following Territory 9 (158.38 and 158.85 fish per household, respectively), Territory 6 (63.76 and 57.76 fish per household, respectively), and Territory 4 (29.14 and 24.67 fish per household, respectively). In 2020, Territory 7's household use rate ranked fifth with only 0.51 fish per household exceeded by Territory 1 (2.65 fish per household), Territory 2 (1.74 fish per household), Territory 6 (1.64 fish per household), and Territory 3 (1.27 fish per household). In 2021, Territory 7's use of fall chum salmon per household ranked fourth with a mere 0.02 fish per household following Territory 2's 0.82 fall chum salmon per household, Territory 1's 0.22 fish per household, and Territory 6's 0.10 fish per household.

Territory 4 and Territory 3 typically ranked fourth and fifth, respectively, throughout the 1990-2023 time series, with Territory 4 only exceeding 30 fall chum salmon used per household in 1991, 1992, 1996, and 2012. Territory 3's household use rates only exceeded 15 fall chum per household in 1990-1992, and 1996. Territory 5's household fall chum use rates only exceeded 15 fish per household in 1990 and 1992. Territory 2's household use rates exceeded 15 fish per household only in 1990 and 1992 while Territory 1 used more than 10 fall chum per household only in 1993.

Per capita patterns of fall chum salmon use

Yukon River fall chum salmon rates of subsistence use per person illustrated in Figure A11 demonstrate similar patterns of decline across the watershed as those for household rates, especially in the past decade (cf. Figure A9). Figure A12, illustrates that uses of fall chum salmon per capita consistently were highest among the residents of YRITFC Territories 9, 6, and 7 consistent with territorial household rates of fall

chum salmon uses. Yukon River fall chum salmon per capita use rates across the watershed ranged from 175.39 fish per person in 1990 to a historical low of 0.27 fish per person in 2021.

The 1990-1994 five-year average use of fall chum per capita for all territories combined was 125.87 fish per person, ranging from average highs of 53.63 fish per person in Territory 6, 40.99 fish per person in Territory 9, and 11.52 fish per person in Territory 7 to average lows of 1.77 fish per person in Territory 1 and 2.50 fish per person in Territory 2. The 1995-1999 average was similar at 119.05 fish per person overall with an average range of 53.82 fish per person in Territory 9, 39.27 fish per person in Territory 6, and 11.43 fish per person in Territory 7 to average lows of 1.26 fish per person in Territory 1 and 1.67 fish per person in Territory 5. Per capita uses of fall chum were particularly low in 1993 and 1998 at 63.14 and

48.44 fish per person during those years of poor chum salmon returns to the Yukon River. All other years in the 1990s demonstrated per capita use rates that exceeded 100 fish per person.

The average number of Yukon River fall chum salmon used per person during the 2000-2004 five-year period was the lowest documented uses of fall chum salmon until the most recent crash of Yukon River chum salmon returns with only 39.76 fish used per person throughout the YRITFC territories of the Yukon watershed in Alaska. This historical low was driven particularly by the lows of 2000 and 2002 among all YRITFC territories with only 12.92 and 16.09 fish used per person, respectively. Despite these poor years of fall chum salmon returns in 2000 and 2002, the 2000-2004 averages demonstrated that Territory 6 ranked first with 15.72 fish per person, followed by Territory 9 with 11.13 fish per person and Territory 7 with 5.92 fish per person

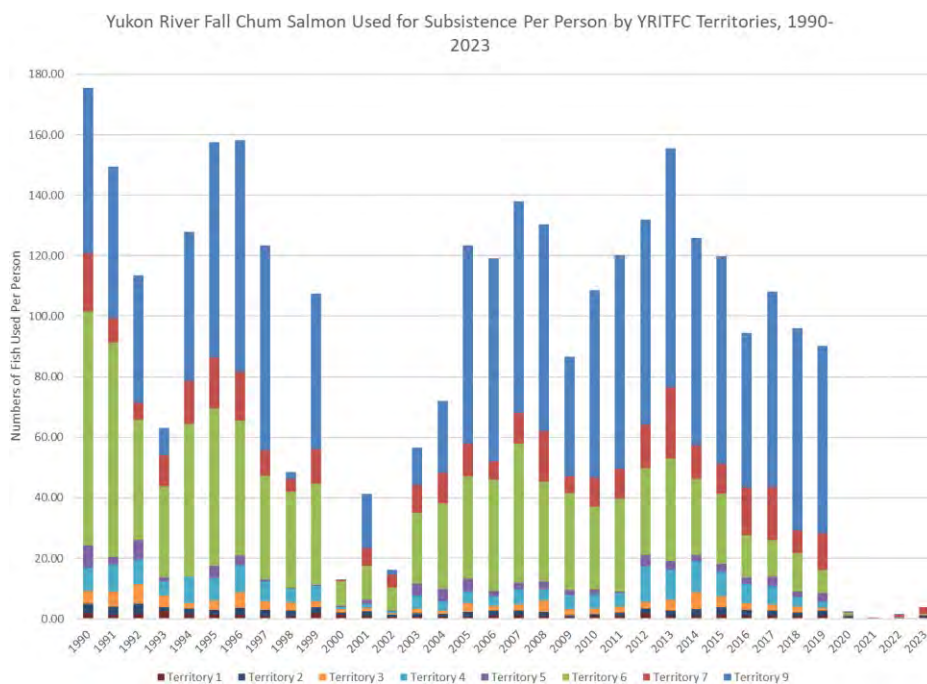


Figure A11. Yukon River fall chum salmon used for subsistence per person, by YRITFC Territory, 1990-2023.

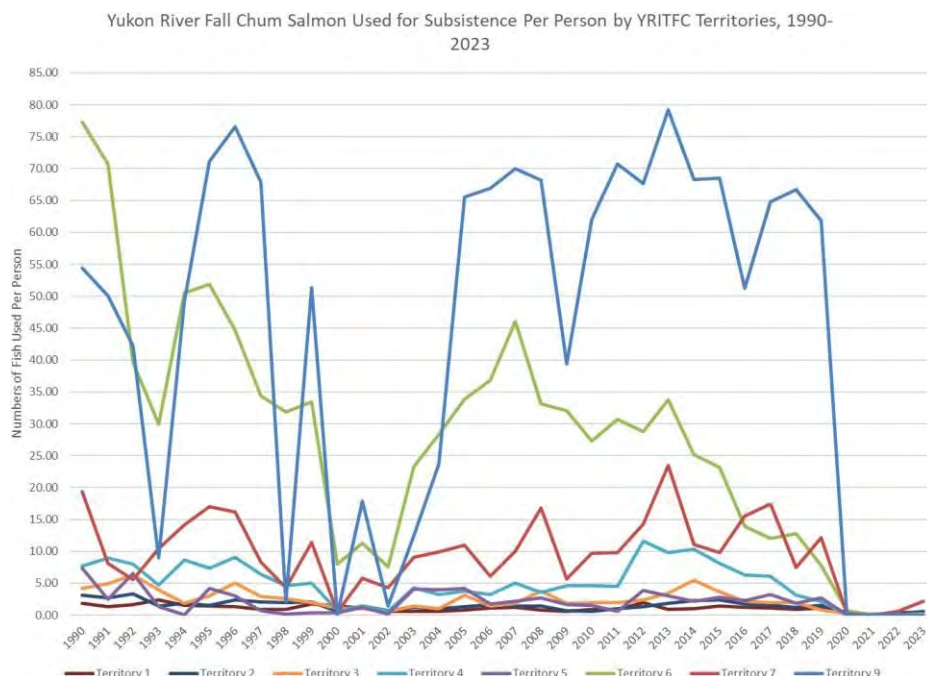


Figure A12. Yukon River fall chum salmon used for subsistence per person, by YRITFC Territory, 1990-2023.

consistent with overall patterns throughout the data time series albeit with much lower levels of use.

The 2005-2009 average per capita uses of fall chum salmon recovered to 119.49 fish per person overall with 61.99, 36.38, and 9.90 fish used per person in Territories 9, 6, and 7, respectively. Ranking fourth during the 2005-2009 period was Territory 4 (4.04 fish per person) followed by Territory 5 (2.51 fish per person), Territory 3 (2.42 fish per person), Territory 2 (1.33 fish per person), and Territory 1 (0.91 fish per person).

The 2010-2014 average number of fall chum salmon used for subsistence across all YRITFC Territories was 128.43 fish per person with a generally consistent pattern among territories of Territory 9 ranking first (69.59 fish per person), followed by Territory 6 (29.14 fish per person), Territory 7 (13.66 fish per person), Territory 4 (8.18 fish per person), Territory 3 (3.06 fish per person), Territory 5 (2.23 fish per person), Territory 2 (1.42 fish per person), and Territory 1 (1.15 fish per person). All years during 2010-2014 exceeded 100 fall chum salmon used per person across all territories.

The 2015-2019 average per capita uses of fall chum salmon was 101.75 fish per person overall, with Territory 9 again ranking highest with 62.62 fish per person, followed by Territory 6 (13.92 fish per person), Territory 7 (12.49 fish per person), Territory 4 (5.18 fish per person), Territory 5 (2.57 fish per person), Territory 3 (2.13 fish per person), Territory 2 (1.67 fish per person), and Territory 1 (1.18 fish per person). During the 2015-2019 five-year period, only 2015 and 2017 demonstrated overall subsistence per capita uses of fall chum salmon that exceeded 100 fish per person, with 94.58 fish per person overall in 2016, 95.99 and 90.23 fish per person in 2018 and 2019, respectively.

Overall per capita uses of Yukon River fall chum salmon in 2020-2023 were the lowest documented rates of use on record with only 2.28 fish per person used in 2020, 0.27 fish per person in 2021, 1.47 fish per

person in 2022, and 3.73 fish per person in 2023. In 2020, the highest rate of use was Territory 6 with 0.69 fish used per person, followed by Territory 1 (0.51 fish per person), Territory 2 (0.38 fish per person), Territory 3 (0.31 fish per person), Territory 7 (0.23 fish per person), Territory 5 (0.11 fish per person), Territory 9 (0.03 fish per person), and lastly Territory 4 (0.02 fish per person). In 2021, the only documented per capita uses of fall chum salmon occurred in Territory 2 (0.18 fish per person), Territories 1 and 6 (0.04 fish per person each), and Territory 7 (0.01 fish per person). Territories 3-5 and Territory 9 used no fall chum salmon in 2021. In 2022, per capita uses ranked first in Territory 7 (0.60 fish per person), followed by Territory 1 (0.33 fish per person), Territory 2 (0.21 fish per person), Territory 9 (0.15 fish per person), Territory 5 (0.10 fish per person), Territory 3 (0.04 fish per person), Territory 6 (0.03 fish per person), and Territory 4 (0.01 fish per person). In 2023, Territory 7 again ranked first with 2.20 fish per person, followed by Territory 2 (0.60 fish per person), Territory 1 (0.49 fish per person), Territories 3 and 6 (0.22 fish per person each), and Territory 5 (0.01 fish per person). Territories 4 and 9's per capita uses of fall chum salmon were zero in 2023.

Recent years of poor fall chum salmon returns demonstrated that those territories most dependent upon Yukon River fall chum salmon (i.e. Territories 9 and 6) did not maintain their respective ranks in per capita uses of fall chum salmon unlike the previous chum crash in the early 2000s. Whether these hardships result from fishery management actions, different perspectives on conservation among the residents of various territories, or for other reasons remain uncertain.

YRITFC Territorial Patterns of Salmon Uses for Subsistence

This section focuses on patterns of Yukon River salmon uses during the 1990-2023 time series to better understand the role of chum salmon relative to other salmon stocks for each YRITFC territory beginning in Territory 1 consisting of Bering Sea Coastal tribal communities located near the mouths of the Yukon River and moving upriver to Territory 9 near the Canadian border. Territory 8, representing the upper Tanana River, is discussed in little detail since salmon uses are not well represented in existing ADF&G data documenting subsistence uses of Yukon River salmon and many residents of Territory 8 obtain their salmon from the Copper River or elsewhere outside the Yukon Fisheries Management Area.

Territory 1

Figure A13 illustrates the subsistence harvest composition for communities in YRITFC Territory 1. Territory 1 communities reflected in this analysis include Chevak (data year 2021), Scammon Bay (2013), Hooper Bay (2021), Nunam Iqua (1980), Alakanuk (1980), Kotlik (1980), and Emmonak (1980, 2008) along the Bering Sea coast and the lowest reaches of the Yukon River drainage. Territory 1 residents are the most coastal oriented harvesters of Yukon River salmon where marine mammals (26.09%) and salmon (25.95%) made up the highest percentages of the total subsistence harvest among Territory 1 communities followed by non-salmon fishes (24.68%) and large land mammals (12.86%). Chum salmon, including both summer chum and fall chum along with unknown chum salmon, contributed 15.58% to the overall subsistence economy based upon this generalized model. ADF&G studies conducted in the 1980s often did not distinguish between summer chum and fall chum salmon; therefore, the proportion of each chum salmon stock is difficult to determine. The generalized model of Territory 1 subsistence harvest composition estimates summer chum salmon at 6.04%, fall chum salmon at 0.03%, and unknown chum salmon at 9.51% of the overall subsistence economy.

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from

commercial fishing efforts among all Territory 1 tribal communities in 1990-2023, except Scammon Bay and Hooper Bay for the years 1990 and 1991. The 1992-1994 average salmon harvests were used to estimate the 1990 and 1991 harvests for both communities in this analysis. Figure A14 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence. Summer chum salmon dominate the subsistence uses of salmon in YRITFC Territory 1 representing an average of 75% of total salmon uses in 1990-1994 and 2015-2019, 74% in 1995-1999 and 2000-2004, 79% in 2005-2009, 81% in 2010-2014, and an average of 66% during the period 2020-2023.

The proportion of total subsistence salmon uses contributed by fall chum salmon in Territory 1 ranged from 4% to 13%, except in 2022 when the proportion of fall chum was 18% of total salmon uses. In the 1990s, the average proportion of fall chum salmon uses was 8% followed by 6-7% in the 2000s, an average of 7% in 2010-2014 and 11% in 2015-2019. Territory 1's proportion of fall chum salmon relative to other salmon was 7%, 11%, 18%, and 11% in 2020, 2021, 2022, and 2023, respectively.

Chinook salmon represented 4-19% of total Territory 1 subsistence uses of salmon except in 2021 when Chinook represented 45% of salmon uses and in 2023 when Chinook represented only 2% of salmon uses for subsistence. Coho salmon uses ranged from 2% to 8% of total salmon uses.

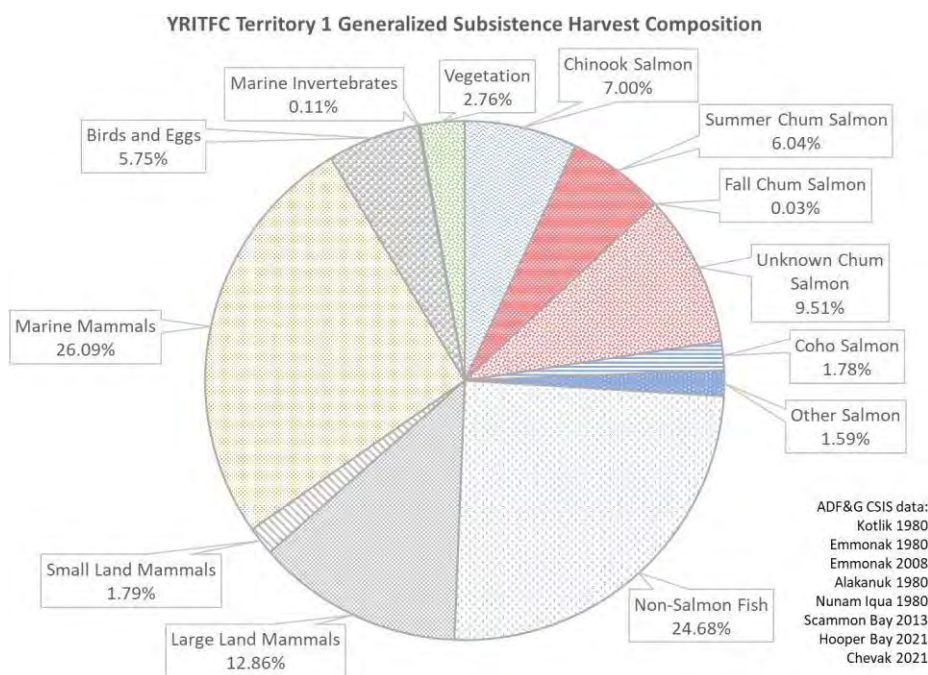


Figure A13. YRITFC Territory 1 generalized subsistence harvest composition (in edible pounds).

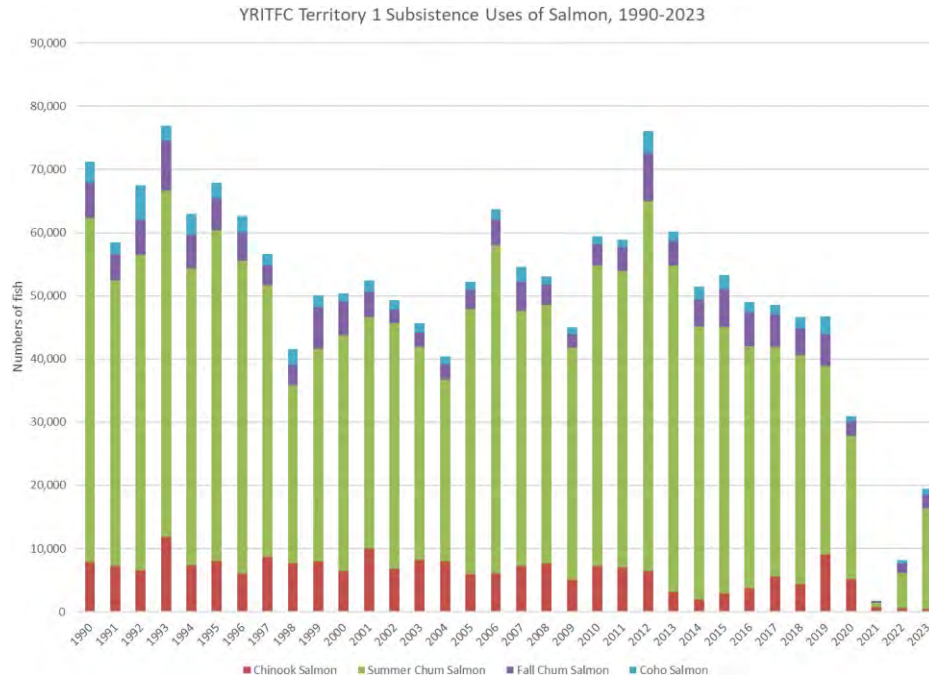


Figure A14. YRITFC Territory 1 subsistence uses of salmon, 1990-2023.

Pink salmon, not considered in this analysis, likely also contributes to Territory 1 subsistence uses of salmon, especially during years of restricted subsistence salmon fishing for Chinook, chum, and coho salmon.

Figure A15 represents Territory 1 subsistence uses of summer chum salmon and Figure A16 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series. The number of summer chum salmon used in YRITFC Territory 1 ranged from a high of 58,611 fish in 2012 to a low of 657 salmon in 2021, the worst year on record for summer chum salmon uses. The 1990-2023 average number of summer chum salmon annually used for subsistence was 38,864 fish in Territory 1, representing an average of 44% of the total uses among all territories. The 1990-1994 five-year average number of summer chum salmon used for subsistence was 50,297 fish, followed by 41,343 summer chum salmon in 1995-1999, 35,079 summer chum salmon in 2000-2004, 42,423 summer chum salmon in 2005-2009, and an average of 49,590 summer chum salmon in 2010-2014, and 36,575 fish in 2015-2019. In 2020, 22,668 summer chum salmon were used for subsistence, followed by 657 fish in 2021, 5,601 fish in 2022, and 15,916 summer chum salmon in 2023. The number of summer chum salmon used in Territory 1 exceeded 45,000 fish in the 1990s, except in 1997-1999 with 42,959, 28,250, and 33,630 fish, respectively. In the 2000s, uses of summer chum salmon exceeded 40,000 fish only in 2005-2008, otherwise ranging from 28,882 fish in 2004 to 38,903 fish in 2002. In the 2010s, Territory 1's uses of summer chum salmon exceeded 40,000 fish in 2010-2015, but fell below 40,000 in 2016-2019 with 38,402, 36,312, 36,236, and 29,815 fish, respectively.

Territory 1 household use rates of summer chum salmon averaged 79.23 fish per household in 1990-1994, 61.37 fish per household in 1995-1999, 48.63 fish per household in 2000-2004, 62.00 fish per household in 2005-2009, 62.35 fish per household in 2010-2014, and 43.40 fish per household in 2015-2019. Household use rates fell to 26.76 summer chum salmon per household in 2020, 0.78 fish per household in 2021, 6.60 fish per household in 2022, and 17.17 fish per household in 2023. The number of

summer chum salmon used for subsistence by Territory 1 households declined over the time series with rates of use almost halved during the chum salmon declines of the late 1990s and early 2000s when rates fell to less than 50 fish per household in 1998-2004, except 2002 when 55.81 fish per household were used. Household rates of summer chum salmon use somewhat recovered in 2005-2015 when use rates exceeded 50 fish per household; however, only in 2006 and 2012 did rates exceed 70 fish per household and approached historic levels of household uses in the early to mid-1990s. The number of summer chum salmon used per Territory 1 household once again fell below 50 fish per household in 2016, fell below 40 fish per household in 2019 where rates have continued to decline during the most recent chum salmon crash.

Territory 1 per capita uses of summer chum salmon averaged 15.82 fish per person in 1990-1994, 11.59 fish per person in 1995-1999, 9.49 fish per person in 2000-2004, 11.36 fish per person in 2005-2009, 12.44 fish per person in 2010-2014, and 8.39 fish per person in 2015-2019. In 2020-2023, per capita uses of summer chum salmon were 5.12, 0.15, 1.28, and 3.65 fish per person, respectively. The number of summer chum salmon used per person for subsistence exceeded 10 fish per person in most years except in 1998, 1999, 2001, 2003, 2004, 2009, and 2015-2023.

Figure A17 represents Territory 1 subsistence uses of fall chum salmon and Figure A18 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. The number of fall chum salmon used in YRITFC Territory 1 ranged from a high of 7,890 in 1993 to a low of 182 in 2021, the worst year on record for both summer and fall stocks of

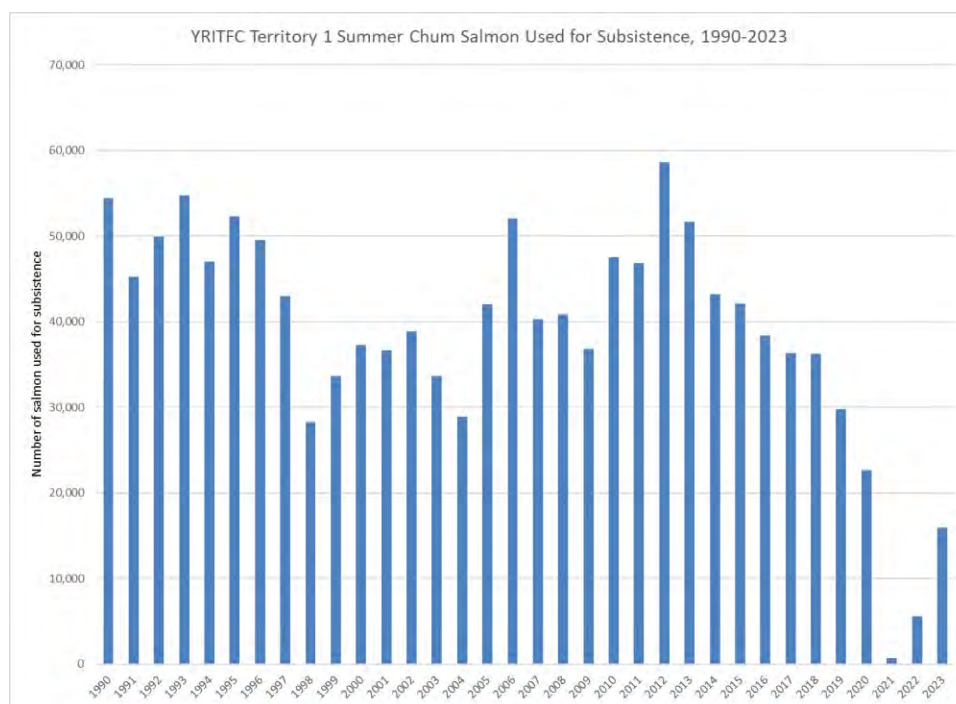


Figure A15. YRITFC Territory 1 subsistence uses of summer chum salmon, 1990-2023.

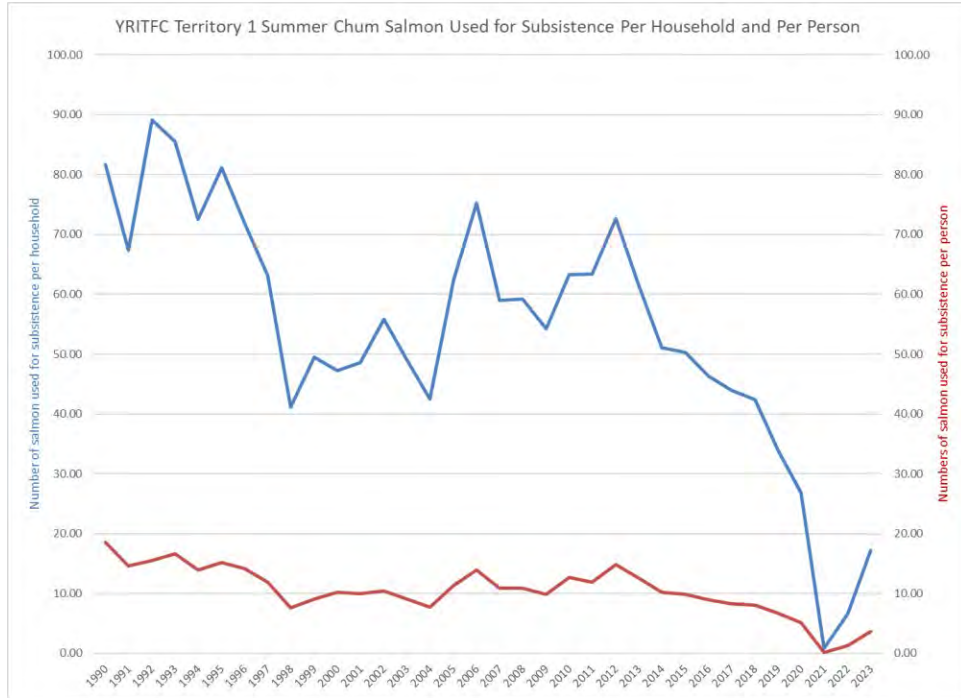


Figure A16. YRITFC Territory 1 subsistence uses of summer chum salmon per household and per person, 1990-2023.

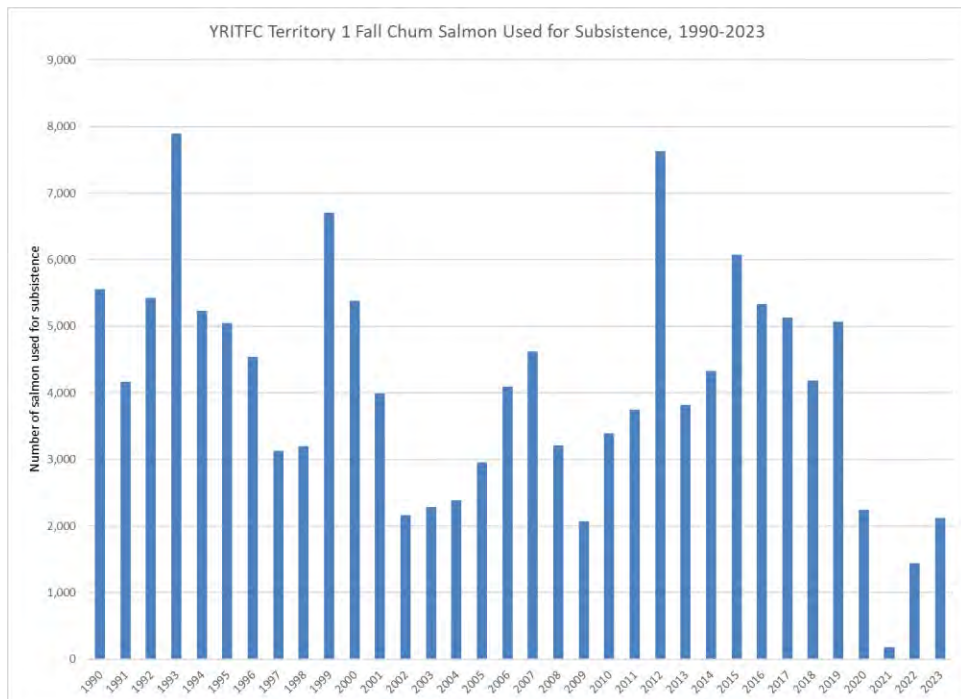


Figure A17. YRITFC Territory 1 subsistence uses of fall chum salmon, 1990-2023.

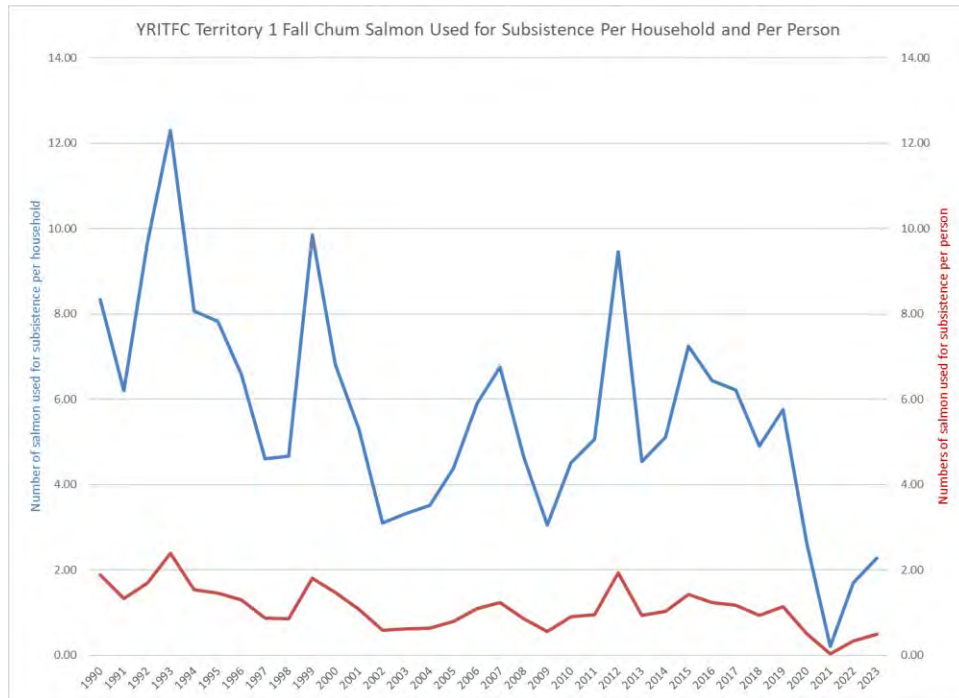


Figure A18. YRITFC Territory 1 subsistence uses of fall chum salmon per household and per person, 1990-2023.

chum salmon. The 1990-2023 average number of fall chum salmon annually used for subsistence was 4,081 fish in Territory 1, representing an average of 6% of the total uses among all territories. The 1990- 1994 five-year average number of fall chum salmon used for subsistence was 5,653 fish, followed by 4,525 fall chum salmon in 1995-1999, 3,243 fall chum salmon in 2000-2004, 3,391 fall chum salmon in 2005-2009, and an average of 4,583 fall chum salmon in 2010-2014, and 5,159 fish in 2015-2019. In 2020, 2,246 fall chum salmon were used for subsistence, followed by 182 fish in 2021, 1,444 fish in 2022, and 2,121 fall chum salmon in 2023. Territory 1 household use rates of fall chum salmon varied considerably annually throughout the 1990-2023 time series from a high of 12.31 fish per household in 1993 to a historic low of 0.22 fish per household in 2021. The number of fall chum salmon used per

household averaged 8.92 fish in 1990-1994, 6.71 fish per household in 1995-1999, 4.41 fish per household in in 2000-2004, 4.95 fish per household in 2005-2009, 5.74 fish per household in 2010-2014, and 6.12 fish per household in 2015-2019. Household use rates fell to 2.65 fall chum salmon per household in 2020, 0.22 fish per household in 2021, 1.70 fish per household in 2022, and 2.29 fish per household in 2023. Territory 1 household use rates of fall chum salmon only exceeded 10 fish per household in 1993 and only fell below 4 fish per household in 2002-2004 and 2009 prior to the most recent chum salmon disaster beginning in 2020.

Territory 1 per capita uses of Yukon River fall chum salmon ranged from a high of 2.39 fish per person in 1993 to a low of 0.04 fish per person in 2021. The 1990-1994 average per capita rates of fall chum salmon use were 1.77 fish per person, an average of 1.26 fish per person in 1995-1999, 0.88 fish per person in 2000-2004, 0.91 fish per person in 2005-2009, 1.15 and 1.18 fish per person in 2010-2014 and 2015-2019, respectively. Territory 1's per capita use of fall chum salmon was 0.51, 0.04, 0.33, and 0.49 fish per person, respectively, during the 2020-2023 period. The number of fall chum salmon used per person in Territory 1 exceeded 1 fish per person in the 1990s except in 1997 and 1998 when only 0.87 fish per person were used each year. During the 2000s, per capita uses exceeded 1 fish per person only in

2000, 2001, 2006, and 2007. In the 2010s, Territory 1 per capita rates of fall chum salmon use fell below 1 fish per person only in 2010 (0.90 fish per person), 2011 (0.95 fish per person), 2013 (0.93 fish per person), and 2018 (0.93 fish per person). In 2020, the number of fall chum salmon used per person in Territory 1 was 0.51 fish per person, followed by 0.04 fish per person in 2021, 0.33 fish per person in 2022, and 0.49 fish per person in 2023.

Territory 2

Figure A19 shows the results of a generalized model of subsistence harvest composition for communities in YRITFC Territory 2 for which comprehensive subsistence harvest data are available. Territory 2 communities reflected in this analysis include Mountain Village (data years 1980, 2010), Marshall (2010), and Pilot Station (2013). Territory 2 residents depend upon fish for 70.50% of their overall subsistence economy, with all salmon combined contributing 36.13% and non-salmon fishes contributing 34.37%. Large land mammals contribute the next highest proportion of the total subsistence economy of Territory 2 communities at 17.37%. ADF&G studies conducted in the 1980s often did not distinguish between summer chum and fall chum salmon; therefore, the proportion of each chum salmon stock is difficult to determine with

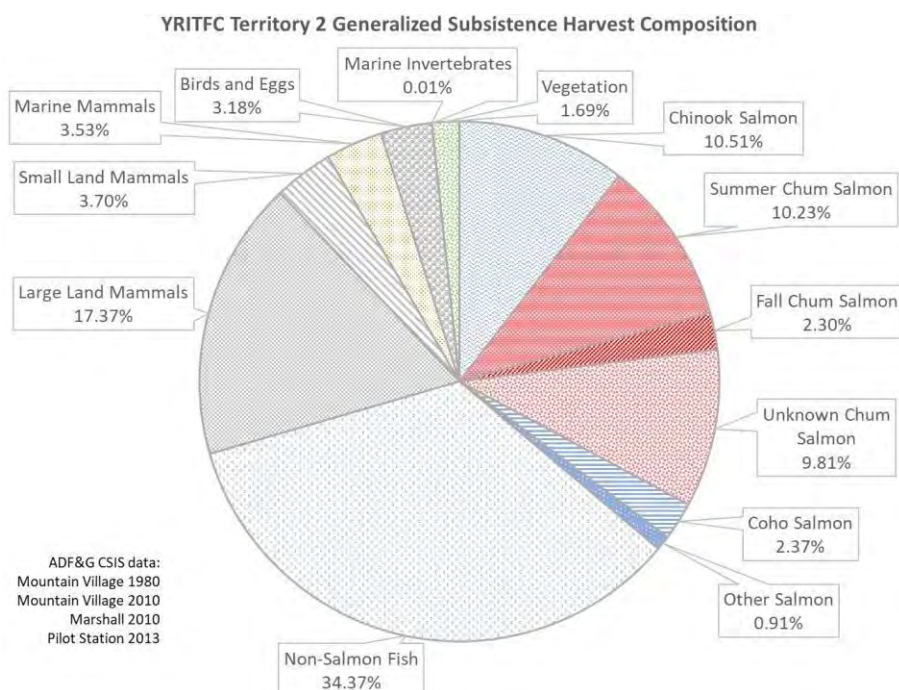


Figure A19. YRITFC Territory 2 generalized subsistence harvest composition (in edible pounds).

precision. Chum salmon, including both summer chum and fall chum along with unknown chum salmon, contributed 22.34% to the overall subsistence economy, whereas Chinook salmon harvests represent 10.51% and other salmon such as coho and pink salmon contribute only 3.28% of the overall subsistence economy.

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from commercial fishing efforts among all Territory 2 tribal communities in 1990-2023.

Figure A20 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence. Summer chum salmon dominate the subsistence uses of salmon in YRITFC Territory 2 representing an average of 57% of total salmon uses in 1990-1994, 62% in 1995-1999 and 2000-2004, 65% in 2005-2009, 74% in 2010-2014, 70% in 2015-2019, and an average of 55% during the period 2020-2023.

The proportion of total subsistence salmon uses contributed by fall chum salmon in Territory 2 ranged from 4% (2000 and 2010) to 18% (2015), except in 2021 and 2022 when the proportion of fall chum was 24% and 25% of total salmon uses, respectively. In the 1990s, the average proportion of fall chum salmon uses was 10-12% followed by an average of 6-8% in the 2000s, an average of 10% in 2010-2014 and 13% in 2015-2019. Territory 2's proportion of fall chum salmon relative to other salmon was 5% in 2020 and 14% in 2023.

Chinook salmon represented overall 15-31% of total Territory 2 subsistence uses of salmon except in 2013 (3% Chinook salmon), 2014 (2%), 2015 (3%), 2016 (9%), 2017 (14%), 2021 (40%), and 2023 (3%).

Coho salmon uses ranged from 2% to 14% of total salmon uses. Pink

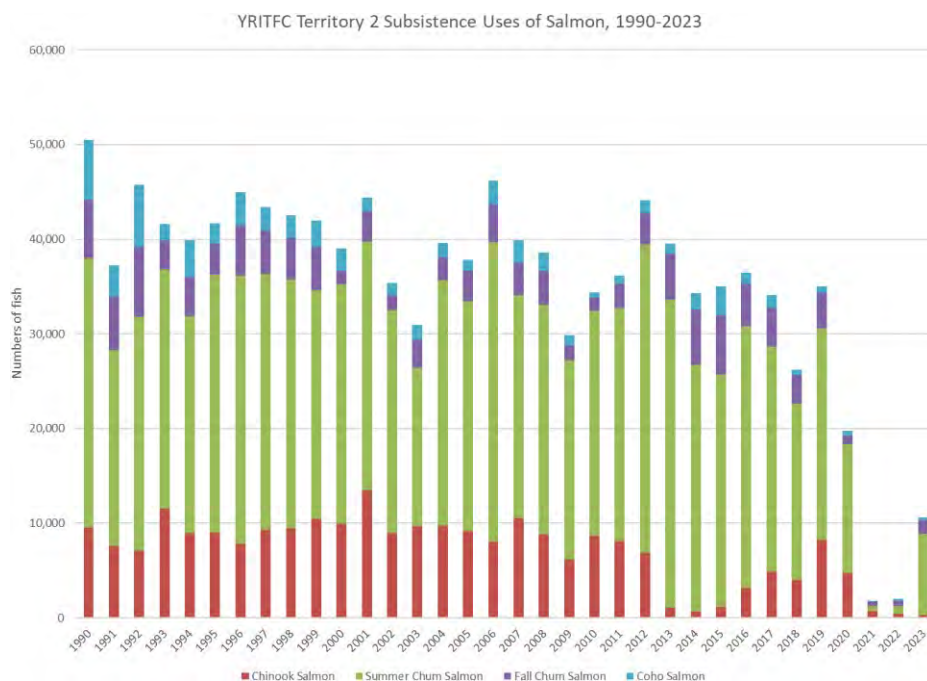


Figure A20. YRITFC Territory 2 subsistence uses of salmon, 1990-2023.

salmon, not considered in this analysis, likely also contributes to Territory 2 subsistence uses of salmon, especially during years of restricted subsistence salmon fishing to conserve other salmon stocks.

Figure A21 represents Territory 2 subsistence uses of summer chum salmon and Figure A22 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series.

The number of summer chum salmon used in YRITFC Territory 2 ranged from a high of 32,500 fish in 2012 to 16,773 fish in 2003 between 1990 and 2019. Figure A21 does not reflect a particularly noticeable pattern of overall decline in the number of Yukon River summer chum salmon used for subsistence as found in other YRITFC territories.

The 1990-2023 average number of summer chum salmon annually used for subsistence was 22,881 fish in Territory 2, representing an average of 26% of the total uses among all territories. The 1990-1994 five- year average number of summer chum salmon used for subsistence was 24,418 fish, followed by 26,601 summer chum salmon in 1995-1999, 23,578 summer chum salmon in 2000-2004, 24,964 summer chum salmon in 2005-2009, and an average of 27,926 summer chum salmon in 2010-2014, and 23,389 fish in 2015-2019. In 2020, Territory 2 used 13,635 summer chum salmon, followed by 539, 840, and 8,567 fish in 2021, 2022, and 2023, respectively. Subsistence uses of summer chum salmon in Territory 2 fell below 20,000 fish only in 2003 (16,773 fish), 2018 (18,616 fish), and in 2020-2023. Territory 2 uses of summer chum salmon exceeded 25,000 fish in 1990, 1993, 1995-1998, 2000-2001, 2004, 2006, 2012-2014, and 2016.

Territory 2 household use rates of summer chum salmon averaged 57.97 fish per household in 1990-1994, 59.77 fish per household in 1995-1999, 49.04 fish per household in 2000-2004,

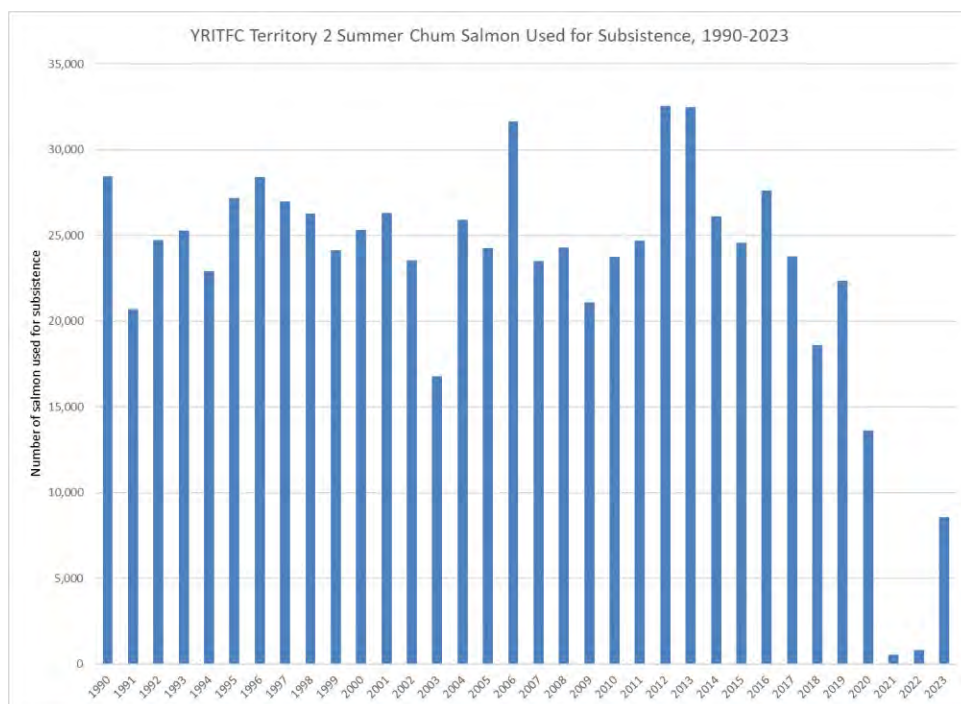


Figure A21. YRITFC Territory 2 subsistence uses of summer chum salmon, 1990-2023.

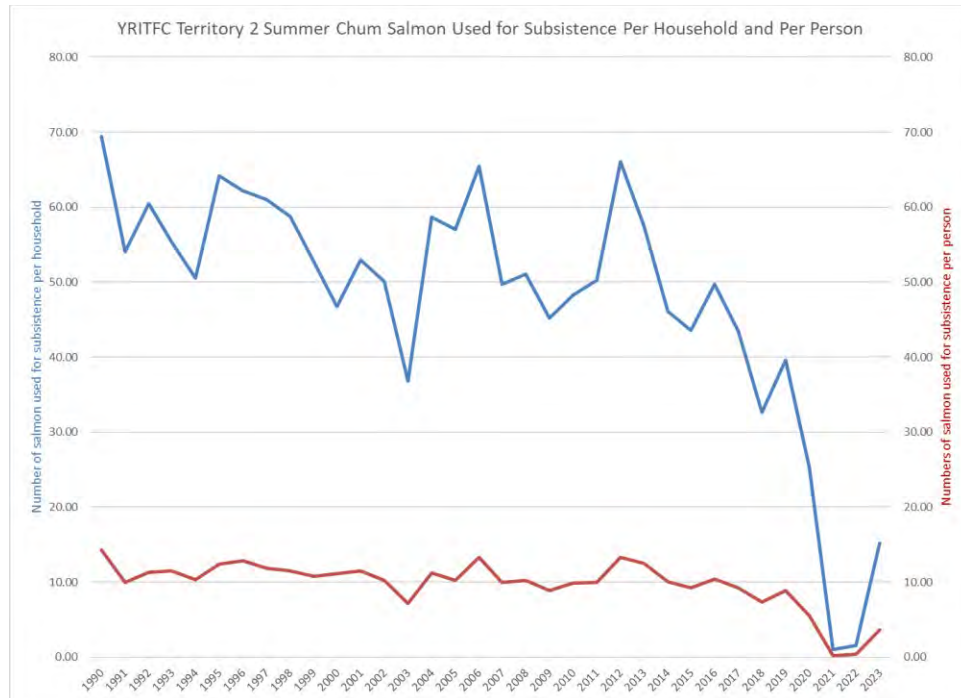


Figure A22. YRITFC Territory 2 subsistence uses of summer chum salmon per household and per person, 1990-2023.

53.66 fish per household in 2005-2009, 53.62 fish per household in 2010-2014, and 41.79 fish per household in 2015-2019. Household use rates fell to 25.34 summer chum salmon per household in 2020, 1.01 fish per household in 2021, 1.59 fish per household in 2022, and 15.22 fish per household in 2023. The number of summer chum salmon used per Territory 2 households exceeded 50 fish per household in the 1990s, 2001-2002, 2004-2006, 2008, and 2011-2013 during which household use rates exceeded 40 fish per household, except in 2003 (36.78 fish per household), 2018 and 2019 (32.66 and 39.62 fish per household, respectively), and during the most recent chum crash of 2020-2023 (see above).

Territory 2 per capita uses of summer chum salmon averaged 11.48 fish per person in 1990-1994, 11.88 fish per person in 1995-1999, 10.24 fish per person in 2000-2004, 10.52 fish per person in 2005-2009, 11.15 fish per person in 2010-2014, and 9.03 fish per person in 2015-2019. In 2020-2023, per capita uses of summer chum salmon were 5.57, 0.22, 0.35, and 3.60 fish per person, respectively. The number of summer chum salmon used per person for subsistence exceeded 10 fish per person in most years except in 1991 (9.99 fish per person), 2003 (7.14 fish per person), 2007 (9.98 fish per person), 2009 (8.84 fish per person), 2010 (9.85 fish per person), 2011 (9.99 fish per person), 2015 (9.26 fish per person), 2017-2019 (9.22, 7.35, 8.88 fish per person, respectively), and 2020-2023 (see above).

Figure A23 represents Territory 2 subsistence uses of fall chum salmon and Figure A24 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. The number of fall chum salmon used in YRITFC Territory 2 ranged from a high of 7,382 in 1992 to a low of 435 in 2021, the worst year on record for both summer and fall stocks of chum salmon. The 1990-2023 average number of fall chum salmon annually used for subsistence was 3,508 fish in Territory 2, representing an average of 5% of the total uses among all territories. The 1990-1994 five-year average number of fall chum salmon used for subsistence was 5,288 fish, followed by 4,472 fall chum salmon in 1995-1999, 2,324 fall chum salmon in 2000-2004, 3,166 fall chum salmon in 2005-2009, and an average

of 3,605 fall chum salmon in 2010-2014, and 4,334 fish in 2015-2019. In 2020, 937 fall chum salmon were used for subsistence, followed by 435 fish in 2021, 512 fish in 2022, and 1,436 fall chum salmon in 2023. Territory 2 subsistence uses of fall chum salmon exceeded 3,000 fish in the 1990s and 2000s, except in 2000 (1,425 fish), 2002-2004 (1,618, 2,901, and 2,421 fish, respectively), 2009 (1,563 fish) and in the 2010s, except in 2010-2011 and 2018 (1,419, 2,578 fish, and 2,985 fish, respectively).

Territory 2 household use rates of fall chum salmon varied considerably annually throughout the 1990-2023 time series from a high of 18.05 fish per household in 1992 to a historic low of 0.82 fish per household in 2021. The number of fall chum salmon used per household averaged 12.75 fish in 1990-1994, an average of 10.01 fish per household in 1995-1999, 4.89 fish per household in 2000-2004, 6.81 fish per household in 2005-2009, 6.75 fish per household in 2010-2014, and 7.74 fish per household in 2015-2019. Household use rates fell to 1.74 fall chum salmon per household in 2020, 0.82 fish per household in 2021, 0.97 fish per household in 2022, and 2.55 fish per household in 2023. Territory 2 household use rates of fall chum salmon exceeded 10 fish per household in the 1990s, except in 1993-1995 (6.77, 9.16, and 7.82 fish per household, respectively) and exceeded 5 fish per household in the 2000s, except in 2000 (2.63 fish per household). and only fell below 4 fish per household in 2002-2004 and 2009 prior to the most recent chum salmon disaster beginning in 2020.

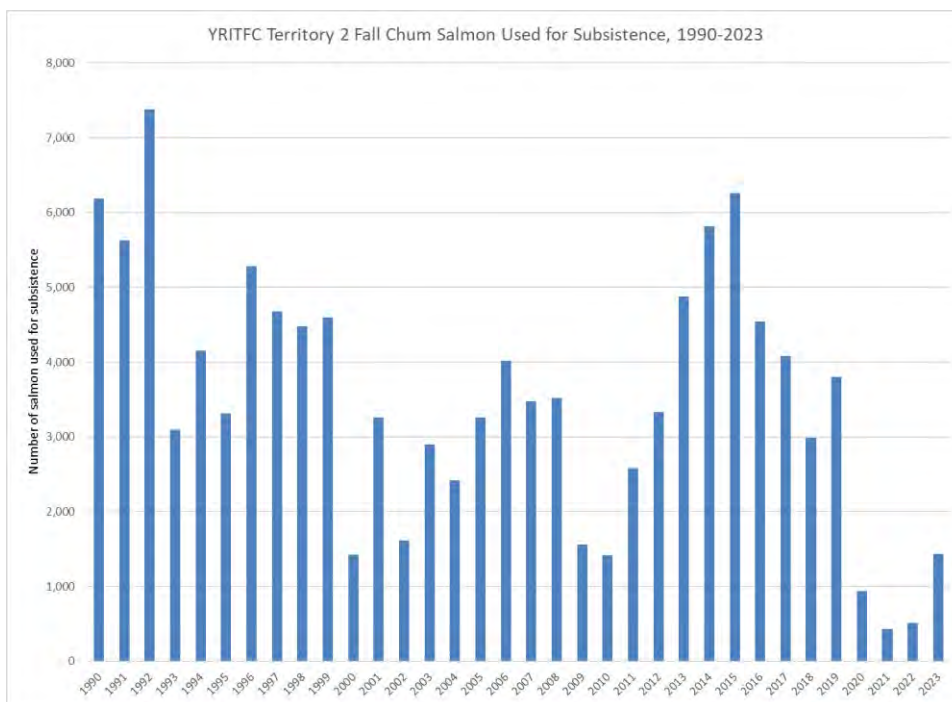


Figure A23. YRITFC Territory 2 subsistence uses of fall chum salmon, 1990-2023.

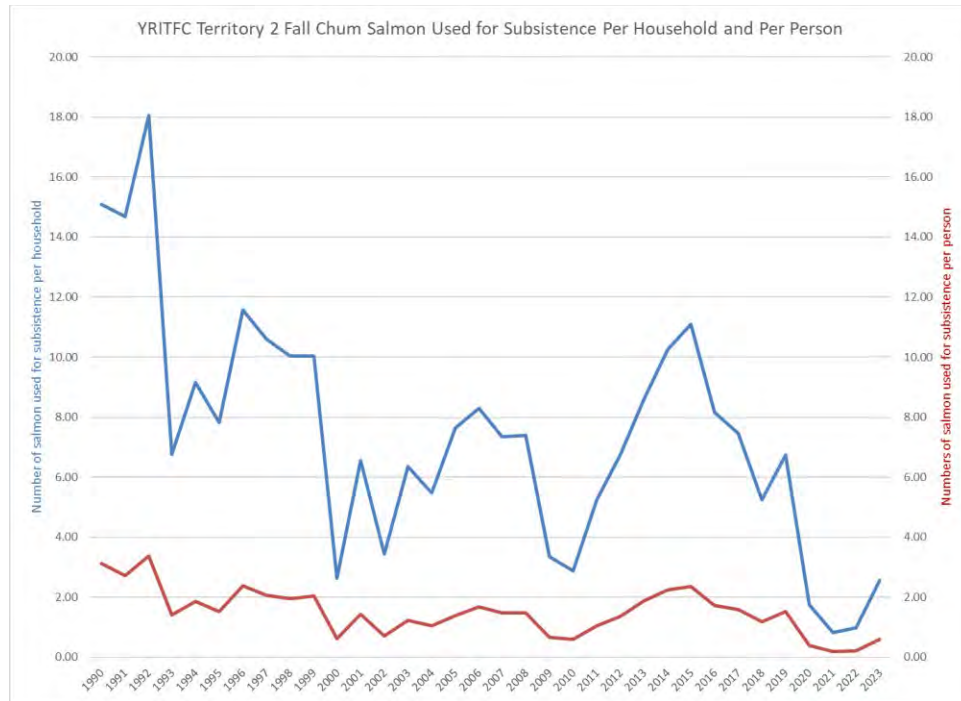


Figure A24. YRITFC Territory 2 subsistence uses of fall chum salmon per household and per person, 1990-2023.

Territory 2 per capita uses of Yukon River fall chum salmon ranged from a high of 3.38 fish per person in 1992 to a low of 0.18 fish per person in 2021. The 1990-1994 average per capita rates of fall chum salmon use were 2.50 fish per person, an average of 1.99 fish per person in 1995-1999, 1.01 fish per person in 2000-2004, 1.33 fish per person in 2005-2009, 1.42 and 1.67 fish per person in 2010-2014 and 2015-2019, respectively. The number of fall chum salmon used per person in Territory 2 exceeded 2 fish per person in the 1990s, except in 1993-1995 (1.40, 1.87, and 1.52 fish per person, respectively) and 1998 when 1.96 fish per person were used. Between 2000-2023, the number of fall chum salmon used in Territory 2 fell below 2 fish per person in all years except in 2014 and 2015 with 2.24 and 2.36 fish per person, respectively. During this same period (2000-2023), per capita uses of fall chum salmon fell below one fish per person in 2000 (0.63 fish per person), 2002 (0.70 fish per person), 2009 (0.66 fish per person), 2010 (0.59 fish per person), and 2020-2023 (see above). In 2020, the number of fall chum salmon used per person in Territory 2 was 0.38 fish per person, followed by 0.18 fish per person in 2021, 0.21 fish per person in 2022, and 0.60 fish per person in 2023.

Territory 3

Figure A25 shows the subsistence harvest composition for communities in YRITFC Territory 3 for which comprehensive subsistence harvest data are available. Territory 3 communities include Grayling (data years 1990, 2011), Anvik (1990, 2011), Shageluk (1990, 2013), Holy Cross (1990), and Russian Mission (2011). Territory 3 residents depend upon large land mammals for 36.78% of the overall subsistence economy, followed by all salmon combined at 32.93%, and non-salmon fishes at 19.00%. Chum salmon represent 15.82% of the total generalized subsistence economy of YRITFC Territory 3, followed by Chinook salmon (13.96%) and coho salmon (2.94%).

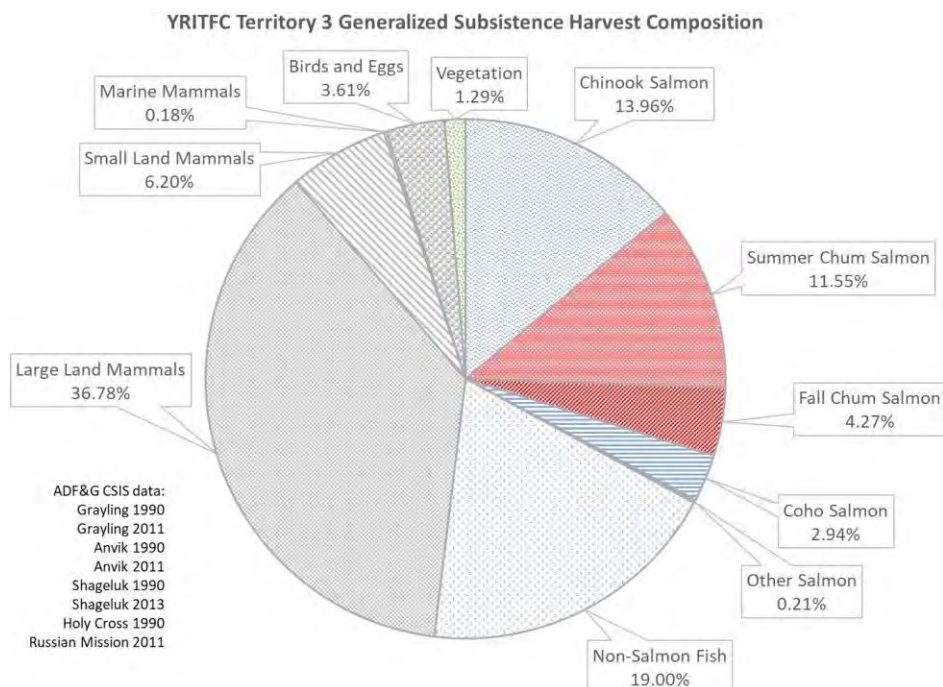


Figure A25. YRITFC Territory 3 generalized subsistence harvest composition (in edible pounds).

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from commercial fishing efforts among all Territory 3 tribal communities in 1990-2023. Figure A26 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence and an overall declining trend in subsistence uses of salmon in Territory 3.

Summer chum salmon and Chinook salmon dominate the subsistence uses of salmon in YRITFC Territory 3 representing an average of 51% summer chum and 26% Chinook salmon during 1990-1994, an average of 52% summer chum and 33% Chinook salmon in 1995-1999, an average of 34% summer chum and 54% Chinook salmon in 2000-2004, an average of 34% summer chum salmon and 48% Chinook salmon in 2005-2009, an average of 49% summer chum salmon and 27% Chinook salmon in 2010-2014, and an average of 45% summer chum salmon and 30% Chinook salmon in the 2015-2019 period. During 2020- 2023, an average of 54% of Territory 3 subsistence uses were of summer chum salmon and 24% Chinook salmon. The proportion of total subsistence uses of salmon contributed by summer chum salmon ranged from a high of 65% in 2012 (excluding 2021 and 2023 with 66% and 73% summer chum) to a low of 14% with a corresponding Chinook salmon proportion of 75% in 2001.

The proportion of total subsistence salmon uses contributed by fall chum salmon in Territory 3 ranged from a high of 37% in 2014 and 2015 to a low of 5% in 2002. The average proportion of total salmon uses contributed by fall chum salmon was 17% and 11% in the 1990-1994 and 1995-

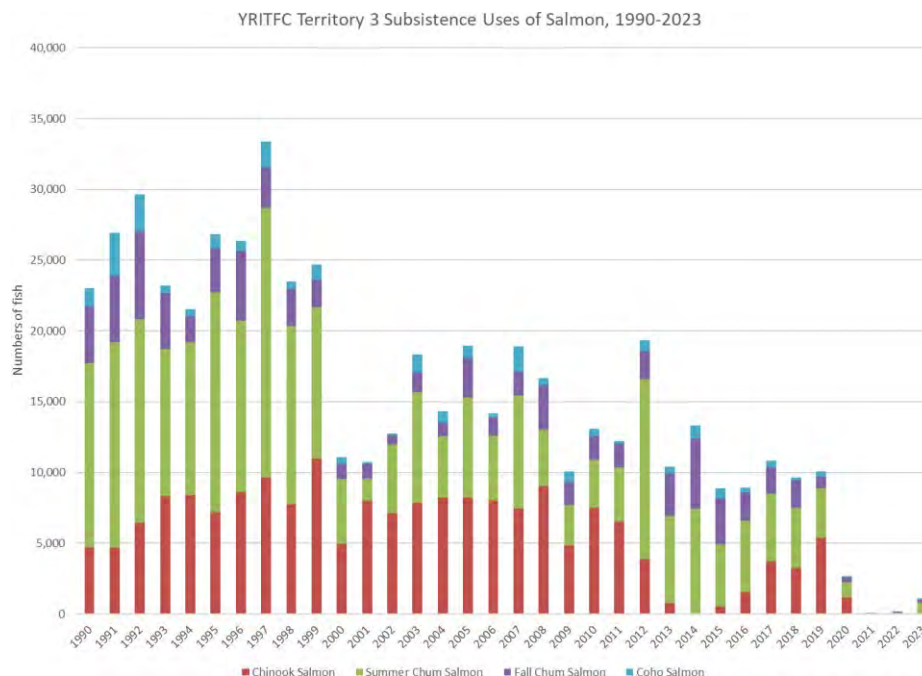


Figure A26. YRITFC Territory 3 subsistence uses of salmon, 1990-2023.

1999 periods, respectively, followed by a 2000-2004 average of 8% fall chum, a 2005-2009 average of 13% fall chum, a 2010-2014 average of 19%, and a 2015-2019 average of 20%. In 2020-2023, fall chum contributed 11%, 0%, 21%, and 19% of total subsistence salmon uses, respectively.

Pink salmon, not considered in this analysis, likely also contributes to Territory 3 subsistence uses of salmon, especially during years of restricted subsistence salmon fishing to conserve other salmon stocks.

Figure A27 represents Territory 3 subsistence uses of summer chum salmon and Figure A28 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series. The number of summer chum salmon used in YRITFC Territory 3 ranged from a high of 19,068 fish in 1997 to a low of 68 fish in 2022. In 2021, 81 summer chum salmon were used in Territory 3, which was the worst year on record for summer chum salmon uses. The 1990-2023 average number of summer chum salmon annually used for subsistence was 7,061 fish in Territory 3, representing an average of 8% of the total uses among all territories. The 1990-1994 five-year average number of summer chum salmon used for subsistence was 12,614 fish, followed by 14,022 summer chum salmon in 1995-1999, and average of 4,619 and 5,283 summer chum salmon in 2000-2004 and 2005-2009 periods, respectively. In 2010-2014, an average of 6,686 summer chum salmon were used in Territory 3 and 4,390 fish in the subsequent period of 2015-2019. In 2020, Territory 3 used 1,042 summer chum salmon for subsistence, followed by 81, 68, and 798 fish in 2021-2023, respectively. YRITFC Territory 3 uses of summer chum salmon

exceeded 10,000 fish each year of the 1990s but fell below 5,000 fish in the 2000s in all years except 2003 (7,774 fish), 2005 (7,078 fish), and 2007 (7,947 fish). Similarly, in the 2010s, subsistence uses of summer chum salmon fell below 5,000 fish, except in 2012-2014, when 12,677, 6,140, and 7,417 summer chum salmon were used, respectively, and except in 2016, when 5,059 fish were used in Territory 3.

Territory 3 household use rates of summer chum salmon averaged 53.92 fish per household in 1990-1994, 55.15 fish per household in 1995-1999, 19.91 fish per household in 2000-2004, 22.84 fish per household in 2005-2009, 27.59 fish per household in 2010-2014, and 17.30 fish per household in 2015-2019. Household use rates fell to 4.40 summer chum salmon per household in 2020, 0.35 fish per household in 2021, 0.30 fish per household in 2022, and 3.47 fish per household in 2023. The number of summer chum salmon used per Territory 3 households exceeded 40 fish per household in the 1990s, except in 1993 (37.99 fish per household) and 1994 (39.48 fish per household). In the 2000s and 2010s, household use rates of summer chum salmon exceeded 15 fish per household, except in 2001 (5.91 fish per household), 2009 (12.68 fish per household), and 2019 (13.94 fish per household). Notably, in 2012, Territory 3 used 53.26 fish per household, which was only exceeded in 1990-1992, 1995, and 1997. In 2020-2023, Territory 3 household uses of summer chum salmon fell below 5 fish per household (see above).

Territory 3 per capita uses of summer chum salmon averaged 12.94 fish per person in 1990-1994, 14.15 fish per person in 1995-1999, 4.89 fish per person in 2000-2004, 6.04 fish per person in 2005-2009, an average of 7.73 fish per person in 2010-2014, and 4.66 fish per person in 2015-2019. In 2020-2023, per capita uses of summer chum salmon were 1.07, 0.09, 0.08, and 0.87 fish per person, respectively. The number of summer chum salmon used per person for subsistence exceeded 10 fish in the 1990s, exceeded 4 fish per person in the 2000s and 2010s, except in 2001 (1.51 fish per person), 2009 (3.38 fish per person), and 2019 (3.48 fish per person).

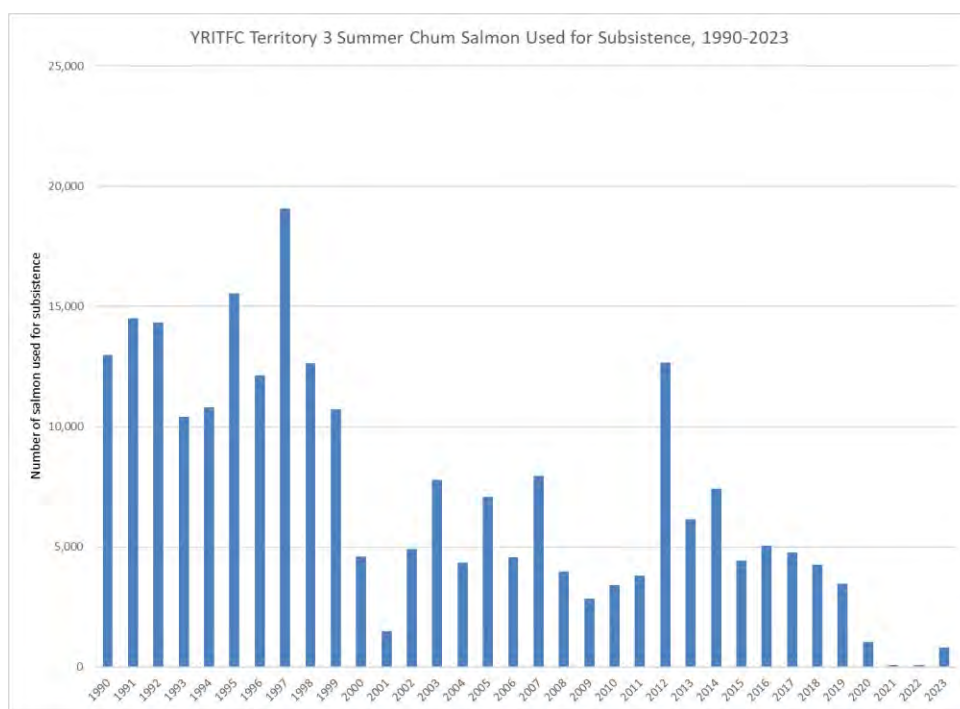


Figure A27. YRITFC Territory 3 subsistence uses of summer chum salmon, 1990-2023.

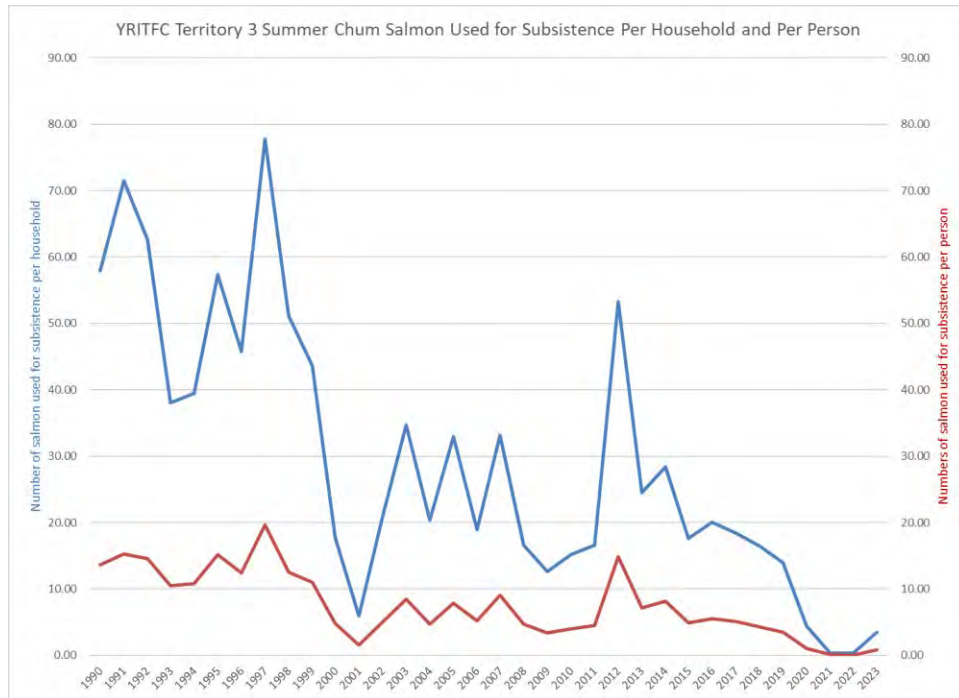


Figure A28. YRITFC Territory 3 subsistence uses of summer chum salmon per household and per person, 1990-2023.

Figure A29 represents Territory 3 subsistence uses of fall chum salmon and Figure A30 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. The number of fall chum salmon used in YRITFC Territory 3 ranged from a high of 6,245 in 1992 to a low of zero fish in 2021, the worst year on record for both summer and fall stocks of chum salmon. Figure A29 demonstrates a declining trend in the number of fall chum salmon used for subsistence in Territory 3 from the historic high number used in 1992 through 2002, followed by a variable but increasing trend in numbers until the second largest number of fall chum salmon used occurred in 2014 (4,936 fish), which was followed by another declining trend in uses leading up to the current period of poor chum salmon returns to the Yukon River.

The 1990-2023 average number of fall chum salmon annually used for subsistence was 2,220 fish in Territory 3, representing an average of 3% of the total uses among all territories. The 1990-1994 five-year average number of fall chum salmon used for subsistence was 4,150 fish, followed by 3,072 fall chum salmon in 1995-1999, 1,008 fall chum salmon in 2000-2004, 2,105 fall chum salmon in 2005-2009, and an average of 2,670 fall chum salmon in 2010-2014, and 1,984 fish in 2015-2019. In 2020, 302 fall chum salmon were used for subsistence, followed by zero fish in 2021, 39 fish in 2022, and 203 fall chum salmon in 2023. Territory 3 subsistence uses of fall chum salmon exceeded 3,000 fish in the 1990s, except in 1994 (1,828 fish), 1997-1999 (2,832, 2,597, and 1,911 fish, respectively). In the 2000s and 2010s, the number of fall chum salmon used in Territory 3 exceeded 1,000 fish, except in 2002 (617 fish), 2004 (963 fish), and 2019 (844 fish). In 2020, 302 fall chum salmon were used in Territory 3, followed by zero fall chum in 2021, 39 fall chum in 2022, and 203 fish in 2023.

Territory 3 household use rates of fall chum salmon varied considerably annually throughout the 1990-2023 time series from a high of 27.27 fish per household in 1992 to a historic low of zero fish per

household in 2021. The number of fall chum salmon used per household averaged 17.90 fish in 1990-1994, an average of 11.97 fish per household in 1995-1999, 4.28 fish per household in 2000-2004, 9.13 fish per household in 2005-2009, 10.87 fish per household in 2010-2014, and 7.82 fish per household in 2015-2019. Household use rates fell to 1.27 fall chum salmon per household in 2020, zero fish per

household in 2021, 0.17 fish per household in 2022, and 0.88 fish per household in 2023. Territory 3 household use rates of fall chum salmon exceeded 10 fish per household in the 1990s, except in 1994 (6.67 fish per household) and 1999 (7.77 fish per household). Household use rates exceeded 4 fall chum salmon per household in the 2000s and 2010s, except in 2002 (2.63 fish per household) and 2019 (3.40 fish per household) prior to the most recent chum salmon disaster beginning in 2020 (see above).

Territory 3 per capita uses of Yukon River fall chum salmon ranged from a high of 6.33 fish per person in 1992 to a low of zero fish per person in 2021. The 1990-1994 average per capita rates of fall chum salmon use were 4.26 fish per person, an average of 3.10 fish per person in 1995-1999, 1.06 fish per person in 2000-2004, 2.42 fish per person in 2005-2009, 3.06 and 2.13 fish per person in 2010-2014 and 2015-2019, respectively. The number of fall chum salmon used per person in Territory 3 exceeded 2 fish per person in the 1990s, except in 1994 (1.82 fish per person) and 1999 (1.96 fish per person). In the 2000s, the number of fall chum salmon used in Territory 3 fell below 2 fish per person in all years, except in 2005 and 2008 with 3.10 and 3.74 fish per person, respectively. During this same period, per capita

uses of fall chum salmon fell below one fish per person in 2002 (0.63 fish per person). In the 2010s, per capita uses of fall chum salmon exceeded 2 fish, except in 2010 (1.99 fish per person), 2017-2019 (1.97, 1.97, and

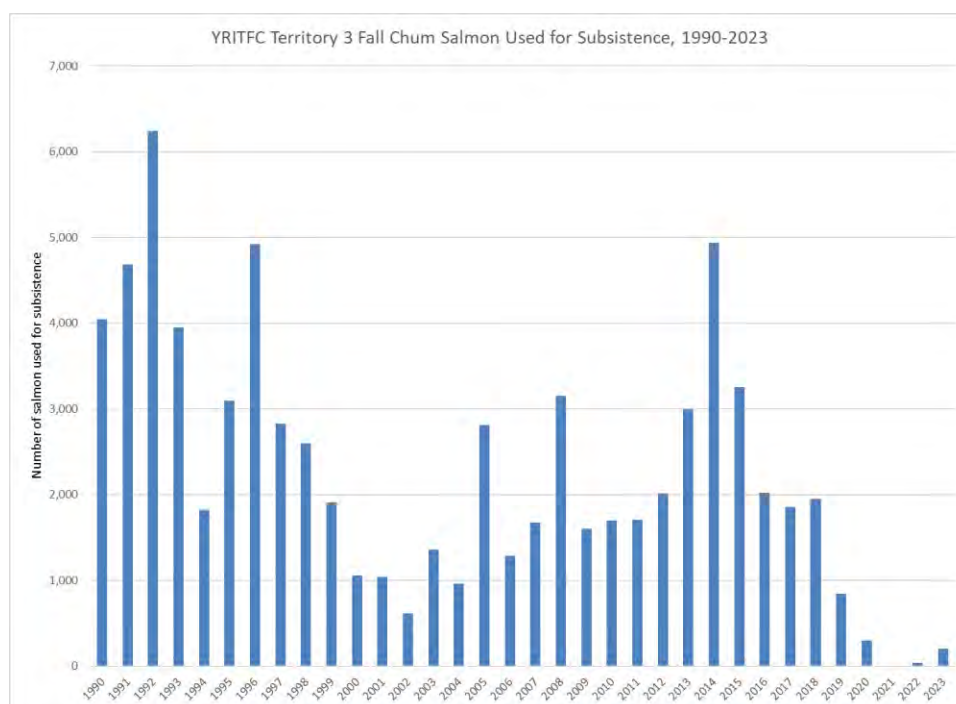


Figure A29. YRITFC Territory 3 subsistence uses of fall chum salmon, 1990-2023.

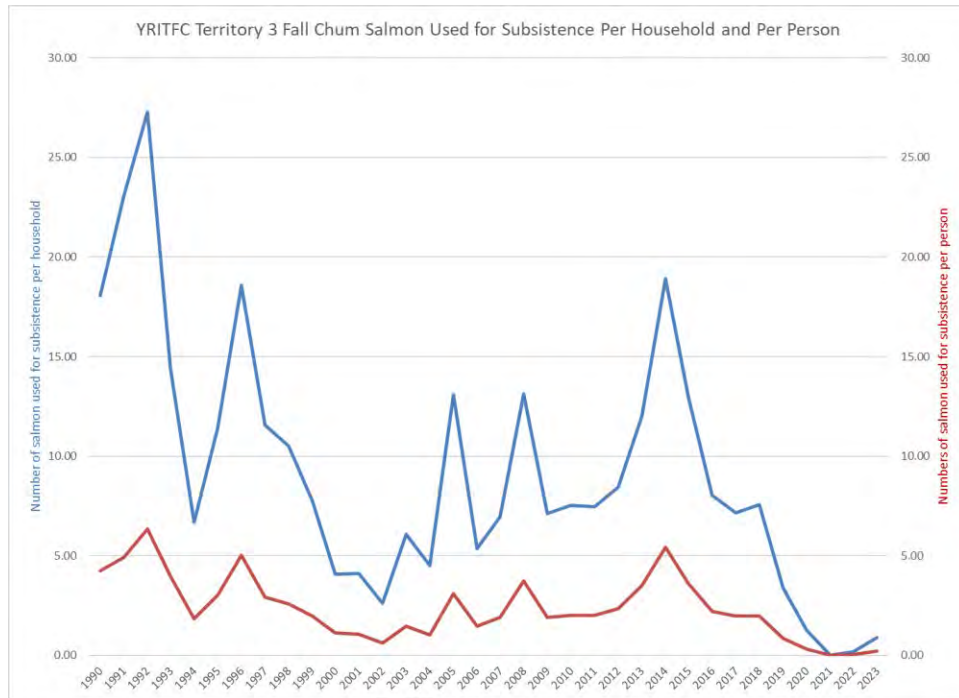


Figure A30. YRITFC Territory 3 subsistence uses of fall chum salmon per household and per person, 1990-2023.

0.85 fish per person, respectively) and exceeded 3 fish in 2013-2015 with 3.49, 5.43, and 3.61 fish per person, respectively. In 2020, the number of fall chum salmon used per person in Territory 3 fell to 0.31 fish per person, followed by zero fish in 2021, 0.04 fish per person in 2022, and 0.22 fish per person in 2023.

Territory 4

Figure A31 shows the subsistence harvest composition for communities in YRITFC Territory 4 for which comprehensive subsistence harvest data are available. Territory 4 communities include Ruby (data year 2010), Galena (1985, 2010), Nulato (2010), and Kaltag (2018). Territory 4 residents depend on salmon for 62.5% of the overall subsistence economy, including 47.35% chum salmon. Summer chum salmon contributed 36.23%, which is the largest proportion of the total subsistence harvest, followed by large land mammals (24.49%), Chinook salmon (13.21%), fall chum salmon (11.09%), and non-salmon fishes (8.93%).

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from commercial fishing efforts among all Territory 4 tribal communities in 1990-2023.

Figure A32 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence. Fall chum salmon and Chinook salmon dominate the subsistence uses of salmon in YRITFC Territory 4 representing an average of 38% fall chum and 24% Chinook salmon during 1990-1994, an average of 35% fall chum and 30% Chinook salmon in 1995-1999, an average of 20% fall chum and 49% Chinook salmon in 2000-2004, an

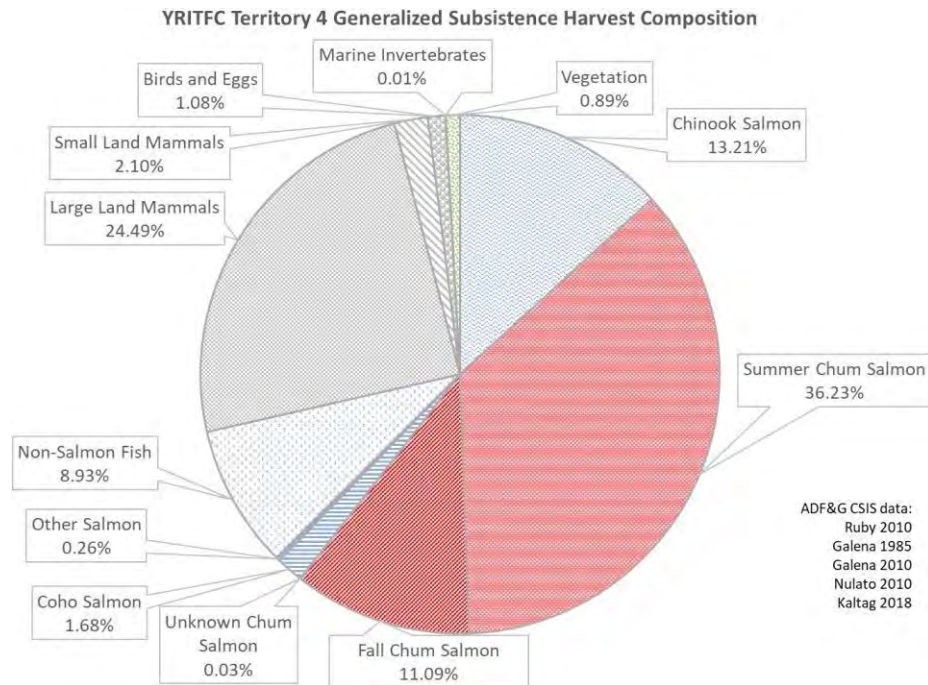


Figure A31. YRITFC Territory 4 generalized subsistence harvest composition (in edible pounds).

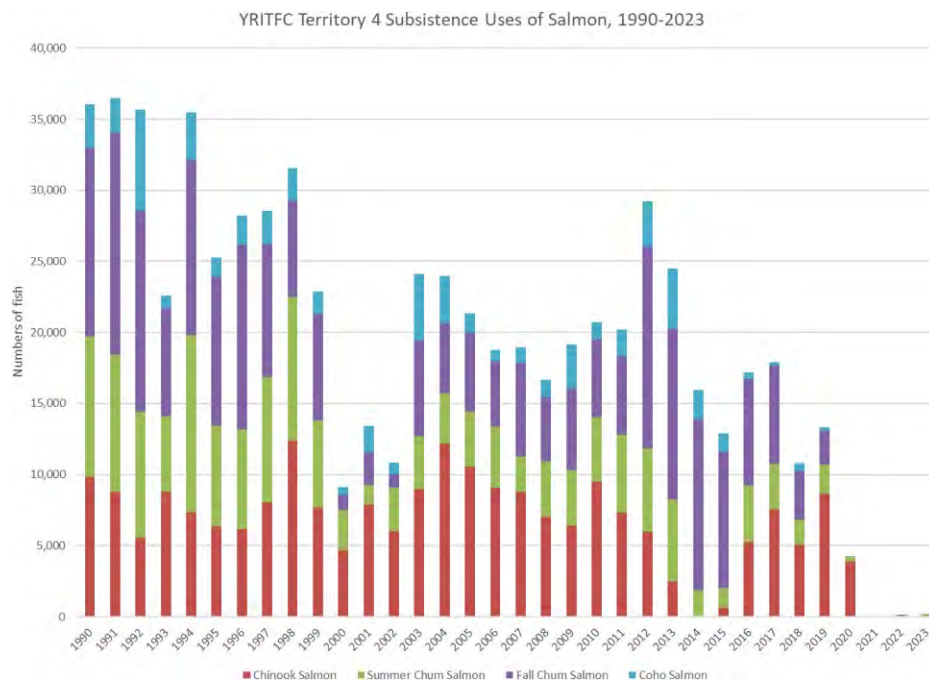


Figure A32. YRITFC Territory 4 subsistence uses of salmon, 1990-2023.

average of 29% fall chum salmon and 44% Chinook salmon in 2005-2009, an average of 45% fall chum salmon and 23% Chinook salmon in 2010-2014, and an average of 41% fall chum salmon and 38% Chinook salmon in 2015-2019.

During 2020-2023, an average of 2% of Territory 4 subsistence uses were of fall chum salmon, 35% summer chum salmon, 63% Chinook salmon, and less than 1% coho salmon. The proportion of total subsistence uses of salmon contributed by fall chum salmon ranged from highs of 75% in 2014 and 74% in 2015 to lows of zero in 2021-2023. Excluding 2020 when the Chinook salmon proportion of total subsistence use of salmon was 91%, the proportion of Chinook salmon ranged from highs of 65% in 2019 and 59% in 2001 to lows of 0.43% in 2014 and 5% in 2015.

The proportion of total subsistence salmon uses contributed by summer chum salmon in Territory 4 ranged from a high of 35% in 1994, excluding 2022 (39% summer chum) and 2023 (79% summer chum), to lows of 8% in 2020 and 11% in 2001, 2014, and 2015. The average proportion of total salmon uses contributed by summer chum salmon was 28% and 29% in the 1990-1994 and 1995-1999 periods, respectively, followed by a 2000-2004 average of 18% summer chum, a 2005-2009 average of 19% summer chum, a 2010-2014 average of 21%, and a 2015-2019 average of 17%. In 2020-2023, summer chum contributed 8%, 12%, 39%, and 79% of total subsistence salmon uses, respectively.

Figure A33 represents Territory 4 subsistence uses of summer chum salmon and Figure A34 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series. The number of summer chum salmon used in YRITFC Territory 4 ranged from a high of 12,481 fish in 1994 to a low of 2 fish in 2021, which was the worst year on record

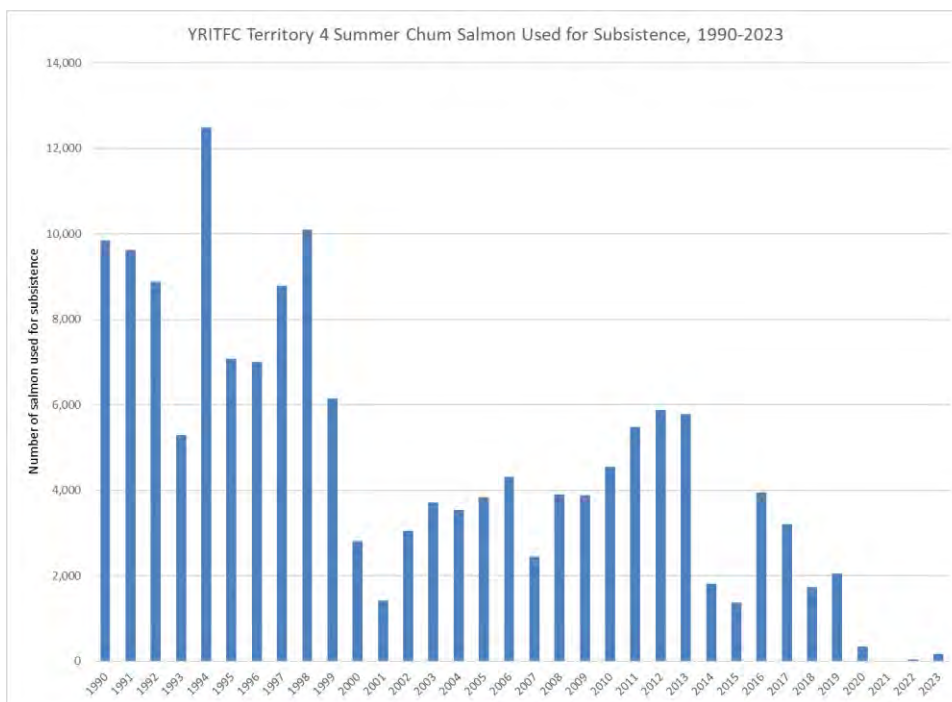


Figure A33. YRITFC Territory 4 subsistence uses of summer chum salmon, 1990-2023.

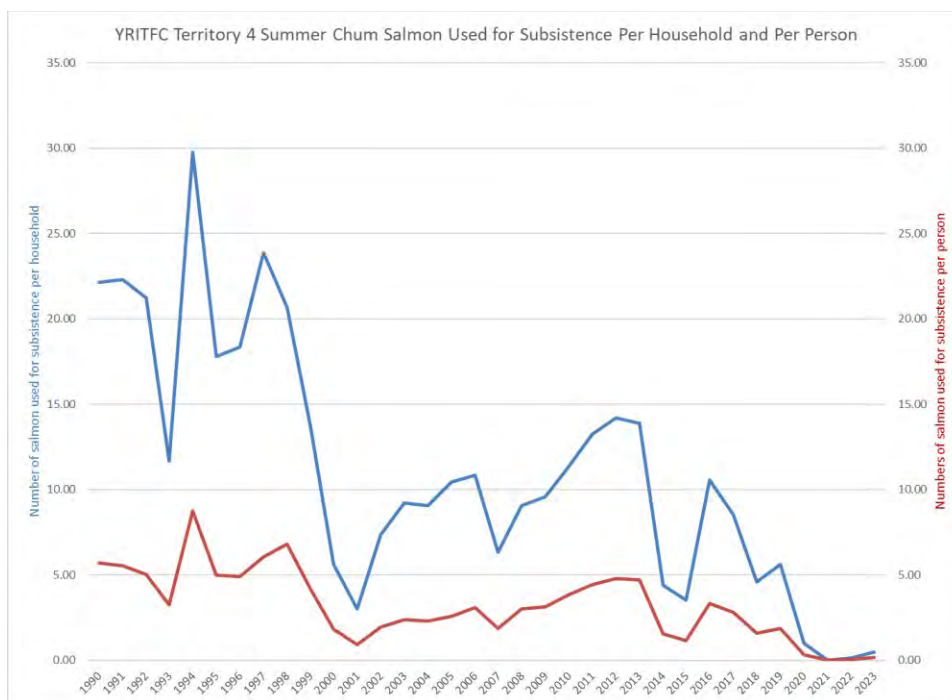


Figure A34. YRITFC Territory 4 subsistence uses of summer chum salmon per household and per person, 1990-2023.

for summer chum salmon uses. The 1990-2023 average number of summer chum salmon annually used for subsistence was 4,544 fish in Territory 4, representing an average of 5% of the total uses among all territories. The 1990-1994 five-year average number of summer chum salmon used for subsistence was 9,224 fish, followed by 7,822 summer chum salmon in 1995-1999, and average of 2,902 and 3,674 fish in 2000-2004 and 2005-2009, respectively. The 2010-2014 average number of summer chum salmon used in Territory 4 was 4,703 fish, followed by 2,461 fish in 2015-2019. In 2020-2023, 349, 2, 47, and 165 summer chum salmon were used for subsistence.

Territory 4 household use rates of summer chum salmon averaged 21.43 fish per household in 1990-1994, 18.87 fish per household in 1995-1999, 6.86 fish per household in 2000-2004, 9.26 fish per household in 2005-2009, 11.42 fish per household in 2010-2014, and 6.57 fish per household in 2015-2019. Household use rates fell to 1.01 summer chum salmon per household in 2020, 0.01 fish per household in 2021, 0.14 fish per household in 2022, and 0.46 fish per household in 2023. The number of summer chum salmon used per Territory 4 households exceeded 20 fish per household in the 1990s, except in 1993 (11.67 fish per household), 1995 (17.79 fish per household), 1996 (18.35 fish per household), and 1999 (13.64 fish per household). In the 2000s, household use rates of summer chum salmon fell below 10 fish per household, except in 2005 (10.44 fish per household) and 2006 (10.86 fish per household). In the 2010s, the number of summer chum salmon used per household exceeded 10 fish, except in 2014 (4.41 fish per household), 2015 (3.52 fish per household), 2017 (8.54 fish per household), 2018 (4.60 fish per household), and 2019 (5.63 fish per household). In 2020-2023, Territory 4 household uses of summer chum salmon fell below 1 fish per household, except in 2020 (see above).

Territory 4 per capita uses of summer chum salmon averaged 5.66 fish per person in 1990-1994, 5.38 fish per person in 1995-1999, 1.88 fish per person in 2000-2004, 2.74 fish per person in 2005-2009, 3.87 fish

per person in 2010-2014, and 2.15 fish per person in 2015-2019. In 2020-2023, per capita uses of summer chum salmon were 0.32, zero, 0.05, and 0.16 fish per person, respectively. The number of summer chum salmon used per person for subsistence exceeded 4 fish in the 1990s, except for 1993 with only 3.25 fish used per person. Per capita uses of summer chum salmon exceeded 1 fish per person in the 2000s and 2010s, except in 2001 (0.92 fish per person).

Figure A35 represents Territory 4 subsistence uses of fall chum salmon and Figure A36 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. The number of fall chum salmon used in YRITFC Territory 4 ranged from a high of 15,613 in 1991 to a low of zero fish in 2021 and 2023. Figure A35 demonstrates a declining trend in the number of fall chum salmon used for subsistence in Territory 4 from the historic high numbers used in 1991 and 1992 down to the lows of the early 2000s, which were the lowest uses of fall chum salmon until the most recent chum salmon crash began in 2020. Territory 4 fall chum salmon uses between 2003 and 2011 demonstrated a partial recovery in fall chum salmon uses ranging from approximately 4,500 – 6,500 fish. In 2012, subsistence uses of fall chum salmon once again exceeded 14,000 fish, followed by another declining trend in uses leading up to the current collapse in chum salmon returns to the Yukon River that began in 2020.

The 1990-2023 average number of fall chum salmon annually used for subsistence was 6,837 fish in Territory 4, representing an average of 9.5% of the total uses among all territories. The 1990-1994 five-year average number of fall chum salmon used for subsistence in Territory 4 was 12,602 fish, followed by 9,423 fall chum salmon in 1995-1999, 3,200 fall chum salmon in 2000-

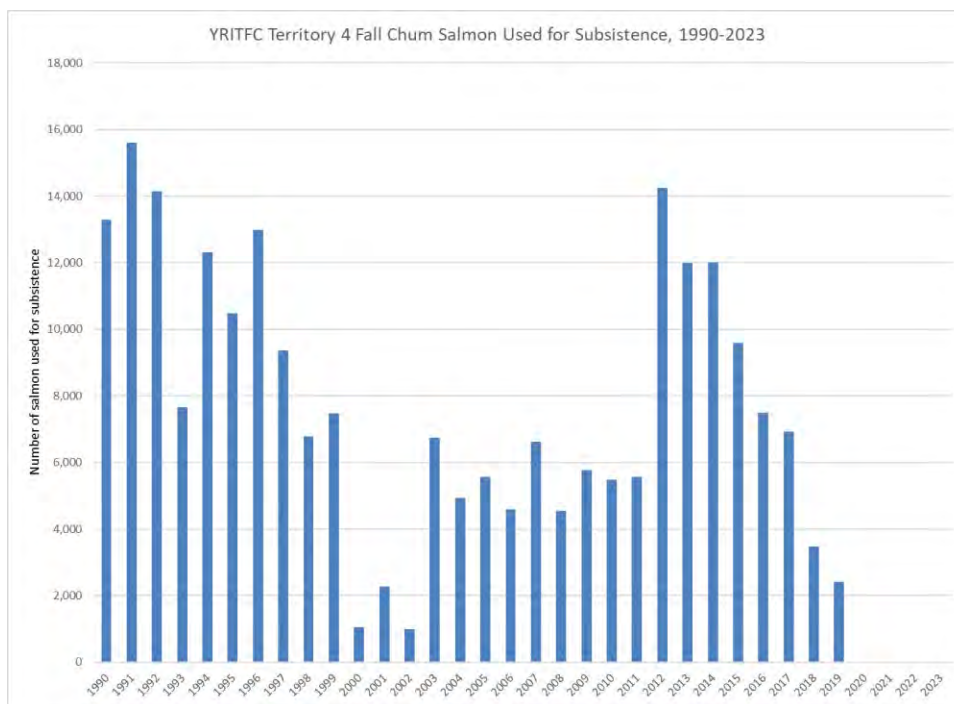


Figure A35. YRITFC Territory 4 subsistence uses of fall chum salmon, 1990-2023.

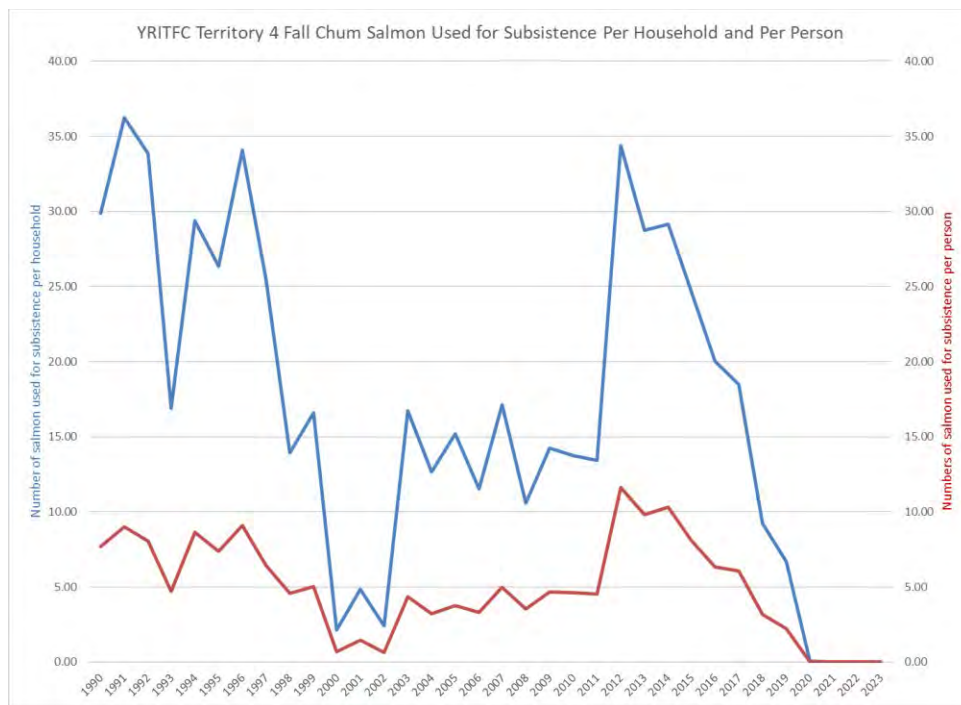


Figure A36. YRITFC Territory 4 subsistence uses of fall chum salmon per household and per person, 1990-2023.

2004, 5,415 fall chum salmon in 2005-2009, and an average of 9,861 fall chum salmon in 2010-2014, and 5,984 fish in 2015-2019. In 2020, 19 fall chum salmon were used for subsistence, followed by zero fish in 2021, 10 fish in 2022, and zero fall chum salmon used in 2023. Territory 4 subsistence uses of fall chum salmon exceeded 10,000 fish in the 1990s, except in 1993 (7,667 fish), 1997 (9,358 fish), 1998 (6,791 fish), and 1999 (7,485 fish). In the 2000s, the number of fall chum salmon used for subsistence in Territory 4 exceeded 4,000 fish, except in 2000-2002 with only 1,057, 2,276, and 996 fall chum salmon used. In the 2010s, the fall chum salmon uses exceeded 5,000 fish, except in 2018 and 2019 with 3,473 and 2,423 fish, respectively.

Territory 4 household use rates of fall chum salmon varied considerably throughout the 1990-2023 time series from a high of 36.23 fish per household in 1991 to a historic low of zero fish per household in 2021 and 2023. The number of fall chum salmon used per household averaged 29.23 fish in 1990-1994, an average of 23.28 fish per household in 1995-1999, 7.75 fish per household in 2000-2004, 13.73 fish per household in 2005-2009, 23.90 fish per household in 2010-2014, and 15.81 fish per household in 2015-2019. Household use rates fell to 0.06 fall chum salmon per household in 2020, zero fish per household in 2021, 0.03 fish per household in 2022, and zero fish per household in 2023. Territory 4 household use rates of fall chum salmon exceeded 20 fish per household in the 1990s, except in 1993 (16.89 fish per household), 1998 (13.92 fish per household), and 1999 (16.60 fish per household). Territory 4 household rates of use of fall chum salmon exceeded 10 fish during the 2000s and 2010s, except in 2000-2002 (2.12, 4.84, and 2.41 fish per household, respectively) and 2018-2019 (9.21 and 6.67 fall chum used per household, respectively).

Territory 4 per capita uses of Yukon River fall chum salmon ranged from a high of 11.62 fish per person in 2012 to a low of zero fish per person in 2021 and 2023. The 1990-1994 average per capita rates of fall

chum salmon use were 7.62 fish per person, an average of 6.51 fish per person in 1995-1999, 2.07 fish per person in 2000-2004, 4.04 fish per person in 2005-2009, 8.18 and 5.18 fish per person in 2010-2014 and 2015-2019, respectively. The number of fall chum salmon used per person in Territory 4 exceeded 6 fish per person in the 1990s, except in 1993 (4.70 fish per person), 1998 (4.58 fish per person), and 1999 (5.05 fish per person). In the 2000s, the number of fall chum salmon used in Territory 4 fell below 2 fish per person in 2000-2002 (0.69, 1.47, and 0.64 fish per person, respectively), but otherwise exceeded 3 fish per person in 2003-2009). In the 2010s, per capita uses of fall chum salmon exceeded 4 fish, except in 2018 and 2019 with 3.18 and 2.23 fish per person, respectively. Notably, during 2012-2015, fall chum per capita uses exceeded 8 fish per person. In 2020, the number of fall chum salmon used per person in Territory 4 fell to 0.02 fish per person, followed by zero fish in 2021, 0.01 fish per person in 2022, and zero fish per person in 2023.

Territory 5

Figure A37 shows the subsistence harvest composition for communities in YRITFC Territory 5 within the Koyukuk River drainage for which comprehensive subsistence harvest data are available. Territory 5 communities include Bettles/Evansville (data years 1982, 1983, 1984), Bettles (2011), Evansville (2011), Allakaket/Alatna (1982, 1983, 1984), Alatna (2011), Allakaket (2011), Hughes (1982, 2014), and Huslia (1983). Territory 5 residents depend upon salmon for 55.34% of their total subsistence harvests, including 50.95% chum salmon (29.67% summer chum salmon, 3.48% fall chum salmon, and 17.80% unknown chum salmon). After salmon, the

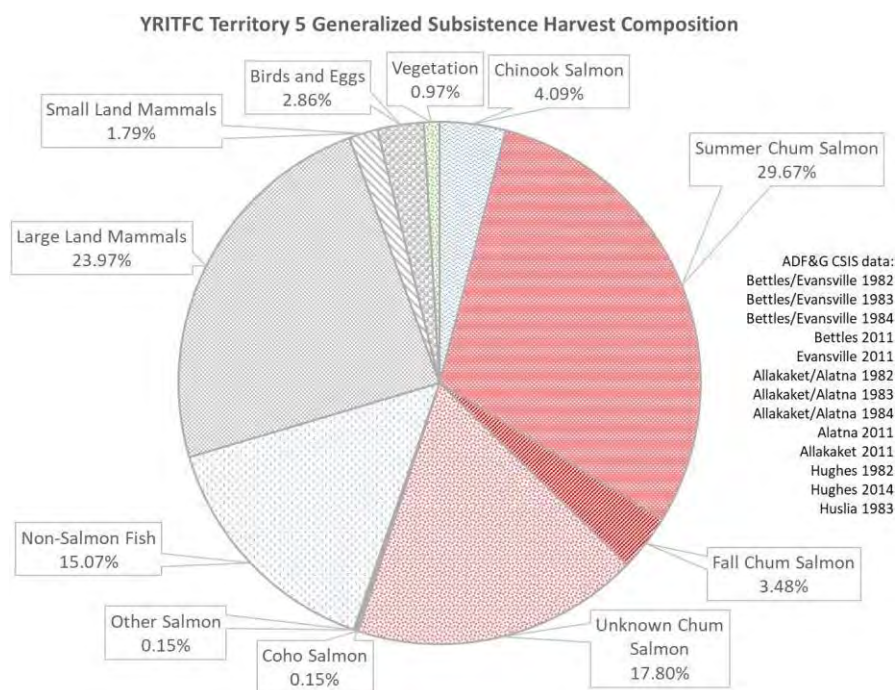


Figure A37. YRITFC Territory 5 generalized subsistence harvest composition (in edible pounds).

next largest contributors to the Territory 5 overall subsistence economy are large land mammals (23.97%), non-salmon fishes (15.07%), and Chinook salmon (4.09%).

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from commercial fishing efforts among all Territory 5 tribal communities in 1990-2023.

Figure A38 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence in Territory 5. Summer chum salmon dominates the subsistence uses of salmon in YRITFC Territory 5 representing an average of 85% summer chum salmon during 1990-1994, 82% summer chum salmon in 1995-1999, an average of 78% summer chum salmon in 2000-2004, 2005-2009, and 2010-2014, and an average of 77% summer chum salmon in 2015-2019. The proportion of total subsistence uses of salmon contributed by summer chum salmon ranged from highs of 94% in 1994, 93% in 2002, 92% in 2011, and 91% in 1993 to a low of 60% in 2019, excluding 2022 when 50% of the 292 salmon used in Territory 5 were summer chum salmon. During 2020-2023, an average of 79% of Territory 5 subsistence uses were of summer chum salmon.

The proportion of total subsistence salmon uses contributed by fall chum salmon in Territory 5 ranged from highs of 24% in 2019, 23% in 2014, and 22% in 1990 and 2005 to lows of zero percent in 2021 and less than 1% in 1994 and 2002. In Territory 5, the average proportion of total salmon uses contributed by fall chum salmon was 10% in the 1990-1994 and 1995-1999 periods, followed by a 2000-2004 average of 11% fall chum, a 2005-2009 average of 13% fall chum, and

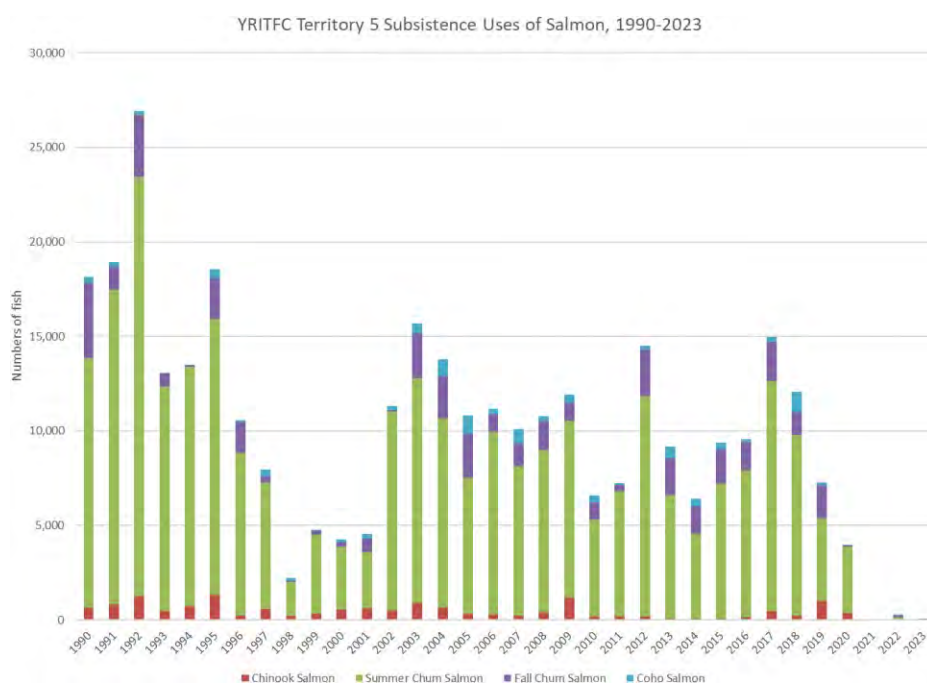


Figure A38. YRITFC Territory 5 subsistence uses of salmon, 1990-2023.

averages of 16% fall chum in 2010-2014 and 2015-2019. In 2020-2023, fall chum contributed 2%, zero percent, 21%, and 9% of total subsistence salmon uses, respectively.

The proportion of Chinook salmon used in Territory 5 ranged from highs of 14% in 2019 and 13% in 2001 to lows of zero percent in 2021 and 2022 and less than 1% in 2013-2015. The proportion of total

salmon uses contributed by coho salmon ranged from highs of 9% in 2005 and 2018 to lows of zero percent in 2021 and less than 1% in 1992-1994.

Figure A39 represents Territory 5 subsistence uses of summer chum salmon and Figure A40 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series. The number of summer chum salmon used in YRITFC Territory 5 ranged from a high of 22,190 fish in 1992 to lows of 2 fish in 2021, 45 fish in 2023, 146 fish in 2022, and 1,779 fish in 1998. The 1990-2023 average number of summer chum salmon annually used for subsistence was 8,040 fish in Territory 1, representing an average of 9% of the total uses among all territories. The 1990-1994 five-year average number of summer chum salmon used for subsistence was 15,339 fish, followed by 7,190 summer chum salmon in 1995-1999, and average of 7,758 and 8,553 fish in 2000-2004 and 2005-2009, respectively. The 2010-2014 average number of summer chum salmon used in Territory 5 was 6,889 fish, followed by 8,202 fish in 2015-2019. In 2020-2023, 3,509, 2, 146, and 45 summer chum salmon were used for subsistence, respectively.

Territory 5 household use rates of summer chum salmon ranged from highs of 127.04 fish per household in 1992, 97.52 fish per household in 1991, and 79.20 fish per household in 1995 to a low of 8.01 fish per household in 1998, if 2021-2023 are excluded. The number of summer chum salmon used per household averaged 84.09 fish per household in 1990-1994, 37.43 fish per

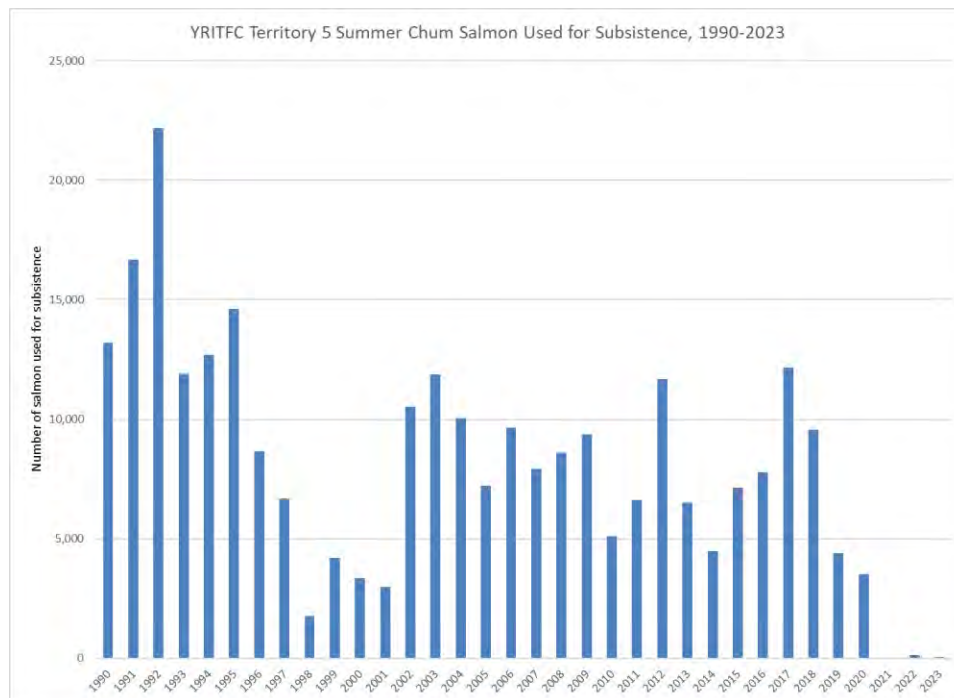


Figure A39. YRITFC Territory 5 subsistence uses of summer chum salmon, 1990-2023.

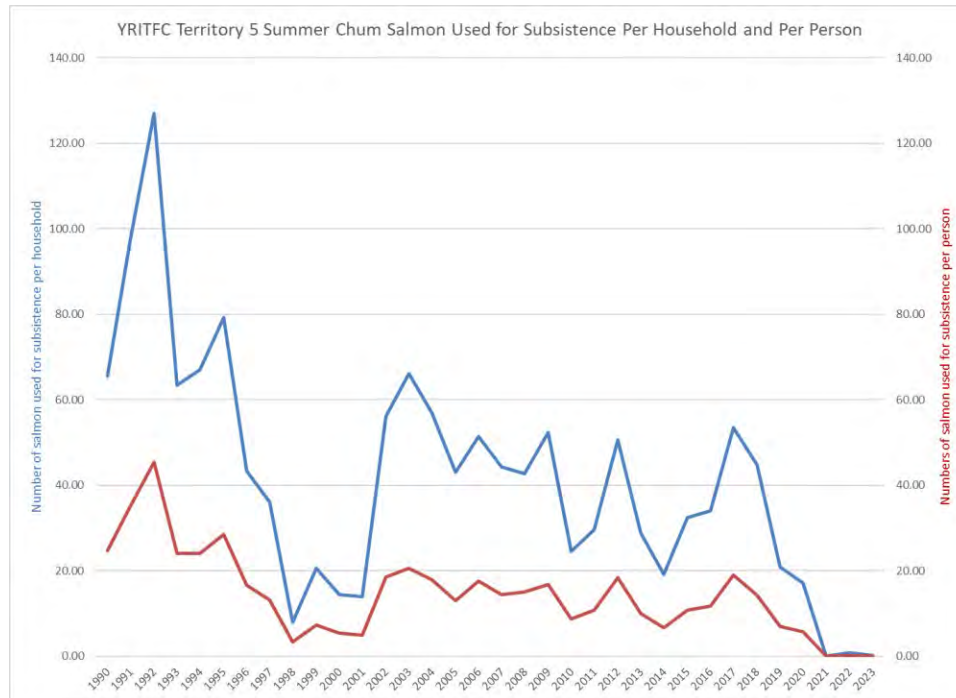


Figure A40. YRITFC Territory 5 subsistence uses of summer chum salmon per household and per person, 1990-2023.

household in 1995-1999, 41.51 fish per household in 2000-2004, 46.77 fish per household in 2005-2009, 30.55 fish per household in 2010-2014, and 37.15 fish per household in 2015-2019. Household use rates fell to 17.12 summer chum salmon per household in 2020, 0.01 fish per household in 2021, 0.78 fish per household in 2022, and 0.22 fish per household in 2023. The number of summer chum salmon used per Territory 5 household exceeded 60 fish per household in the 1990s, except in 1996-1999 (43.39, 36.02, 8.01, and 20.54 fish per household, respectively). In the 2000s, household use rates of summer chum salmon exceeded 40 fish per household, except in 2000 (14.48 fish per household) and 2001 (13.90 fish per household). In the 2010s, the number of summer chum salmon used per household exceeded 20 fish, except in 2014 (19.24 fish per household).

Territory 5 per capita uses of summer chum salmon averaged 30.70 fish per person in 1990-1994, 13.81 fish per person in 1995-1999, 13.52 fish per person in 2000-2004, 15.38 fish per person in 2005-2009, 10.93 fish per person in 2010-2014, and 12.59 fish per person in 2015-2019. In 2020-2023, per capita uses of summer chum salmon were 5.70, zero, 0.24, and 0.07 fish per person, respectively. The number of summer chum salmon used per person for subsistence exceeded 24 fish in the 1990s, except for 1996-1999 (16.62, 13.09, 3.39, and 7.39 fish per person, respectively). Per capita uses of summer chum salmon exceeded 10 fish per person in the 2000s and 2010s, except in 2000 (5.48 fish per person), 2001 (4.99 fish per person), 2010 (8.71 fish per person), 2014 (6.74 fish per person), and 2019 (6.95 fish per person).

Figure A41 represents Territory 5 subsistence uses of fall chum salmon and Figure A42 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. The number of fall chum salmon used in YRITFC Territory 5 ranged from highs of 3,966 in 1990, 3,204 fall chum in 1992, and 2,437 fish in 2012 to lows of 55 fish in 1994, 71 fish in 1998, and 100 fish in 2002,

excluding the years 2020-2023. Figure A41 demonstrates considerable inter-annual variation in fall chum salmon use during the 1990-2023 time series.

The 1990-2023 average number of fall chum salmon annually used for subsistence was 1,225 fish in Territory 5, representing an average of 2% of the total uses among all territories. The 1990-1994 five-year average number of fall chum salmon used for subsistence in Territory 5 was 1,816 fish, followed by 864 fall chum salmon in 1995-1999, 1,134 fish in 2000-2004, 1,396 fall chum salmon in 2005-2009, and an average of 1,423 fall chum salmon in 2010-2014, and 1,667 fish in 2015-2019. In 2020, 70 fall chum salmon were used in Territory 5, followed by zero fish in 2021, 62 fish in 2022, and 5 fall chum salmon used in 2023. Territory 5 subsistence uses of fall chum salmon exceeded 1,000 fish in the 1990s, except in 1993 (662 fish), 1994 (55 fish), 1997 (331 fish), 1998 (71 fish), and 1999 (193 fish). In the 2000s, the number of fall chum salmon used for subsistence in Territory 5 exceeded 900 fish, except in 2000-2002 (243, 733, and 100 fall chum salmon used, respectively) and 2006 and 2009 (946 fish each). In the 2010s, fall chum salmon uses exceeded 1,000 fish, except in 2010 (924 fish) and 2011 (339 fish).

Territory 5 household use rates of fall chum salmon varied considerably throughout the 1990-2023 time series from highs of 19.63 fish per household in 1990, 18.34 fish per household in 1992, and 13.94 fish per household in 2005 to lows of 0.29 fish per household in 1994, 0.32 fish per household in 1998, 0.53 fish per household in 2002, and 0.94 fish per household in 1999, excluding the years 2020-2023. The number of fall chum salmon used per household averaged 9.75 fish in 1990-1994, an average of 4.52 fish per household in 1995-1999, 6.15 fish per household in 2000-2004, 7.74 fish per household in 2005-2009, 6.28 fish per household in 2010-2014, and 7.58 fish per household in 2015-2019. Territory 5 household use rates fell to 0.34

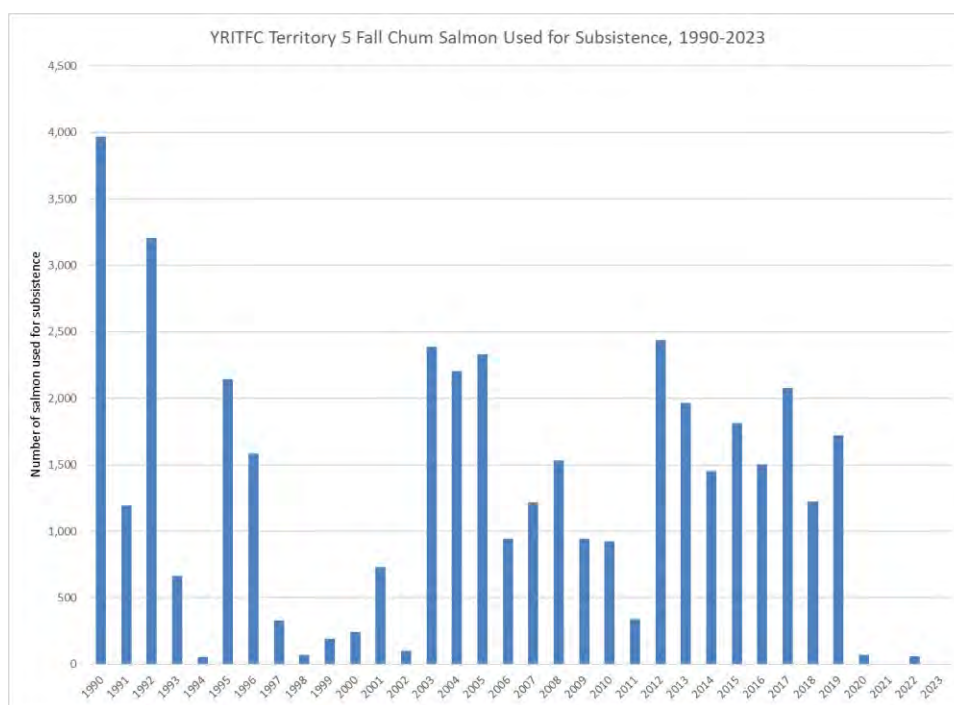


Figure A41. YRITFC Territory 5 subsistence uses of fall chum salmon, 1990-2023.

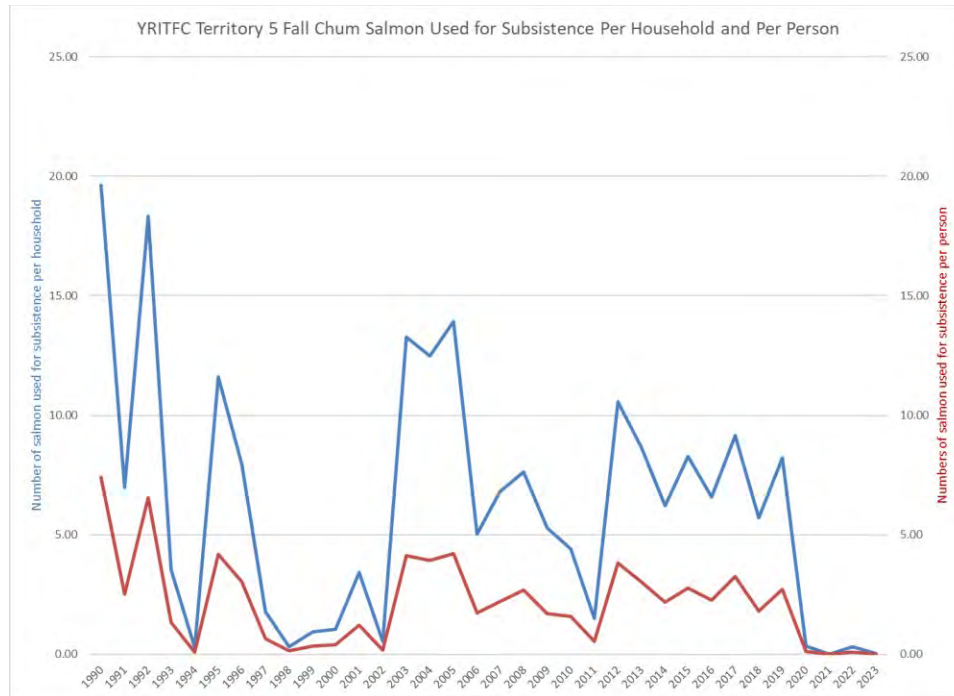


Figure A42. YRITFC Territory 5 subsistence uses of fall chum salmon per household and per person, 1990-2023.

fall chum salmon per household in 2020, zero fish per household in 2021, 0.33 fish per household in 2022, and 0.02 fish per household in 2023. Territory 5 household use rates of fall chum salmon ranged from 0.29 fish per household to 19.63 fish per household in the 1990s, exceeding 10 fish per household only in 1990 (19.63 fish per household), 1992 (18.34 fish per household), and 1995 (11.61 fish per household). Household use rates in the 2000s ranged from 0.53 fall chum salmon in 2002 to 13.94 fish per household in 2005, exceeding 10 fish per household only in 2003-2005 (13.28, 12.49, and 13.94 fish per household, respectively). In the 2010s, Territory 5 household rates of use of fall chum salmon ranged from 1.51 fish per household in 2011 to 10.57 fish per household in 2012, the only year in the 2010s where uses of fall chum salmon exceeded 10 fish per household.

Territory 5 per capita uses of Yukon River fall chum salmon ranged from highs of 7.40 fish per person in 1990 and 6.57 fish per person in 1992 to lows of 0.10 fish per person in 1994, 0.14 fish per person in 1998, and 0.18 fish per person in 2002, excluding the years 2020-2023. The 1990-1994 average per capita rates of fall chum salmon use were 3.58 fish per person, an average of 1.67 fish per person in 1995-1999,

1.97 fish per person in 2000-2004, 2.51 fish per person in 2005-2009, 2.23 and 2.57 fish per person in 2010-2014 and 2015-2019, respectively. In 2020, per capita uses of fall chum salmon in Territory 5 were

0.11 fish per person, followed by zero fish per person in 2021, 0.10 fish per person in 2022, and 0.01 fish per person in 2023.

Territory 6

Figure A43 shows the subsistence harvest composition for communities in YRITFC Territory 6 for which comprehensive subsistence harvest data are available. Territory 6

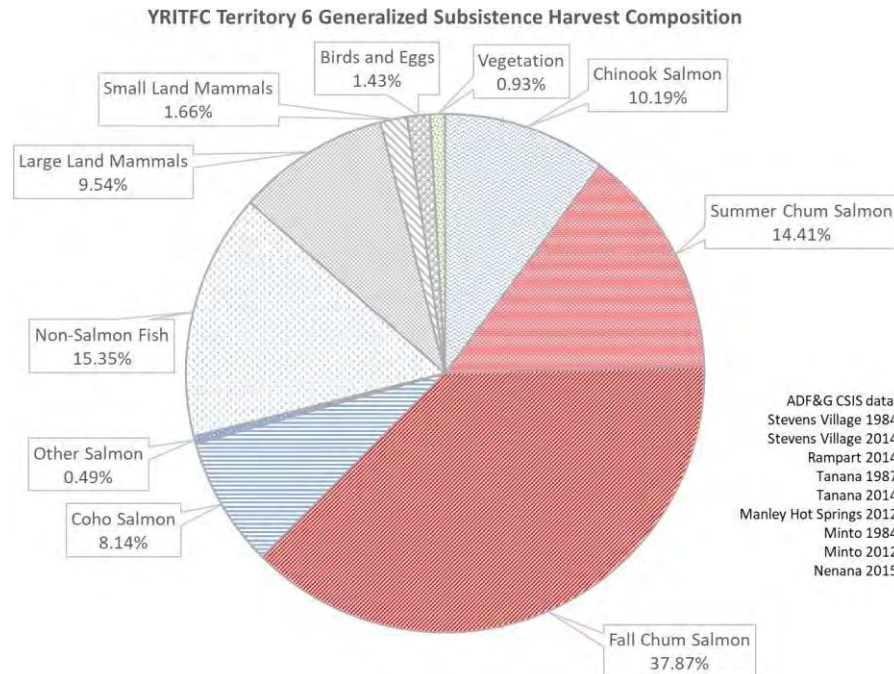


Figure A43. YRITFC Territory 6 generalized subsistence harvest composition (in edible pounds).

communities include Stevens Village (data years 1984, 2014), Rampart (2014), Tanana (1987, 2014), Manley Hot Springs (2012), Minto (1984, 2012), and Nenana (2015). Territory 6 residents depend upon salmon for 71.10% of their total subsistence harvests, including 52.28% chum salmon (14.41% summer chum salmon and 37.87% fall chum salmon), 10.19% Chinook salmon, 8.14% coho salmon, and 0.49% other salmon. After salmon, the next largest contributions to the overall subsistence economy in Territory 6 communities is non-salmon fishes (15.35%) and large land mammals (9.54%).

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from commercial fishing efforts among all Territory 6 tribal communities in 1990-2023.

Figure A44 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence in Territory 6. Figure A44 demonstrates an overall declining trend in the number of salmon used for subsistence in Territory 6. Yukon River fall chum salmon dominates the subsistence uses of salmon in YRITFC Territory 6 representing an average of 60% fall chum salmon during 1990-1994 and 1995-1999, 46% fall chum salmon in 2000-2004, 62% fall chum salmon in 2005-2009, 68% fall chum salmon in 2010-2014, and an average of 70% fall chum salmon in 2015-2019. The proportion of total subsistence uses of salmon contributed by fall chum salmon in Territory 6 ranged from a high of 75% in 2014 to lows of 33% in 2001 and 2002 and 35% in 2000, excluding the years 2020-2023. During 2020-2023, an average of 26% of Territory 6 subsistence uses were of fall chum salmon, including 27% in 2020, 24% in 2021, 12% in 2022, and 41% in 2023.

The proportion of total subsistence salmon uses contributed by summer chum salmon in Territory 6 ranged from highs of 20% in 1993 and 2013 to lows of 4% in 2019, 5% in 2001 and 2010, and

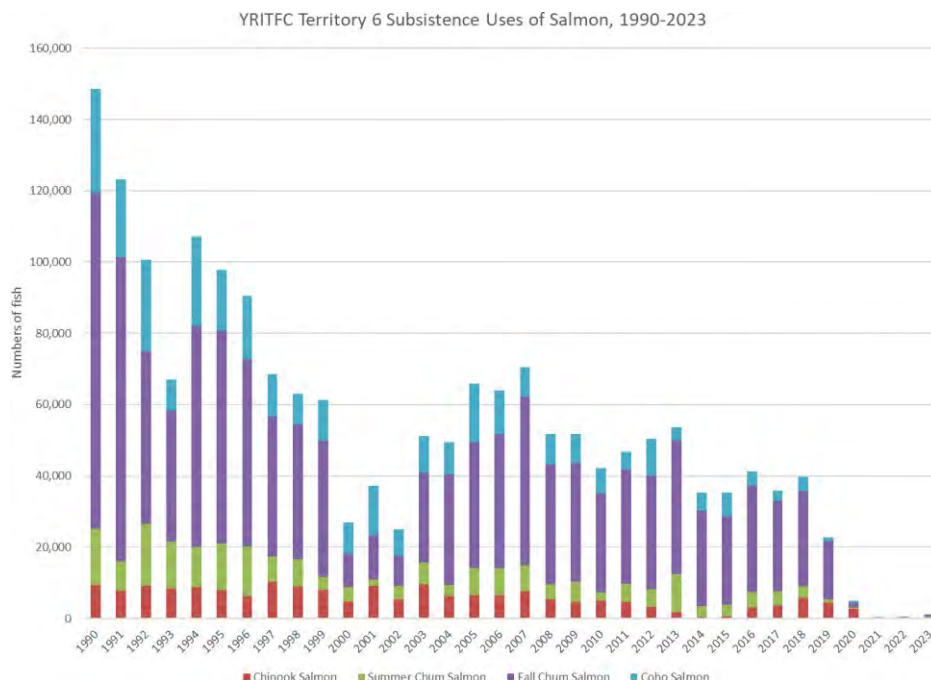


Figure A44. YRITFC Territory 6 subsistence uses of salmon, 1990-2023.

6% in 1999 and 2004. In Territory 6, the average proportion of total salmon uses contributed by summer chum salmon was 12% in the 1990-1994 and 1995-1999 periods, followed by a 2000-2004 average of 10%, an average of 11% summer chum salmon in 2005-2009 and 2010-2014, and 9% summer chum salmon in 2015-2019. The proportion of Territory 6 total subsistence uses of salmon contributed by summer chum salmon in 2020-2023 averaged 14%.

Excluding the years 2020-2023, the proportion of Chinook salmon used in Territory 6 ranged from highs of 25% in 2001 and 22% in 2002 to lows of <1% in 2014, 2% in 2015, and 3% in 2013. In 2020-2023, Chinook salmon represented an average of 47% of total subsistence uses of salmon in Territory 6. The proportion of total salmon uses contributed by coho salmon ranged from a high of 37% in 2001 to lows of 3% in 2023, 4% in 2019, and 7% in 2013.

Figure A45 represents Territory 6 subsistence uses of summer chum salmon and Figure A46 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series. Figure A45 demonstrates an overall declining trend in summer chum salmon uses for subsistence with considerable interannual variation with low levels of uses in the early 2000s and early 2020s. Excluding 2020-2023, the number of summer chum salmon used in YRITFC Territory 6 ranged from a high of 17,354 fish in 1992 to lows of 942 summer chum salmon in 2019, 1,783 fish in 2001, and 2,240 fish in 2010. The 1990-2023 average number of summer chum salmon annually used for subsistence was 6,014 fish in Territory 6, representing an average of 7% of the total uses among all territories. The 1990-1994 five-year average number of summer chum salmon used for subsistence was 13,151 fish, followed by 9,031 summer chum salmon in 1995-1999, an average of 3,752 and 6,410 fish in 2000-2004 and 2005-2009, respectively. The 2010-2014 average number of summer chum salmon used in Territory 6 was 5,250 fish, followed by 3,149 fish in 2015-2019. In 2020, 372 summer chum salmon were used in Territory 6, followed by 23 in 2021, 39 in 2022, and 306 in 2023.

Territory 6 household use rates of summer chum salmon ranged from highs of 38.75 fish per household in 1992, 35.23 fish per household in 1990, and 33.54 fish per household in 1996 to lows of 1.07 fish per household in 2019, 3.72 fish per household in 2018, and 4.05 fish per household in 2001, if 2021-2023 are excluded. The number of summer chum salmon used per household averaged 29.33 fish per household in 1990-1994, 21.56 fish per household in 1995-1999, 8.87 fish per household in 2000-2004, 16.10 fish per household in 2005-2009, 12.12 fish per household in 2010-2014, and 4.37 fish per household in 2015-2019. Household use rates fell to 0.45 summer chum salmon per household in 2020, 0.03 fish per household in 2021, 0.05 fish per household in 2022, and 0.38 fish per household in 2023. During the 1990s, the number of summer chum salmon used per Territory 6 household exceeded 30 fish per household in 1990, 1992, 1995, and 1997 and exceeded 20 fish per household in 1993 and 1994. In the 2000s, household use rates of summer chum salmon exceeded 10 fish per household in 2003 and 2005-2009, otherwise reflected low rates of use coinciding with the poor chum salmon returns of the early 2000s (e.g., 8.54 fish per household in 2000, 4.05 in 2001, 9.03 in 2002, and 7.98 summer chum salmon per household in 2004). In the 2010s, the number of summer chum salmon used per household exceeded 10 fish only in 2011-2013, otherwise, household rates of summer chum salmon use for subsistence were some of the lowest on record declining annually from 7.69 fish per household in 2014 to 0.03 fish per household in 2021.

Territory 6 per capita uses of summer chum salmon averaged 10.76 fish per person in 1990-1994,

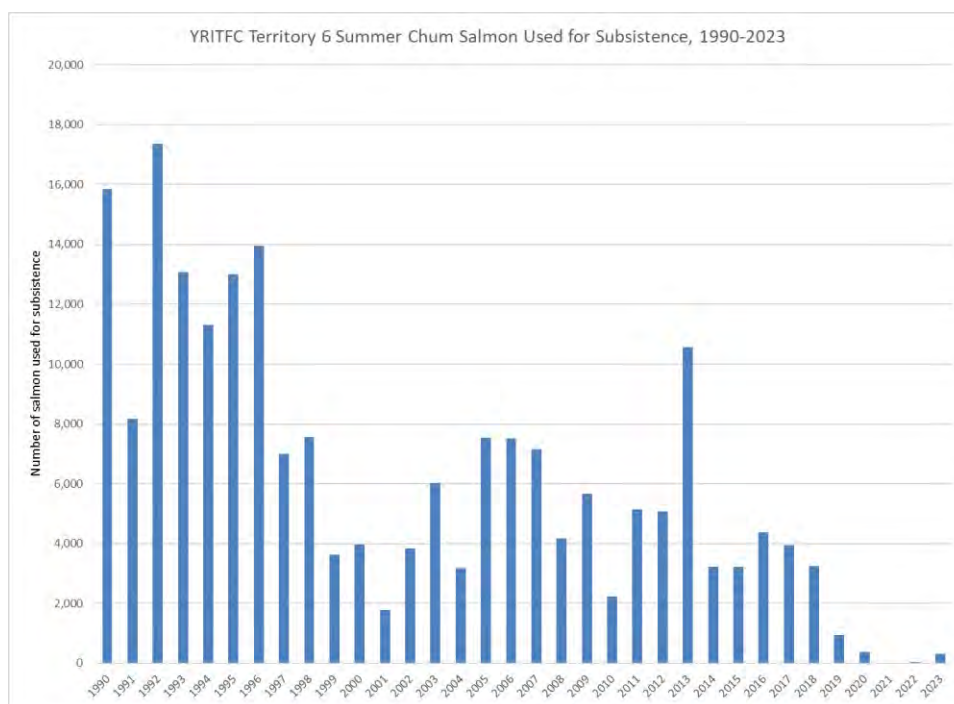


Figure A45. YRITFC Territory 6 subsistence uses of summer chum salmon, 1990-2023.

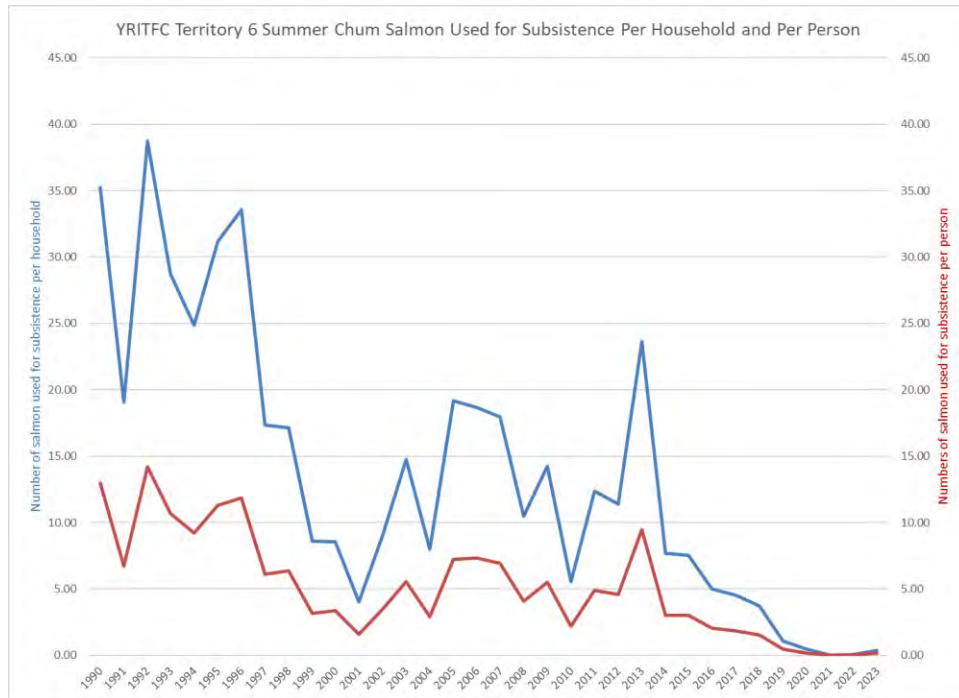


Figure A46. YRITFC Territory 6 subsistence uses of summer chum salmon per household and per person, 1990-2023.

7.77 fish per person in 1995-1999, 3.38 fish per person in 2000-2004, 6.22 fish per person in 2005-2009, 4.84 fish per person in 2010-2014, and 1.78 fish per person in 2015-2019. In 2020-2023, per capita uses of summer chum salmon were 0.19, 0.01, 0.02, and 0.16 fish per person, respectively. The number of summer chum salmon used per person for subsistence exceeded 10 fish in the 1990s, except for 1991 (6.74 fish per person), 1994 (9.19 fish per person), and 1997-1999 (6.11, 6.37, and 3.18 fish per person, respectively). Per capita uses of summer chum salmon exceeded 2 fish per person in the 2000s and 2010s, except in 2001 (1.61 fish per person) and 2017-2019 (1.86, 1.55, and 0.45 fish per person, respectively).

Figure A47 represents Territory 6 subsistence uses of fall chum salmon and Figure A48 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. Figure A47 demonstrates an overall declining trend in fall chum salmon uses for subsistence with low levels of uses in the early 2000s and early 2020s. The number of fall chum salmon used in YRITFC Territory 6 ranged from highs of 94,453 fish in 1990, 85,601 fish used in 1991, and 62,075 fish in 1994 to lows of 8,372 fall chum salmon used in 2002, 9,404 fish in 2000, 12,462 fish in 2001, and 16,408 fish used in 2019, excluding the years 2020-2023.

The 1990-2023 average number of fall chum salmon annually used for subsistence was 32,654 fish in Territory 6, representing an average of 45% of the total uses among all territories. The 1990-1994 five-year average of number of fall chum salmon used for subsistence in Territory 6 was 65,461 fish, followed by 45,545 fall chum salmon in 1995-1999, 17,331 fish in 2000-2004, 37,451 fall chum salmon in 2005-2009, an average of 31,253 fall chum salmon in 2010-2014, and 24,623 fish in 2015-2019. Territory 6 subsistence uses of fall chum salmon exceeded 40,000 fish in the 1990s, except in 1993 (36,682 fish), 1997 (39,336 fish), 1998 (37,829 fish), and 1999 (38,222 fish). In the 2000s, the number of fall chum salmon used for subsistence in Territory 6 exceeded 30,000 fish, except in 2000-2003 (9,404, 12,462,

8,372, and 25,348 fall chum salmon used, respectively). In the 2010s, fall chum salmon uses exceeded 25,000 fish, except in 2015 (24,801 fish) and 2019 (16,408 fish). In 2020, 1,369 fall chum were used in Territory 6, followed by 80 fish in 2021, 52 fish in 2022, and 401 fall chum salmon were used in 2023.

Territory 6 household use rates of fall chum salmon varied considerably throughout the 1990-2023 time series from highs of 209.90 fish per household in 1990, 200.29 fish per household in 1991, and 136.45 fish per household in 1994 to lows of 18.68 fish per household in 2019, 19.77 fish per household in 2002, and 20.27 fish per household in 2000, excluding the years 2020-2023. The number of fall chum salmon used per household averaged 147.09 fish in 1990-1994, an average of 108.65 fish per household in 1995-1999, 41.70 fish per household in 2000-2004, 94.05 fish per household in 2005-2009, 73.14 fish per household in 2010-2014, and 34.06 fish per household in 2015-2019. Territory 6 household use rates fell to 1.64 fall chum salmon per household in 2020, 0.10 fish per household in 2021, 0.07 fish per household in 2022, and 0.50 fish per household in 2023. Territory 6 household use rates of fall chum salmon ranged from 80.56 fish per household to 209.90 fish per household in the 1990s and exceeded 90 fish per household except in 1993 and 1998 with 80.56 and 85.86 fish per household, respectively. Household use rates in the 2000s ranged from 19.77 fall chum salmon in 2002 to 119.04 fish per household in 2007, exceeding 60 fish per household except in 2000-2002 (20.27, 28.29, and 19.77 fish per household, respectively). In the 2010s, Territory 6 household rates of use of fall chum salmon ranged from 18.68 fish per household in 2019 to 84.36 fish per household in 2013 and exceeded 50 fish per household except in 2016-2019 (33.98, 29.29, 30.58, and 18.68 fish per household, respectively).

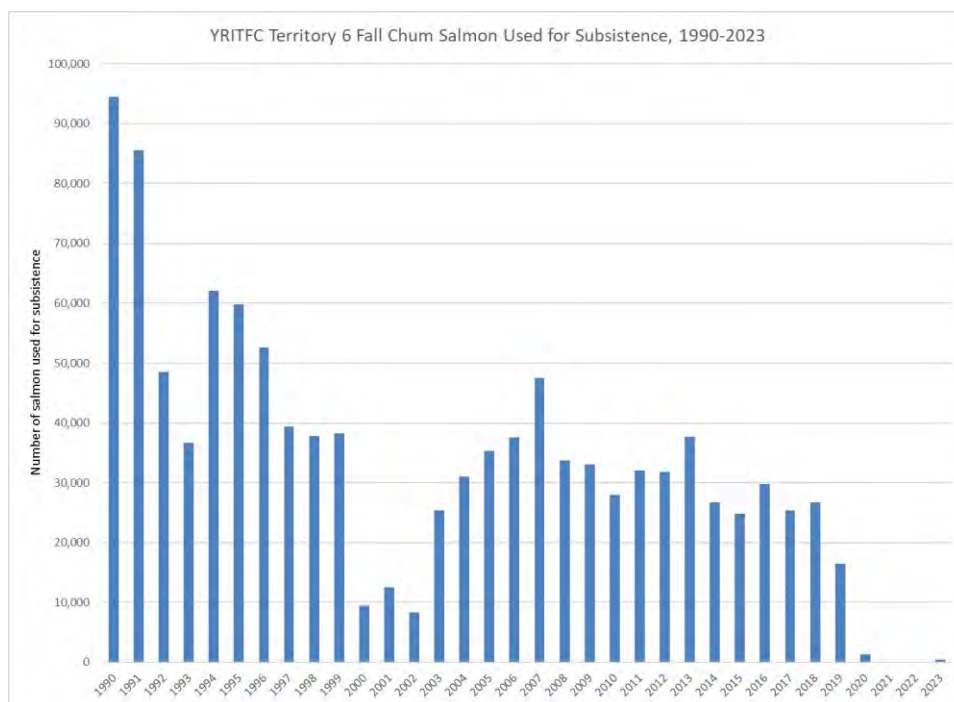


Figure A47. YRITFC Territory 6 subsistence uses of fall chum salmon, 1990-2023.

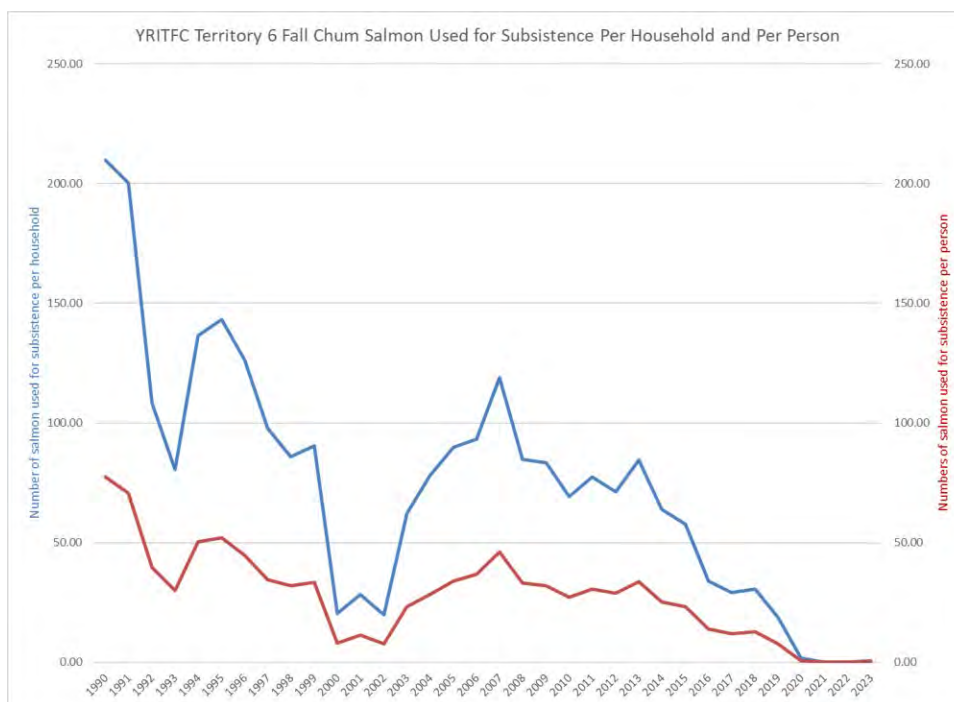


Figure A48. YRITFC Territory 6 subsistence uses of fall chum salmon per household and per person, 1990-2023.

Territory 6 per capita uses of Yukon River fall chum salmon ranged from highs of 77.29 fish per person in 1990 and 70.74 fish per person in 1991 to lows of 7.60 fish per person in 2002, 7.75 fish per person in 2019, 7.60 fish per person in 2002, and 8.02 fish per person in 2000, excluding the years 2020-2023. The 1990-1994 average per capita rates of fall chum salmon use were 53.65 fish per person, an average of 39.27 fish per person in 1995-1999, 15.72 fish per person in 2000-2004, 36.38 fish per person in 2005-2009, 29.14 fish per person in 2010-2014, and 13.92 fish per person in 2015-2019. In 2020, per capita uses of fall chum salmon in Territory 6 were 0.69 fish per person, followed by 0.04 fish per person in 2021, 0.03 fish per person in 2022, and 0.22 fish per person in 2023.

Territory 7

Figure A49 shows the subsistence harvest composition for communities in YRITFC Territory 7 for which comprehensive subsistence harvest data are available. Territory 7 communities include Birch Creek (data year 2018), Fort Yukon (1987, 2017), Beaver (1985, 2011), and Venetie (2009). Territory 7 residents depend upon salmon for 57.82% of their total subsistence harvests, including 35.03% chum salmon (12.62% summer chum salmon, 20.77 fall chum salmon, and 1.64% unknown chum salmon) and 22.50% Chinook salmon. After salmon, the next largest contributions to the overall subsistence economy in Territory 7 are large land mammals (23.71%), non-salmon fishes (10.24%), and birds and eggs (4.13%).

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from commercial fishing efforts among all Territory 7 tribal communities in 1990-2023.

Figure A50 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence in Territory 7. Figure A50 demonstrates considerable variability in salmon uses during the 1990-2023 time series, but generally represents an overall declining trend in the number

of salmon used for subsistence in Territory 7. Yukon River fall chum salmon dominates the subsistence uses of salmon in YRITFC Territory 7, representing an average of 48% fall chum salmon during 1990-1994, 70% fall chum in 1995-1999, an average of 51% fall chum salmon in 2000-2004, 61% fall chum salmon in 2005-2009, 81% fall chum salmon in 2010-2014, and an average of 72% fall chum salmon in 2015-2019. The proportion of total subsistence uses of salmon contributed by fall chum salmon in Territory 7 ranged from highs of 96% in 2014, 91% in 2013 and 2015, and 87% in 2016 to lows of 23%

and 25% in 2000 and 1991, respectively, excluding the years 2020-2023. During 2020-2023, an average of 56% of Territory 7 subsistence uses were of fall chum salmon, including 14% in 2020, 23% in 2021, 98% in 2022, and 89% in 2023.

The proportion of total subsistence salmon uses contributed by summer chum salmon in Territory 7 ranged from highs of 54% in 1991 and 21% in 2006 to lows of <1% in 1998, 2005, 2012-2017, and 2019-2023. In Territory 7, the average proportion of total salmon uses contributed by summer chum salmon was 22% in the 1990-1994, an average of 3% summer chum salmon in 1995-1999, followed by a 2000-2004 average of 11% summer chum, 8% summer chum salmon in 2005-2009, an average of 4% in 2010-2014, dropping to an average of 0.58% summer chum salmon in 2015-2019. The proportion of Territory 7 total subsistence uses of salmon contributed by summer chum salmon in 2020-2023 averaged 0.29%.

Excluding the years 2020-2023, the proportion of Chinook salmon used in Territory 7 ranged from highs of 64% in 2000, 46% in 2018, and 40% in 1992 and 1993 to lows of 1% in 2014, 8%

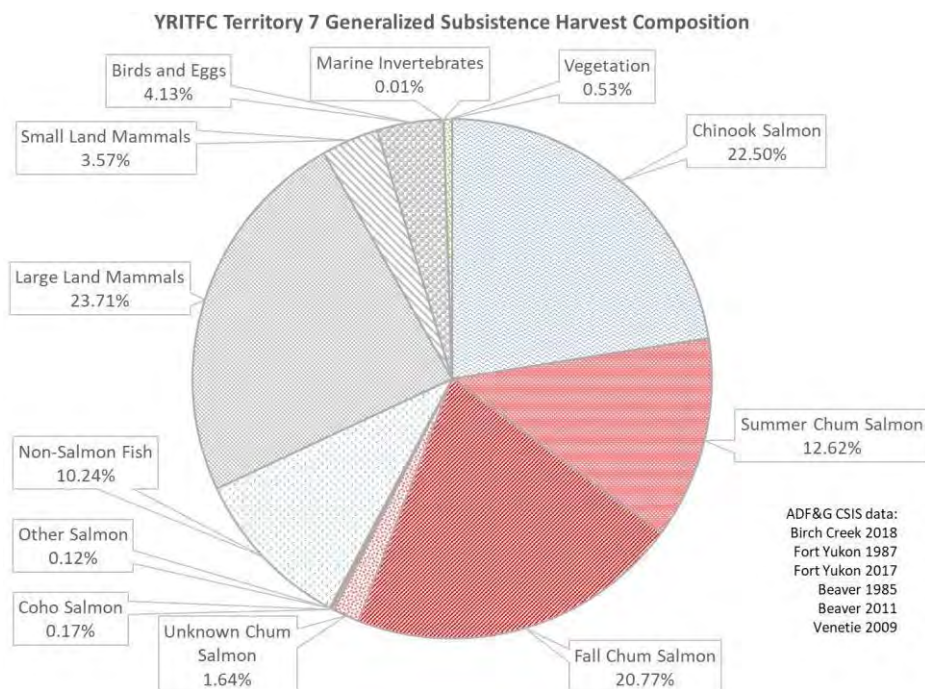


Figure A49. YRITFC Territory 7 generalized subsistence harvest composition (in edible pounds).

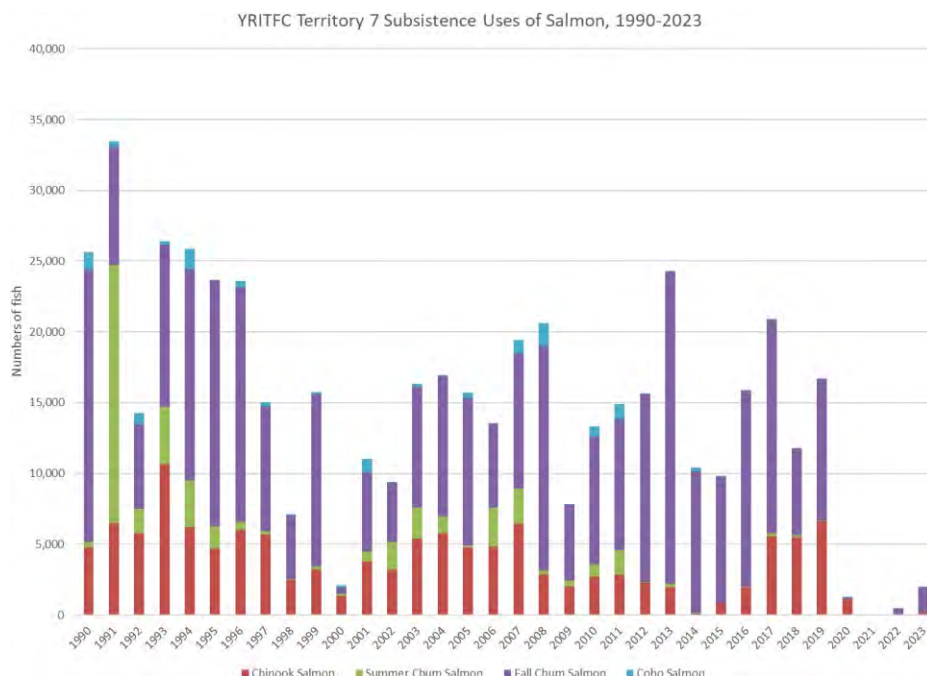


Figure A50. YRITFC Territory 7 subsistence uses of salmon, 1990-2023.

in 2013, and 9% in 2015. In 2020-2023, Chinook salmon represented an average of 43% of total subsistence uses of salmon in Territory 7 (i.e. 85% in 2020, 77% in 2021, <1% in 2022, and 9% Chinook salmon in 2023). The proportion of total salmon uses contributed by coho salmon ranged from highs of 9% in 2001 and 8% in 2008 to lows of 1% or less in 1991, 1993, 1995, 1998-1999, 2002, 2004, 2006, 2009, 2012-2013, 2015-2023.

Figure A51 represents Territory 7 subsistence uses of summer chum salmon and Figure A52 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series. Figure A51 demonstrates the relative lack of use of summer chum salmon in Territory 7 in the past decade with higher levels of use in the 1990s and 2000s, particularly in 1991 when 54% of subsistence salmon

uses were of summer chum salmon. Excluding 2020-2023, the number of summer chum salmon used in YRITFC Territory 7 ranged from a 1991 high of 18,222 fish to lows of zero summer chum salmon in 2015, 27 fish in 2012, 35 fish in 2014 and 2016, 39 fish in 2019, and 45 fish in 1998. The 1990-2023 average number of summer chum salmon annually used for subsistence was 1,354 fish in Territory 7, representing an average of 1.5% of the total uses among all territories. The 1990-1994 five-year average number of summer chum salmon used for subsistence in Territory 7 was 5,530 fish, followed by an average of 540 summer chum salmon in 1995-1999, 1,234 fish in 2000-2004, 1,236 fish in 2005-2009, 574 fish in 2010-2014, and an average of 87 summer chum salmon fish in 2015-2019. In 2020, zero summer chum salmon were used in Territory 7, followed by zero in 2021, 4 fish in 2022, and 7 fish in 2023.

Territory 7 household use rates of summer chum salmon ranged from a high of 49.92 fish per household in 1991 to lows less than one summer chum salmon per household in 1990, 1997-2000, 2005, 2008, and 2012-2023. The number of summer chum salmon used per household averaged 15.10 fish per household in 1990-1994, 1.57 fish per household in 1995-1999, 4.49 fish per household in 2000-2004, 4.43 fish per

household in 2005-2009, 1.60 fish per household in 2010-2014, and 0.25 fish per household in 2015-2019. Household use rates of summer chum salmon exceeded 10 fish per household only in 1991, 1993, and 2006.

Territory 7 per capita uses of summer chum salmon averaged 5.31 fish per person in 1990-1994, 0.52 fish per person in 1995-1999, 1.28 fish per person in 2000-2004, 1.29 fish per person in 2005-2009, 0.61 fish per person in 2010-2014, and 0.10 fish per person in 2015-2019. Territory 7 per capita uses of summer chum salmon were zero in 2020-2022 and 0.01 fish per person in 2023. Territory 7 per capita uses of summer chum salmon exceeded 2 fish per person only in 1991 (17.74 fish per person), 1993 (3.73 fish per person), 1994 (3.10 fish per person), 2003 (2.32 fish per person), 2006 (2.88 fish per person), and 2007 (2.63 fish per person).

Figure A53 represents Territory 7 subsistence uses of fall chum salmon and Figure A54 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. Figure A53 demonstrates considerable interannual variation in fall chum salmon uses. The number of fall chum salmon used in YRITFC Territory 7 ranged from highs of 22,063 fish in 2013, 19,251 fish used in 1990, 17,357 fish in 1995, 16,578 fish in 1996, and 15,858 fish in 2008 to lows of 485 fish in 2000, 4,208 fish in 2002, and 4,535 fish in 1998, excluding the years 2020-2023.

The 1990-2023 average number of fall chum salmon annually used for subsistence was 9,275 fish in Territory 7, representing an average of 13% of the total uses among all territories. The 1990-1994 five-year average of number of fall chum salmon used for subsistence in Territory 7 was

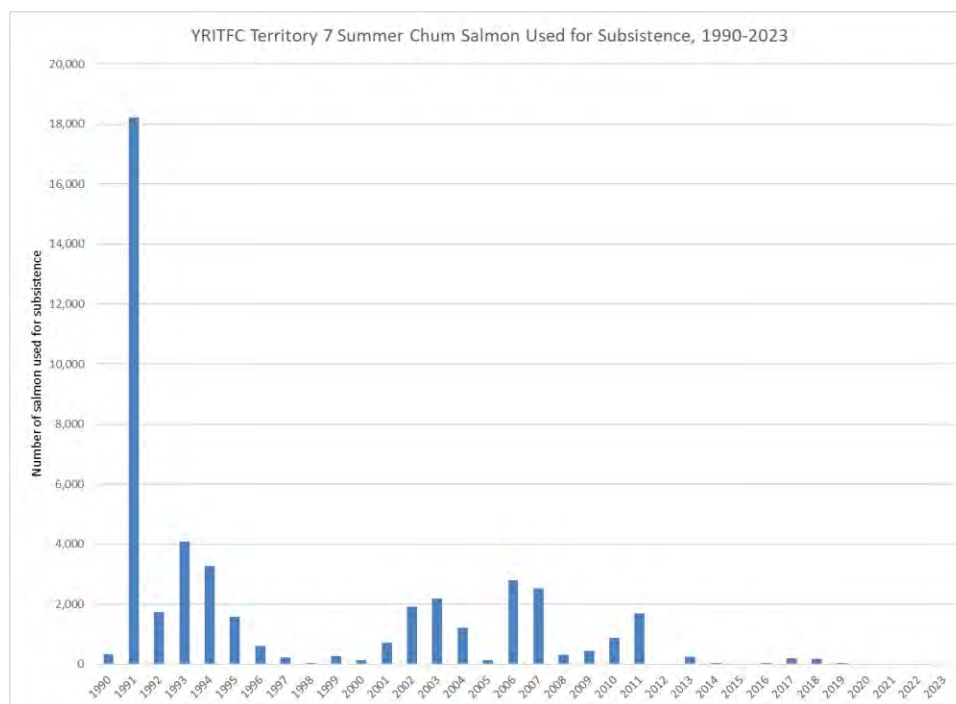


Figure A51. YRITFC Territory 7 subsistence uses of summer chum salmon, 1990-2023.

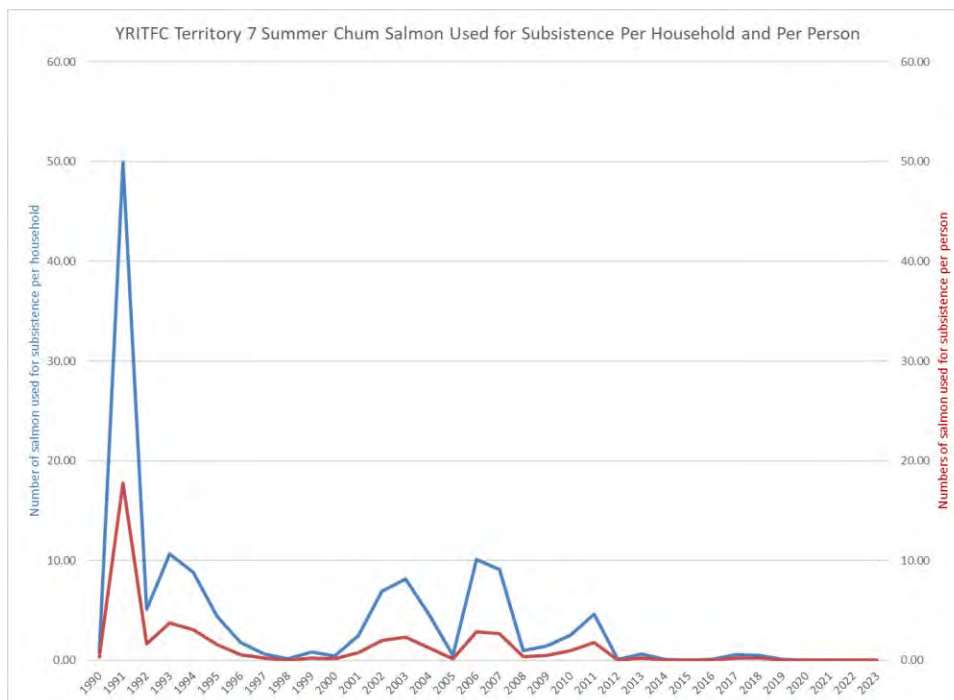


Figure A52. YRITFC Territory 7 subsistence uses of summer chum salmon per household and per person, 1990-2023.

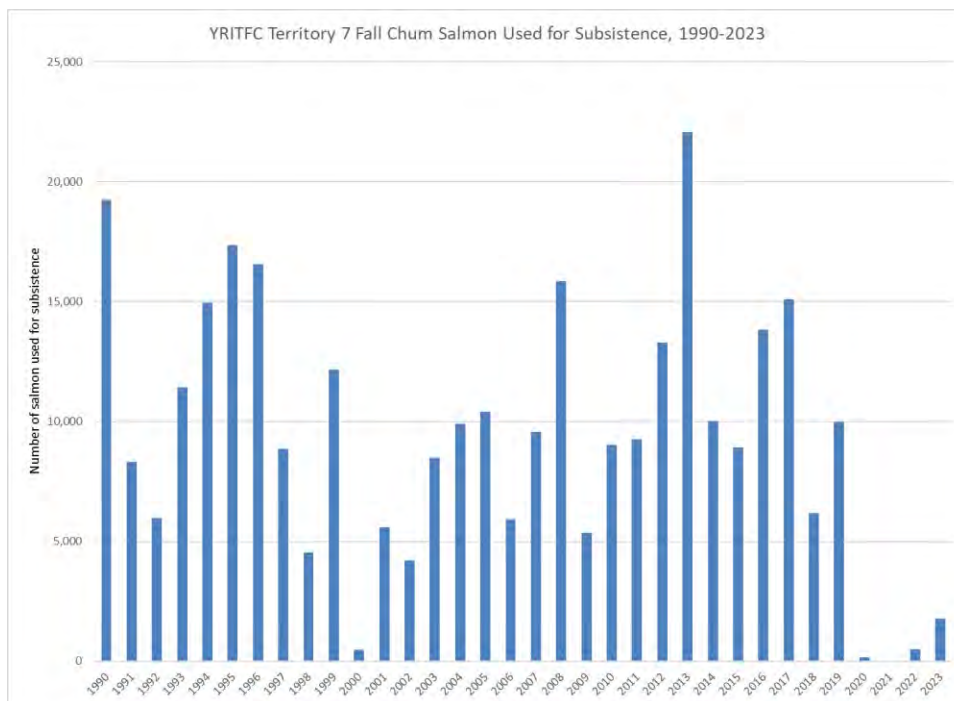


Figure A53. YRITFC Territory 7 subsistence uses of fall chum salmon, 1990-2023.

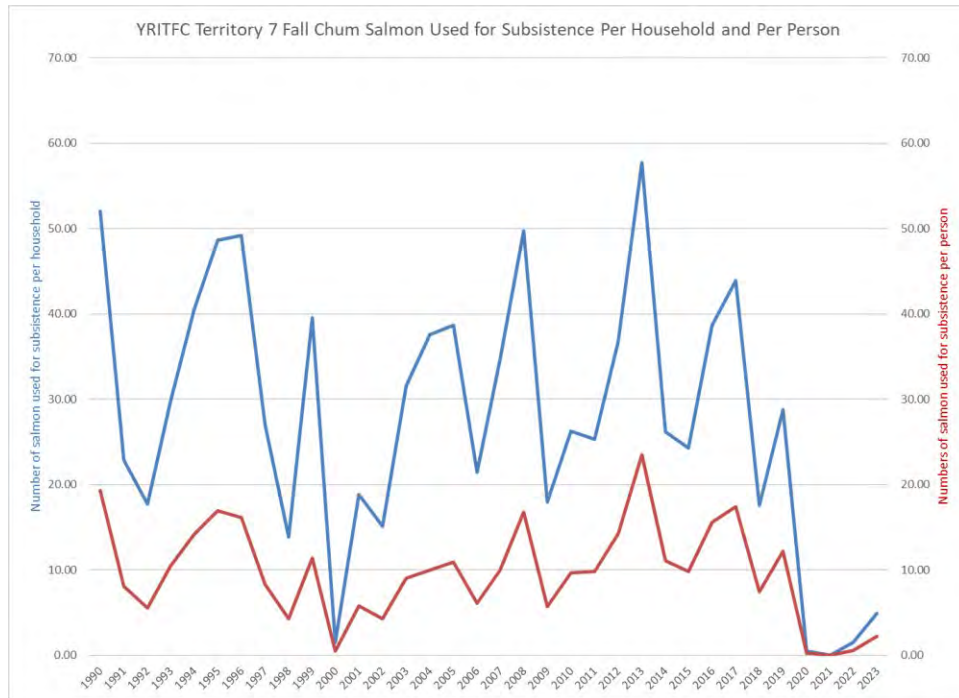


Figure A54. YRITFC Territory 7 subsistence uses of fall chum salmon per household and per person, 1990-2023.

11,989 fish, followed by 11,901 fall chum salmon in 1995-1999, 5,738 fish in 2000-2004, 9,419 fish in 2005-2009, an average of 12,729 fall chum salmon in 2010-2014, and 10,802 fish in 2015-2019. Territory 7 subsistence uses of fall chum salmon exceeded 10,000 fish in the 1990s, except in 1991 (8,332 fish), 1992 (5,985 fish), 1997 (8,862 fish), and 1998 (4,535 fish). In the 2000s, the number of fall chum salmon used for subsistence in Territory 7 exceeded 10,000 fish only in 2005 (10,405 fish) and 2008 (15,858 fish), otherwise exceeded 5,000 fall chum salmon in all years except in 2000 (485 fish) and 2002 (4,208 fish). In the 2010s, fall chum salmon uses exceeded 10,000 fish in 2012-2014 (13,290 fish, 22,063 fish, and 10,011 fish, respectively), otherwise exceeded 8,000 fish in all years except 2018 (6,172 fish). In 2020, 176 fall chum were used in Territory 7, followed by 7 fish in 2021, 497 fish in 2022, and 1,781 fish in 2023.

Territory 7 household use rates of fall chum salmon varied considerably throughout the 1990-2023 time series from highs of 57.76 fish per household in 2013 and 52.03 fish per household in 1990 to lows of 1.51 fish per household in 2000, 13.83 fish per household in 1998, and 15.14 fish per household in 2002, excluding the years 2020-2023. The number of fall chum salmon used per household averaged 32.58 fish in 1990-1994, an average of 35.63 fish per household in 1995-1999, 20.92 fish per household in 2000-2004, 32.47 fish per household in 2005-2009, 34.47 fish per household in 2010-2014, and 30.64 fish per household in 2015-2019. Territory 7 household use rates fell to 0.51 fall chum salmon per household in 2020, 0.02 fish per household in 2021, 1.52 fish per household in 2022, and 4.89 fish per household in 2023.

Territory 7 household use rates of fall chum salmon ranged from 13.83 fish per household to 52.03 fish per household in the 1990s and exceeded 20 fish per household except in 1992 and 1998 with 17.76 and 13.83 fish per household, respectively. Territory 7 household use rates of fall chum salmon during the

2000s ranged from 1.51 to 49.71 fish per household and exceeded 30 fish per household in 2003-2005 and 2007-2008, otherwise fall chum household uses exceeded 15 fish per household in the 2010s except 2000. Household use rates in the 2010s ranged from 17.58 fall chum salmon in 2018 to 57.76 fish per household in 2013, exceeding 25 fish per household in all years except 2015 (24.26 fish per household) and 2018 (17.58 fish per household).

Territory 7 per capita uses of Yukon River fall chum salmon ranged from highs of 23.50 fish per person in 2013 and 19.31 fish per person in 1990 to lows of 0.49 fish per person in 2000, 4.32 fish per person in 1998 and 2002, excluding the years 2020-2023. The 1990-1994 average per capita rates of fall chum salmon use in Territory 7 were 11.52 fish per person, an average of 11.43 fish per person in 1995-1999, 5.92 fish per person in 2000-2004, 9.90 fish per person in 2005-2009, 13.66 fish per person in 2010-2014, and 12.49 fish per person in 2015-2019. In 2020, per capita uses of fall chum salmon were 0.23 fish per person, followed by 0.01 fish per person in 2021, 0.60 fish per person in 2022, and 2.20 fish per person in 2023.

Territory 8

Figure A55 shows the subsistence harvest composition for communities in YRITFC Territory 8 for which comprehensive subsistence harvest data are available. Territory 8 communities include Dot Lake (data years 1987, 2011), Tanacross (1987), Tetlin (1987), and Northway (1987, 2014). ADF&G comprehensive subsistence research demonstrates that harvest of non-salmon fishes contributes the most to the overall subsistence economy of Territory 8 at 42.82%, followed by large land mammals (32.19%), salmon (9.41%), and small land mammals (7.10%). Documented salmon harvests in Territory 8 include other salmon (5.10%) most of which

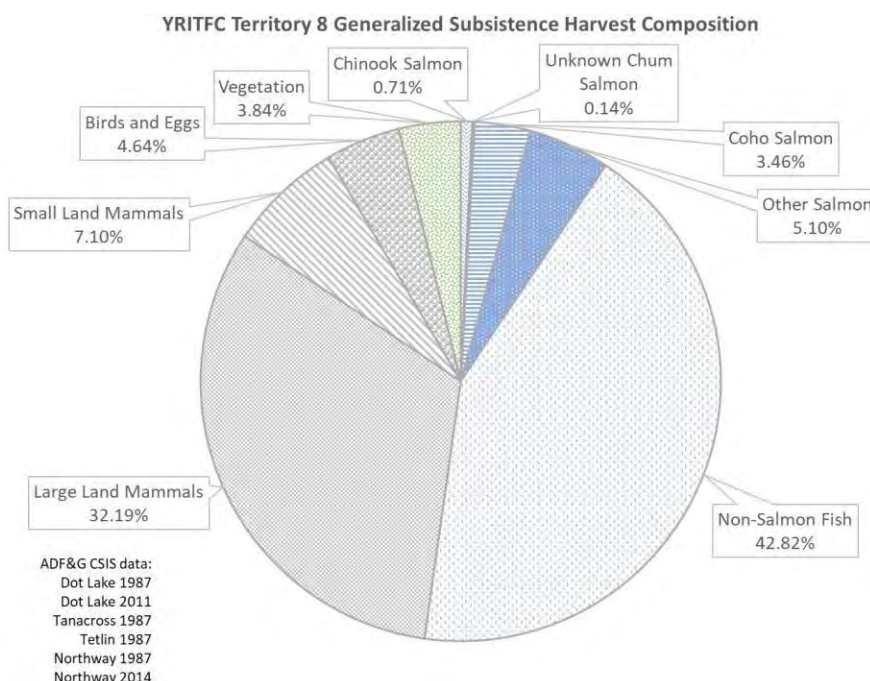


Figure A55. YRITFC Territory 8 generalized subsistence harvest composition (in edible pounds).

are Copper River sockeye salmon, coho salmon (3.46%), Chinook salmon (0.71%), and unknown chum salmon (0.14%).

Territory 8 residents of the Upper Tanana River drainage generally do not have abundant local salmon populations upon which they depend for subsistence, but instead travel elsewhere such as the Copper River, lower Tanana River, or at least formerly to the Yukon River at Eagle to harvest salmon for subsistence uses. Given the relative lack of salmon in the Upper Tanana River region, Territory 8 communities are not part of the Yukon Fisheries Management Area subsistence salmon post-season salmon household harvest survey or harvest calendar program, such that harvest and use data on salmon is very limited. Since Territory 8 is not well represented in the Yukon River subsistence salmon use data, Territory 8 is not further represented in this report.

Territory 9

Figure A56 shows the subsistence harvest composition for communities in YRITFC Territory 9 for which comprehensive subsistence harvest data are available. Territory 9 communities include Circle (data year 2017) and Eagle (2017), the only Alaskan member tribes of the territory for which data are readily available. Territory 9 residents depend upon salmon for 85.92% of their total subsistence harvests, including fall chum salmon (74.24%), Chinook salmon (11.57%), and other salmon (0.11%). After salmon, the next largest contributions to the overall subsistence economy in Territory 9 are large land mammals (10.33%) and non-salmon fishes (1.41%). Given that Figure 21 reflects only subsistence harvest patterns in 2017 for both Eagle and Circle, undoubtedly Chinook salmon would otherwise contribute more to the subsistence

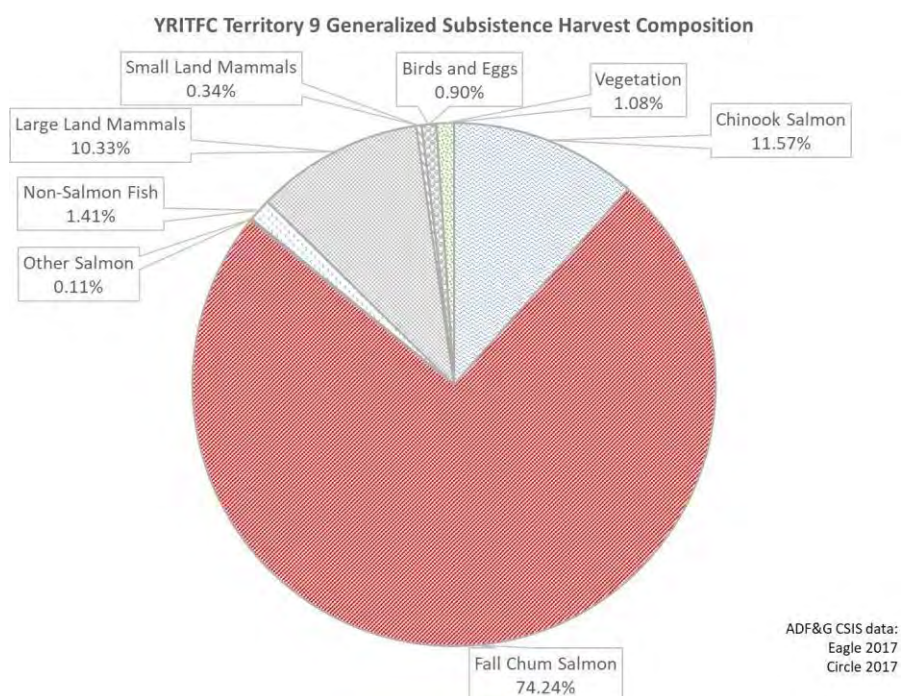


Figure A56. YRITFC Territory 9 generalized subsistence harvest composition (in edible pounds).

economy of Territory 9 if it were not for the many years of conservation concern associated with Yukon River Chinook salmon.

ADF&G post-season household surveys document subsistence salmon harvests, the number of salmon received from in-season test fisheries for subsistence uses, and the number of salmon retained from commercial fishing efforts among all Territory 9 tribal communities in 1990-2023.

Figure A57 illustrates the number of Chinook salmon, summer chum salmon, fall chum salmon, and coho salmon used for subsistence in Territory 9. Figure A57 demonstrates variability in salmon uses during the 1990-2023 time series, but generally represents an overall stability in the number of salmon used for subsistence punctuated by significant declines in 1993, 1998, and the early 2000s, and most recently in 2020-2023. Yukon River fall chum salmon dominates the subsistence uses of salmon in YRITFC Territory 9, representing an average of 77% fall chum salmon during 1990-1994, 81% fall chum in 1995-1999, an average of 55% fall chum salmon in 2000-2004, 86% fall chum salmon in 2005-2009, 96% fall chum

salmon in 2010-2014, and an average of 93% fall chum salmon in 2015-2019. The proportion of total subsistence uses of salmon contributed by fall chum salmon in Territory 9 ranged from highs of 99.59% in 2014, 98% in 2012, and 97% in 2013 and 2015 to lows of 2% in 2000, 11% in 2002, and 15% in 1998, excluding the years 2020-2023. In 2020, the proportion of subsistence salmon uses was 2% fall chum

salmon and 98% Chinook salmon, recognizing that only 464 salmon were used for subsistence in 2020. In 2021, a total of 43 salmon were used in Territory 9, which were 100% Chinook salmon. In 2022, a total of 93 salmon were used with 56% Chinook salmon and 44% fall chum salmon. In 2023, no salmon were used in Territory 9.

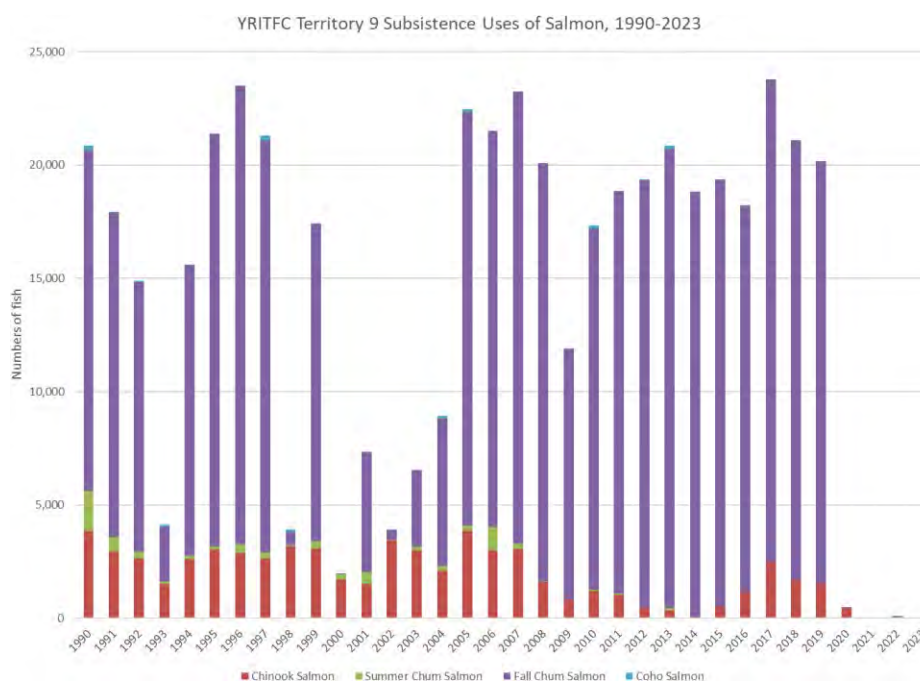


Figure A57. YRITFC Territory 9 subsistence uses of salmon, 1990-2023.

The proportion of total subsistence salmon uses contributed by summer chum salmon in Territory 9 ranged from highs of 12% in 2000 and 8% in 1990 and 2001 to lows of <1% or zero in 1994, 2002, and 2007-2023. In Territory 9, the average proportion of total salmon uses contributed by summer chum salmon was 4% in the 1990-1994, an average of 1% summer chum salmon in 1995-1999, followed by a

2000-2004 average of 4% summer chum, 2% summer chum salmon in 2005-2009, an average of 0.24% in 2010-2014, and zero percent from 2014-2023.

Excluding the years 2020-2023, the proportion of Chinook salmon used in Territory 9 ranged from highs of 89% in 2002, 87% in 2000, and 81% in 1998 to lows <1% in 2014, 2% in 2012 and 2013, and 3% in 2015. The proportion of total salmon uses contributed by coho salmon ranged from a high of 3% in 1998 to <1% or zero in all other years except 1990 (1%), 1993 (2%), and 2004 (1%).

Figure A58 represents Territory 9 subsistence uses of summer chum salmon and Figure A59 reflects the number of summer chum salmon used per household and per person during the 1990-2023 time series. Figure A58 demonstrates the relative lack of use of summer chum salmon in Territory 9 in the past decade with higher levels of use in the 1990s and 2000s. The number of summer chum salmon used in YRITFC Territory 9 ranged from a 1990 high of 1,755 fish to lows of zero summer chum salmon in 2009, 2012, 2014-2023. The 1990-2023 average number of summer chum salmon annually used for subsistence was 208 fish in Territory 9, representing an average of 0.2% of the total uses among all territories. The 1990- 1994 five-year average number of summer chum salmon used for subsistence in Territory 9 was 590 fish, followed by an average of 232 summer chum salmon in 1995-1999, 246 fish in 2000-2004, 301 fish in 2005-2009, 46 fish in 2010-2014, and zero summer chum salmon in 2015-2019.

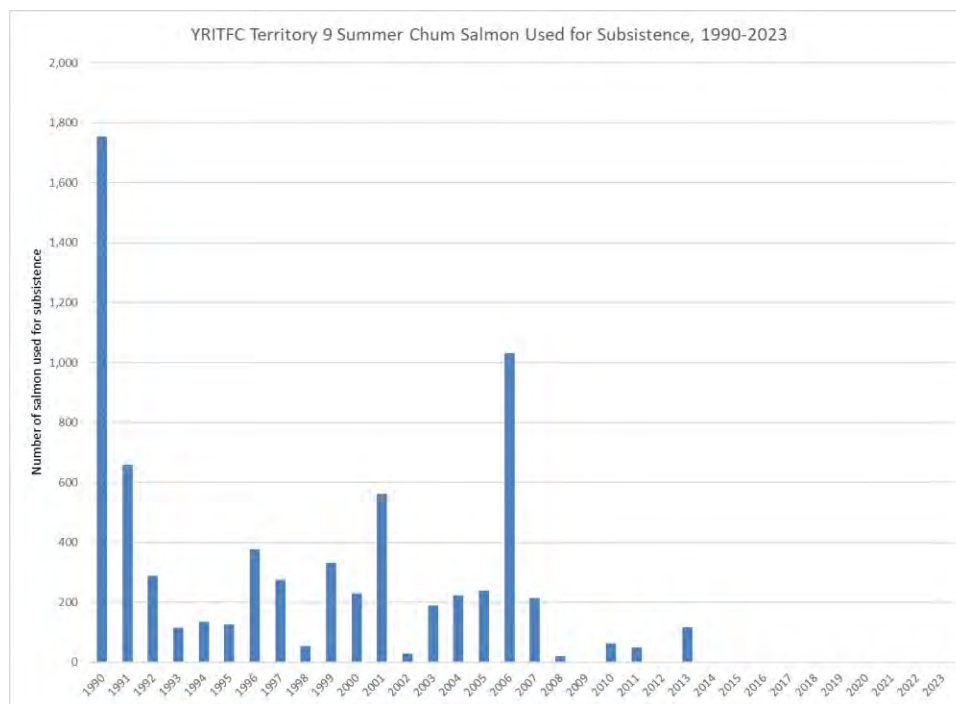


Figure A58. YRITFC Territory 9 subsistence uses of summer chum salmon, 1990-2023.

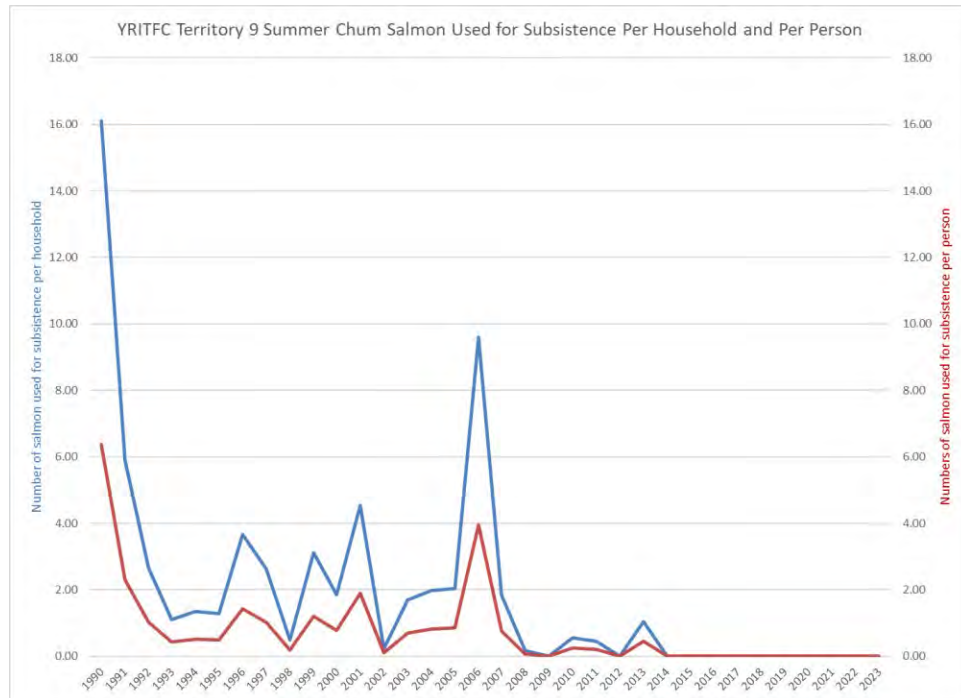


Figure A59. YRITFC Territory 9 subsistence uses of summer chum salmon per household and per person, 1990-2023.

Territory 9 household use rates of summer chum salmon ranged from a high of 16.10 fish per household in 1990 to lows less than one or zero summer chum salmon per household in 1998, 2002, 2008-2012, and 2014-2023. The number of summer chum salmon used per household averaged 5.42 fish per household in 1990-1994, 2.24 fish per household in 1995-1999, 2.05 fish per household in 2000-2004, 2.73 fish per household in 2005-2009, 0.41 fish per household in 2010-2014, and zero per household in 2015-2019 and 2020-2023. Household use rates of summer chum salmon exceeded 10 fish per household only in 1990 and exceeded 2 fish per household only in 1991 (5.89 fish per household), 1992 (2.64 fish per household), 1996 (3.66 fish per household), 1997 (2.62 fish per household), 1999 (3.12 fish per household), 2001 (4.53 fish per household), 2005 (2.04 fish per household), and 2006 (9.59 fish per household).

Territory 9 per capita uses of summer chum salmon ranged from highs of 6.36 fish per person in 1990 and 3.95 fish per person in 2006 to lows of less than one or zero fish per person in 1993-1995, 1998, 2000, 2002-2005, and 2007-2023. The number of summer chum use per person in Territory 9 averaged 2.13 fish per person in 1990-1994, 0.87 fish per person in 1995-1999, 0.86 fish per person in 2000-2004, 1.13 fish per person in 2005-2009, 0.18 fish per person in 2010-2014, and zero fish per person in 2015-2019, and 2020-2023. Territory 9 per capita uses of summer chum salmon exceeded 2 fish per person only in 1990 (6.36 fish per person), 1991 (2.30 fish per person), and 2006 (3.95 fish per person).

Figure A60 represents Territory 9 subsistence uses of fall chum salmon and Figure A61 reflects the number of fall chum salmon used per household and per person during the 1990-2023 time series. Figure A60 demonstrates considerable interannual variation in fall chum salmon uses in the 1990s and early 2000s. Territory 9 uses of fall chum salmon exceeded 15,000 fish annually in 2005-2019, except in 2009 with only 11,051 fall chum salmon used that year. Fall chum salmon uses during this time were comparable to 1995-1997 when the number of fish used were 18,217, 20,224, and 18,195 fish,

respectively. The number of fall chum salmon used in YRITFC Territory 9 ranged from highs of 21,308 fish in 2017, 20,268 in 2013, and 20,224 fish used in 1996 to lows of 32 fish in 2000, 413 fish in 2002, and 580 fish in 1998, excluding the years 2020-2023.

The 1990-2023 average number of fall chum salmon annually used for subsistence was 12,222 fish in Territory 9, representing an average of 17% of the total uses among all territories. The 1990-1994 five-year average of number of fall chum salmon used for subsistence in Territory 9 was 11,305 fish, followed by 14,246 fall chum salmon in 1995-1999, 3,124 fish in 2000-2004, 17,044 fish in 2005-2009, an average of 18,315 fall chum salmon in 2010-2014, and 19,062 fish in 2015-2019. Territory 9 subsistence uses of fall chum salmon exceeded 10,000 fish in the 1990s, except in 1993 (2,419 fish) and 1998 (580 fish). The number of fall chum salmon used for subsistence in Territory 9 exceeded 10,000 fish in 2005-2019. In 2020, 9 fall chum were used in Territory 9, followed by zero fish in 2021, 41 fish in 2022, and zero fish in 2023.

Territory 9 household use rates of fall chum salmon varied considerably throughout the 1990-2023 time series from highs of 197.04 fish per household in 1996, 184.96 fish per household in 1995, and 181.97 fish per household in 2013 to lows of 0.26 fish per household in 2000, 3.37 fish per household in 2002, and 5.39 fish per household in 1998, excluding the years 2020-2023. The number of fall chum salmon used per household averaged 105.16 fish in 1990-1994, an average of 138.69 fish per household in 1995-1999, 26.77 fish per household in 2000-2004, 149.98 fish per household in 2005-2009, 160.14 fish per household in 2010-2014, and 137.90 fish per household in 2015-2019. Territory 9 household use rates fell to 0.06 fall chum salmon per

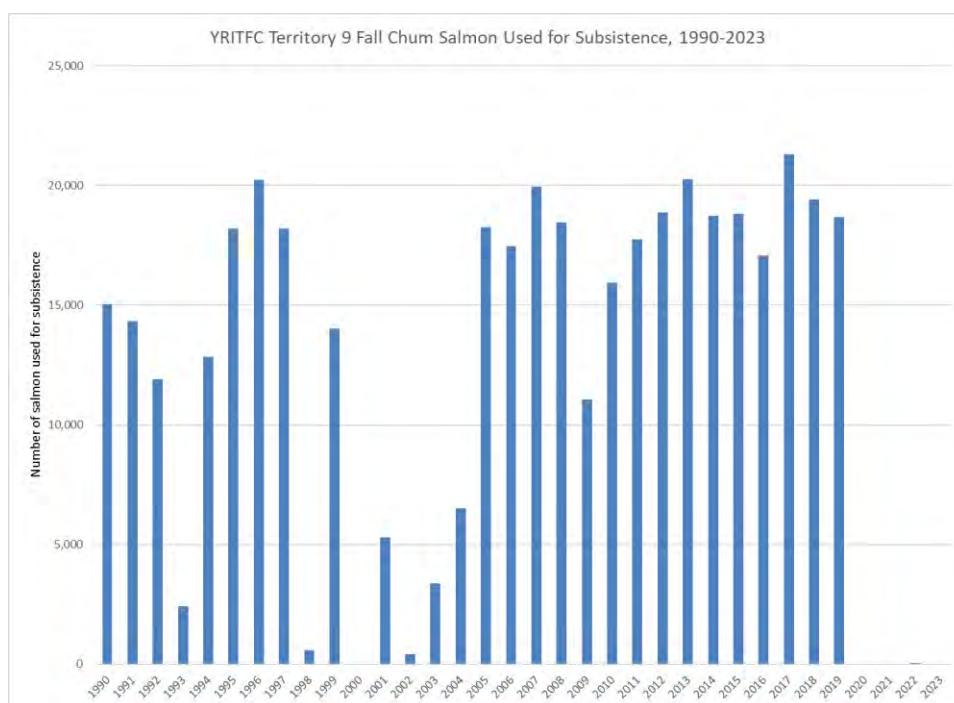


Figure A60. YRITFC Territory 9 subsistence uses of fall chum salmon, 1990-2023.

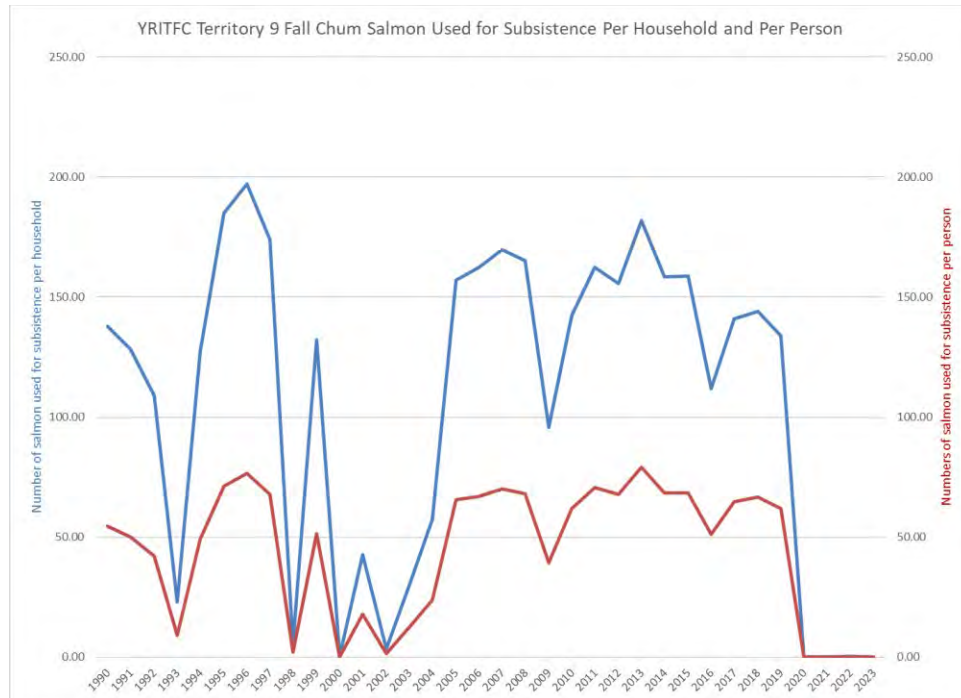


Figure A61. YRITFC Territory 9 subsistence uses of fall chum salmon per household and per person, 1990-2023.

household in 2020, zero fish per household in 2021 and 2023, and 0.28 fish per household in 2022.

Territory 9 household use rates of fall chum salmon ranged from 5.39 fish per household to 197.04 fish per household in the 1990s and exceeded 125 fish per household except in 1993 and 1998 with 23.02 and 5.39 fish per household, respectively. Territory 9 household use rates of fall chum salmon during the 2000s ranged from 0.26 to 169.81 fish per household and exceeded 125 fish per household only 2005-2008, otherwise fall chum household uses fell below 50 fish per household in 2000-2003. Household use rates in the 2010s ranged from 111.76 fall chum salmon in 2016 to 181.97 fish per household in 2013, exceeding 130 fish per household in all years except 2016.

Territory 9 per capita uses of Yukon River fall chum salmon ranged from highs of 79.17 fish per person in 2013 and 76.61 fish per person in 1996 to lows of 0.11 fish per person in 2000, 1.42 fish per person in 2002, and 2.10 fish per person in 1998, excluding the years 2020-2023. The 1990-1994 average per capita rates of fall chum salmon use in Territory 7 were 40.99 fish per person, an average of 53.82 fish per person in 1995-1999, 11.13 fish per person in 2000-2004, 61.99 fish per person in 2005-2009, 69.59 fish per person in 2010-2014, and 62.62 fish per person in 2015-2019. In 2020, per capita uses of fall chum

salmon were 0.03 fish per person, followed by zero fish per person in 2021 and 2023, and 0.15 fish per person in 2022.

CONCLUSION

This technical report serves to describe and characterize the role of Yukon River chum salmon stocks in the subsistence economies of tribal communities within the Alaskan portion of the Yukon River watershed by tribal territories established by the member tribes of the Yukon River Inter-Tribal Fish Commission.

This report serves as reference material for the Tanana Chiefs Conference Tribal Resource Stewardship

Division staff to support development of NPFMC Chum Bycatch EIS cooperating agency contributions and comments.

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Our Vision

Healthy, Strong, Unified Tribes

Our Mission

Tanana Chiefs Conference provides a unified voice in advancing sovereign tribal governments through the promotion of physical and mental wellness, education, socioeconomic development, and culture of the Interior Alaska Native people.



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