

Environmental Assessment/Regulatory Impact Review for Proposed Amendment XX to the Fishery Management Plan for the Salmon Fisheries in the EEZ Off Alaska

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Abstract: The *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* (FMP) manages the salmon fisheries in the United States Exclusive Economic Zone (EEZ; 3 nautical miles to 200 nautical miles offshore) off Alaska. The North Pacific Fishery Management Council developed this FMP under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). In 2012, the Council comprehensively revised the FMP to comply with the recent Magnuson-Stevens Act requirements, such as annual catch limits and accountability measures, and to more clearly reflect the Council's policy with regard to State of Alaska management authority for commercial and sport salmon fisheries in the EEZ. Now, in response to a United States Court of Appeals Ninth Circuit ruling, the Council is considering how to revise the FMP to manage the commercial salmon fishery that occurs in the EEZ waters of Cook Inlet that had been removed from Federal management with the 2012 revisions to the FMP. The Council is considering new management measures that comply with Magnuson-Stevens Act requirements for the Cook Inlet commercial salmon fishery in the EEZ, such as status determination criteria, annual catch limits, and accountability measures.

List of Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
1954 Act	North Pacific Fisheries Act of 1954
1992 Stocks Act	North Pacific Anadromous Stocks Act of 1992
AAC	Alaska Administrative Code
ABC	acceptable biological catch
ACL	annual catch limit
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADOR	Alaska Department of Revenue
AFSC	Alaska Fisheries Science Center
AIS	Automated Information System
AKFIN	Alaska Fisheries Information Network
AKRO	NMFS Alaska Regional Office
AM	accountability measure
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
APA	Administrative Procedure Act
AS	Alaska Statute
BEG	biological escapement goal
BiOp	biological opinion
BOF	Alaska Board of Fisheries
BSAI	Bering Sea and Aleutian Islands
CFEC	Commercial Fisheries Entry Commission
CFR	Code of Federal Regulations
COAR	Commercial Operator Annual Reports
Convention	International Convention for the High Seas Fisheries of the North Pacific Ocean between Canada, Japan, and the United States
Council	North Pacific Fishery Management Council
CPUE	catch per unit effort
CWT	coded-wire tag
DCCED	Department of Commerce, Community, and Economic Development
DNR	Alaska Department of Natural Resources
DPS	distinct population segment
EDPS	Eastern Distinct Population Segment
E.O.	Executive Order
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FFP	Federal Fisheries Permit

Acronym or Abbreviation	Meaning
FMA	Fisheries Management Area
FMP	fishery management plan
FMU	fishery management unit
FONSI	Finding of No Significant Impact
FR	Federal Register
Ft	foot or feet
GOA	Gulf of Alaska
GSI	genetic stock identification
IRFA	initial regulatory flexibility analysis
LOA	length overall
M	meters
MFMT	maximum fishing mortality threshold
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSC	Marine Stewardship Council
MMPA	Marine Mammal Protection Act
MSST	minimum stock size threshold
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA OLE	NOAA Office of Law Enforcement
NPFMC	North Pacific Fishery Management Council
NS	National Standard
OEG	optimal escapement goal
OFL	overfishing limit
OY	optimum yield
PBR	potential biological removal
PCFA	principal components factor analysis
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation
SBRM	Standardized Bycatch Reporting Methodologies
SDC	Status Determination Criteria
Secretary	Secretary of Commerce
SEG	sustainable escapement goal
State	State of Alaska
TAC	total allowable catch
UCI	Upper Cook Inlet
UCIDA/CIFF	United Cook Inlet Drift Association and Cook Inlet Fishermen's Fund
U.S.	United States
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VMP	vessel monitoring plan
VMS	vessel monitoring system
WDPS	Western Distinct Population Segment

Executive Summary

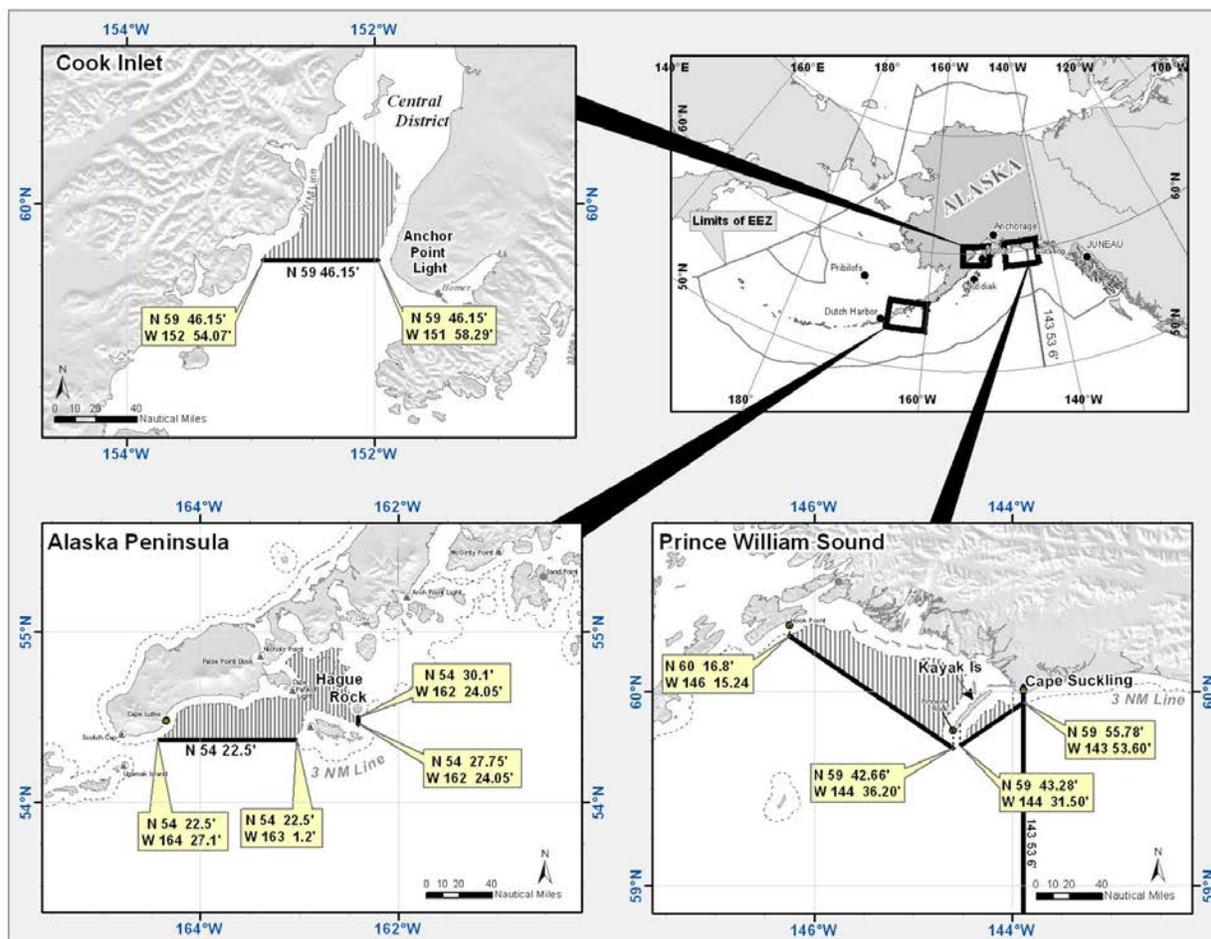
The North Pacific Fishery Management Council (Council) is considering an action that would amend the *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* (FMP) to manage the salmon fisheries that occur in Federal (EEZ) waters of Cook Inlet. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA) directs the Council to prepare a fishery management plan for each fishery under its authority that requires conservation and management. The fisheries under the authority of the Council are those fisheries that occur in the United States Exclusive Economic Zone (EEZ), which is 3 nautical miles to 200 nautical miles off the coast of Alaska. The Magnuson-Stevens Act requires that each fishery management plan be consistent with the ten national standards and contain specific conservation and management measures.

The FMP was approved in 1979 and comprehensively revised in 1990 (NPFMC 1990b) and in 2012 (NMFS 2012c). The FMP conserves and manages the Pacific salmon fisheries that occur in the EEZ off Alaska. The FMP establishes two management areas, the East Area and the West Area, with the border between the two areas at the longitude of Cape Suckling (Figure ES-1). The FMP manages commercial and sport salmon fisheries differently in each area. In the East Area, the FMP includes all EEZ waters, delegates management of the commercial troll salmon fishery and the sport salmon fishery to the State of Alaska (State), and prohibits commercial salmon fishing with net gear. In the West Area, the FMP includes most of the EEZ waters and prohibits commercial salmon fishing in the West Area. Three defined traditional net fishing areas—Cook Inlet, the Alaska Peninsula, and Prince William Sound—were removed from the West Area by Amendment 12 to the FMP and the State manages the salmon fisheries in these areas.

The FMP's unique functions—closing the vast majority of the EEZ to salmon fishing and facilitating State management of the few salmon fisheries in the EEZ—reflect the salmon life cycle. Salmon have a complex life cycle that involves a freshwater rearing period, followed by a period of ocean feeding prior to their spawning migration back to freshwater. Most salmon stocks are vulnerable to harvest by numerous commercial and sport fisheries in marine areas. Salmon from individual brood years can return as adults to spawn over a two to six-year period. As a result, a single year class can be vulnerable to fisheries for several years. Salmon migrate and feed over great distances during their marine life stage. While there is great diversity in the range and migratory habits among different species of salmon, there also is a remarkable consistency in the migratory habit within stock groups, which greatly facilitates stock-specific fishery planning. Salmon are also taken in rivers and streams during their spawning migration by subsistence, sport, commercial, and personal use fisheries.

The FMP also recognizes that the State is the authority best suited for managing Alaska salmon fisheries given the State's existing infrastructure and expertise. The State manages Alaska salmon stocks throughout their range using a management approach that is specifically designed to address the life cycle of salmon, the nonselective nature of fishing in a mixed stock fishery, and the fact that a given salmon stock is subject to multiple fisheries through its migration from marine to fresh waters. Additionally, Chinook salmon harvested in the East Area are managed under provisions of the Pacific Salmon Treaty, an international agreement with Canada that provides for an abundance-based management regime that takes into account the highly mixed stock nature of the harvest.

Figure ES-1 The FMP’s management area, showing the East and West Areas and the three traditional net fishing areas.



Prior to Amendment 12 to the FMP, no comprehensive consideration of management strategy or scope of coverage had occurred since 1990. State fisheries regulations and Federal and international laws affecting Alaska salmon had changed since 1990 and the Magnuson-Stevens Act (as amended since 1990) expanded the requirements for Federal fishery management plans. Additionally, the 1990 FMP was vague with respect to management authority for the three traditional net areas that occur in the West Area. The Council determined that the FMP must be updated in order to comply with the current Magnuson-Stevens Act requirements and that the FMP should be amended to more clearly reflect the Council’s policy with regard to the State of Alaska’s continued management authority over commercial fisheries in the West Area, the Southeast Alaska commercial troll fishery, and the sport fishery.

With Amendment 12, the Council revised the FMP both to reflect its policy for managing salmon fisheries and to comply with Magnuson-Stevens Act. In developing Amendment 12, the Council considered (1) alternatives for defining the scope of the FMP and determining where Federal conservation and management is required, and (2) options for the specific management provisions in the FMP that apply to the fisheries managed under the FMP. The Council recommended, and National Marine Fisheries Service (NMFS) implemented, Amendment 12 to the FMP in 2012. The FMP, as amended by Amendment 12 (2012 FMP), maintained the management structure in the East Area, and modified the

West Area to specifically exclude three traditional net commercial salmon fishing areas and the sport fishery from the FMP, and updated the FMP.

Cook Inlet commercial salmon fishermen and seafood processors filed a lawsuit in Federal district court challenging Amendment 12 and its implementing regulations. The lawsuit focused on Amendment 12's removal of the Cook Inlet Area from the FMP. The Ninth Circuit determined that Magnuson-Stevens Act section 302(h)(1) clearly and unambiguously requires a Council to prepare and submit FMPs for each fishery under its authority that requires conservation and management and that no other provision in the Magnuson-Stevens Act creates an exception to this statutory requirement, or supported NMFS's arguments that this requirement applies to fisheries that require *Federal* conservation and management. Because the Council and NMFS concluded that the Cook Inlet salmon fishery requires conservation and management by some entity, the Ninth Circuit found that the Cook Inlet portion of the salmon fishery must be included in the FMP given the statutory language of the Magnuson-Stevens Act. The Ninth Circuit's decision is now final, and the FMP must be amended to bring it into compliance with the Ninth Circuit's decision, the provisions of the Magnuson-Stevens Act, and other applicable law. Under the Ninth Circuit's decision, the Council and NMFS must amend the FMP to include the three traditional net fishing areas in the fishery management unit for the West Area and to manage the commercial salmon fisheries that occur in the EEZ waters of these three areas.

At its June 2020 meeting, the Council finalized the following three Alternatives for consideration at initial review. First, as required under NEPA, although untenable based on the Ninth Circuit's decision, there is the status quo or no action Alternative 1. This would continue to defer management of Cook Inlet EEZ salmon fisheries to the State of Alaska by excluding the traditional net fishing area in the Cook Inlet EEZ from the FMP. Alternative 2 would establish Federal management of the commercial salmon fishery in the Cook Inlet EEZ with management of the commercial salmon fishery delegated to the State of Alaska, in accordance with the MSA and all other applicable Federal law. Finally, Alternative 3 would establish Federal management of the commercial salmon fishery in the Cook Inlet EEZ with the Council and NMFS managing all aspects of the commercial salmon fishery and without any delegation of management authority to the State of Alaska. This would result in separate State and Federal commercial salmon fisheries for Cook Inlet stocks covered under the FMP. Alternative 3 would require comprehensive preseason coordination and cooperation between the State and NMFS to evaluate all removals and avoid overfishing. The Alternatives, including their elements and options, are summarized in Table ES-1.

The introduction of Cook Inlet EEZ commercial salmon fishery management to the Council process will require coordination of Council activities with the availability of data and other needed information collected by the State of Alaska. This will be necessary even in the absence of delegated management (i.e., under Alternative 3) since no Federal data collection infrastructure currently exists to inform Federal management. Table ES-2 provides the sequence of events that would be involved in the annual management process under the action alternatives. In addition, the State of Alaska's multi-year cycle for reviewing salmon escapement goals with comments relevant to this action is included in Table ES-3.

Next Steps

At its October 2020 meeting, the Council will be presented with an initial review draft analytical document for this action and intends to select a preliminary preferred alternative.

At this time, the Council anticipates it will be able to take final action by December 2020. After Council final action in December 2020, the Council will submit its FMP amendment to NMFS for Secretarial review under the MSA, and NMFS will complete Secretarial review of the FMP amendment and implementing regulations by December 2021. If NMFS approves the FMP amendment and implementing regulations, the 2022 fishing season for the commercial salmon fishery in the Cook Inlet EEZ will operate under the new FMP and implementing regulations.

Table ES-1 Summary of Alternatives and their elements

	Alternative 1 No Action/Status Quo	Alternative 2 Federal Management/Delegation to the State	Alternative 3 Federal Management/No Delegation to the State
Who can fish?	<ul style="list-style-type: none"> Persons holding limited entry permits issued by CFEC 	<ul style="list-style-type: none"> Persons with CFEC permits allowed by the State, consistent with FMP criteria FFP endorsed for salmon FFP for groundfish retention 	<ul style="list-style-type: none"> Persons holding applicable CFEC permits, consistent with FMP criteria FFP required
When can they fish?	<ul style="list-style-type: none"> Times allowed by ADF&G/BoF 	<ul style="list-style-type: none"> Times allowed by ADF&G, consistent with FMP criteria 	<ul style="list-style-type: none"> Times allowed by the FMP and Federal regulations Federal regulations would set opening date and fishing days and inseason management would close the fishery to avoid exceeding the TAC <ul style="list-style-type: none"> Option 1: Mirror State fishing periods (additional monitoring of State vessels would be required) Option 2: Open the EEZ fishery off-cycle with State fishing periods
Where can they fish?	<ul style="list-style-type: none"> Areas allowed by ADF&G/BoF 	<ul style="list-style-type: none"> Areas allowed by ADF&G, consistent with FMP criteria 	<ul style="list-style-type: none"> EEZ areas allowed by the FMP and Federal regulations <ul style="list-style-type: none"> Option 1: Federal Regulations could mirror State fishing areas <i>OR</i> Option 2: Independent EEZ open areas
How much can the fishery catch?	<ul style="list-style-type: none"> Amount allowed by open times/areas, set by BoF 	<ul style="list-style-type: none"> Amount allowed by open times/areas set by BoF, while allowing at least the lower bound of the escapement goal to be met 	<ul style="list-style-type: none"> Option 1: Up to TAC set by NMFS Option 2: No fishing if closed due to data limitations or MSA compliant management measures
How are fish allocated between State and Federal waters?	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> As allowed by ADF&G/BoF, consistent with FMP criteria and the MSA 	<ul style="list-style-type: none"> Federal TAC would be set after accounting for all other projected removals in both State and Federal waters
Full retention required?	<ul style="list-style-type: none"> No 	<ul style="list-style-type: none"> Option 1: Yes, all catch must be retained and delivered for accounting. Halibut and non-retention groundfish must be released. Option 2: No, all discards must be recorded in logbook and reported at the time of landing 	<ul style="list-style-type: none"> Option 1: Yes, all catch must be retained and delivered for accounting. Halibut and non-retention groundfish must be released. Option 2: No, all discards must be recorded in logbook and reported at the time of landing.
Mixed deliveries of EEZ and State waters harvests allowed?	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Yes, with accounting of State/EEZ harvest proportion through logbooks and reporting at the time of landing 	<ul style="list-style-type: none"> No, fish caught in the EEZ and State waters may not be onboard together in the same trip
Legal gear	<ul style="list-style-type: none"> Gillnet gear allowed by State regulations 	<ul style="list-style-type: none"> Gillnet gear allowed by State regulations, consistent with FMP criteria 	<ul style="list-style-type: none"> Gillnet gear allowed by Federal regulations

	Alternative 1 No Action/Status Quo	Alternative 2 Federal Management/Delegation to the State	Alternative 3 Federal Management/No Delegation to the State
How are vessels monitored?	<ul style="list-style-type: none"> Enforcement patrols 	<ul style="list-style-type: none"> Enforcement patrols 	<ul style="list-style-type: none"> Enforcement patrols VMS
What records do vessels and processors have to complete?	<ul style="list-style-type: none"> Fish tickets 	<ul style="list-style-type: none"> Paper fish tickets or eLandings Logbook State requirements consistent with the FMP 	<ul style="list-style-type: none"> eLandings Logbook
How are marine mammal and seabird interactions monitored?	<ul style="list-style-type: none"> Self-reporting 	<ul style="list-style-type: none"> Self-reporting 	<ul style="list-style-type: none"> Self-reporting
How are catch, bycatch and discards accounted for? (SBRM)	<ul style="list-style-type: none"> Fish tickets, only if landed 	<ul style="list-style-type: none"> Paper fish tickets or eLandings with separate State and EEZ reporting areas Logbook 	<ul style="list-style-type: none"> eLandings with EEZ reporting areas Logbook
What happens if ACLs are exceeded (Accountability Measures)	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> Postseason ACL - ACL reduction in future seasons 	<ul style="list-style-type: none"> Preseason ACL - NMFS inseason authority to close fishery Postseason ACL - Management review, Future closures or other actions as needed
Process for determining the status of stocks	<ul style="list-style-type: none"> State review of realized escapements relative to escapement goals stocks of concern system 	<ul style="list-style-type: none"> Annual Salmon Plan Team/SSC/Council process <ul style="list-style-type: none"> review of realized escapements relative to escapement goals review OFL/ABC similar to BSAI crab specs 	<ul style="list-style-type: none"> Annual Salmon Plan Team/SSC/Council process <ul style="list-style-type: none"> review of realized escapements relative to escapement goals determination of OFL/ABC determination of preseason ACL/TAC Proposed and final harvest specifications in the <i>Federal Register</i> similar to groundfish
How is overfished/overfishing determined?	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> Status in year is based on comparison to quantities summed over one salmon generation time Overfishing = EEZ MFMT exceeded <ul style="list-style-type: none"> Catch/Run > Max Yield/Run Overfished = Escapements below MSST <ul style="list-style-type: none"> Escapement < ½ Minimum Escapement Goal 	<ul style="list-style-type: none"> Status in year t is based on comparison to quantities summed over T years (one generation time) Overfishing = EEZ MFMT exceeded <ul style="list-style-type: none"> Catch/Run > Max Yield/Run Overfished = Escapements below MSST Escapement < ½ Minimum Escapement Goal
How is OY determined?	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> Sum fishery catches that achieve MSY escapement, as reduced by social, economic, and biological considerations 	<ul style="list-style-type: none"> OY = Sum fishery ACLs
How are MSA compliance issues resolved?	<ul style="list-style-type: none"> n/a for the West Area 	<ul style="list-style-type: none"> First to the State, then to NMFS 	<ul style="list-style-type: none"> n/a

Table ES-2 Actions and events that would contribute on a continuing basis to the annual Federal management process for drift gillnet fishery in the Cook Inlet EEZ. Differential considerations under Alternatives 2 and 3 are also provided

Timing	Lead	Action	Alternative 2 Federal Management/Delegation to the State	Alternative 3 Federal Management/No Delegation to the State
Nov -Jan	ADF&G	Run forecast Advisory Announcements: -Total Production -Specific major runs -Harvest projections -Methods	Include EEZ harvest considerations	State may restrict harvest projections to State waters and may include assumed Federal harvest in methods. Basis for setting of setting of Federal catch limits.
Nov -Jan	ADF&G	Annual Management Reports: -Commercial salmon fishery -Price, average weight, and participation -Salmon enhancement -Stock status and outlook -Subsistence and personal use fisheries -Educational fisheries -Personal use salmon fishery -Season data -Historical data -Salmon outlook and forecast	Include EEZ harvest report	State report only covers fisheries operating in State waters. Effects of EEZ harvest on State fisheries may be included.
Annually pending availability of State data	Salmon Plan Team	SAFE (Abbreviated) Plan Team Report Recommend -OFL/ABC -Year Y-1 Postseason ACLs, Year Y Preseason ACLs -Accountability Measures, as needed Review, comments on -Run, harvest estimates from previous year -Current year fishery performance relative to EGs -Technical improvements	PT would develop SAFE so that it provides comprehensive view of stocks and State fishery management decisions while emphasizing how that information relates to EEZ fishery and Federal mandates	SAFE would provide information needed for management of EEZ fishery given minimal cooperative agreements with State

Timing	Lead	Action	Alternative 2 Federal Management/Delegation to the State	Alternative 3 Federal Management/No Delegation to the State
Annually following Salmon Plan Team meeting	SSC	<p>Determine</p> <ul style="list-style-type: none"> -Stock status -OFL/ABC -Year Y-1 Postseason ACLs, -Year Y Preseason ACLs -TAC, TAC buffer that will prevent ACL overage (Alt 3 only) <p>Review/Recommend:</p> <ul style="list-style-type: none"> -Accountability Measures, as needed -Run, harvest estimates from previous year -Current year fishery performance relative to EGs -Technical improvements 	Opportunity for SSC to maintain productive technical / analytical dialog with the State in addition to ensuring compliance with Federal mandates for ACL overages, overfishing, overfished	Emphasis on management uncertainty, estimating State water harvest, appropriate buffer on preseason ACL for Federal waters TAC
Annually following SSC meeting	Council	<p>Approve:</p> <ul style="list-style-type: none"> -OFL/ABC -Year Y-1 Postseason ACLs -Year Y Preseason ACLs -Accountability Measures, as needed -TAC, TAC buffer that will prevent ACL overage (Alt 3 only) 	Oversight function and initiating appropriate Federal responses to ACL overages, overfishing, overfished	Jurisdictional separation may limit ability to influence State decision making
*Every 3 years, in coordination with the State's Escapement Goal Review Cycle	Salmon Plan Team	<p>SAFE (Comprehensive) Plan Team Report</p> <p>Recommend:</p> <ul style="list-style-type: none"> - Stock status - OFL/ABC - Year Y-1 Postseason ACLs, Year Y Preseason ACLs - Accountability Measures, as needed - TAC, TAC buffer that will prevent ACL overage (Alt 3 only) - Technical discussions with State scientists * Tier changes * Revisions to management objectives, reference points * Discussions with State scientists on escapement goal analyses, models that relate mixed-stock impacts to stock-specific objectives and reference points 	Coordinate PT meeting with State EGR reviews	PT less likely to fully participate in EGR reviews, more likely to interpret analyses into SAFE

Timing	Lead	Action	Alternative 2 Federal Management/Delegation to the State	Alternative 3 Federal Management/No Delegation to the State
*Every 3 years, ...	SSC	<p>Determine</p> <ul style="list-style-type: none"> - Stock status - OFL/ABC - Year Y-1 Postseason ACLs, -Year Y Preseason ACLs - TAC, TAC buffer that will prevent ACL overage (Alt 3 only) <p>Recommend:</p> <ul style="list-style-type: none"> - Accountability Measures, as needed - Run, harvest estimates from previous year - Comments on fishery performance relative to EGs - Technical discussions with State scientists * Tier changes * Revisions to management objectives, reference points * Discussions with State scientists on escapement goal analyses, models that relate mixed-stock impacts to stock-specific objectives and reference points 	<p>Opportunity for SSC to provide productive technical / analytical feedback to State in addition to ensuring compliance with Federal mandates for ACL overages, overfishing, overfished</p>	<p>Limited ability to interact with State decision makers</p>
*Every 3 years, ...	Council	<p>Approve:</p> <ul style="list-style-type: none"> -OFL/ABC -Year Y-1 Postseason ACLs -Year Y Preseason ACLs -Accountability Measures -TAC, TAC buffer that will prevent ACL overage (Alt 3 only) -Revisions to management objectives, reference points 	<p>Possible use of Joint Protocol Committee for overfished stocks</p>	<p>Jurisdictional separation may limit ability to influence State decision making unless MOUs developed</p>
Annually (effective by season opener in June)	NMFS	<p>Rulemaking (Alt 3 only)-</p> <p>Proposed and final salmon harvest specifications in the Federal Register</p>	<p>Rulemaking not necessary except for FMP, reg amendments</p>	<p>Timing of final rule critical to date of fishery opening</p>
Annually (Jun-Aug)	ADF&G	<p>Inseason Management</p> <p>Monitor: runs and harvest</p> <p>Adjust: time/area access</p>	<p>Uses existing methodology, consistent with FMP criteria and MSA requirements</p>	<p>ADF&G needs to factor EEZ openings into inseason management</p>
Annually (Jun-Aug)	NMFS	<p>Inseason Management</p> <p>Monitor: catches</p> <p>Adjust: access - fishery closure</p>	<p>Primarily limited to catch data collection</p> <p>Inseason closure of EEZ not expected</p>	<p>Catch data monitored relative to TAC so that EEZ closure prevents overage</p>

Table ES-3 State of Alaska escapement goal review cycle and relevance to action.

State of Alaska Multi-Year Escapement Goal Review Cycle			Considerations relative to future Council process
Year 1	ADF&G and the Board of Fisheries	<p>Jan-Feb - Publication of escapement goal report.</p> <p>Feb-Mar- BOF area mtg. Includes detailed escapement goal and stock of concern presentations. BOF makes regulatory changes as needed, adopts Stocks of Concern (SOC) and develop action plans, adopt OEGs/in-river run goals.</p> <p>Apr - Directors' memo adopting the recommended escapement goal changes. Escapement goal changes implemented for that year's fishing season.</p>	Joint Protocol Committee meeting, other means of enhancing Council-Board of Fisheries communication may be necessary
Year 2	ADF&G	<p>Oct-Nov- Formation and first meeting of interdivisional escapement goal review team (typically set assignments of which goals will be reviewed and analyses needed)</p> <p>Nov-Dec - Biologists and biometricians work on analyses, periodic escapement goal review team meetings to review ongoing analyses, etc.</p>	<p>This is the year for enhanced review by the PT/SSC/Council in Table ES-2.</p> <p>The PT/SSC need to review, provide recommendations prior to release of EG memo in following year</p>
Year 3	ADF&G and the Board of Fisheries	<p>Jan-Feb - Biologists and biometricians work on analyses, periodic escapement goal review team meetings to review ongoing analyses, etc.</p> <p>Mar - Escapement goal memo sent to CF and SF Directors and provided to BOF and public in time for public proposal submission for the BOF area meeting.</p> <p>Feb-Dec - Escapement goal report authors draft report and escapement goal review team meets as necessary.</p> <p>Sept - SOC memo from ADF&G Directors submitted to BOF with recommendations for listing or delisting stocks.</p> <p>Oct - BOF work session - overview presentation of escapement goal and SOC recommendations from ADF&G.</p>	Possible year for SSC review/comment on Alaska Stocks of Concern

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1. Introduction

The Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska (FMP) manages the salmon fisheries in the United States Exclusive Economic Zone (EEZ; 3 nautical miles to 200 nautical miles offshore) off Alaska. The North Pacific Fishery Management Council (NPFMC or Council) developed this FMP under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA). In 2012, the Council comprehensively revised the FMP to comply with the recent Magnuson-Stevens Act requirements, such as annual catch limits and accountability measures, and to more clearly reflect the Council's policy with regard to State of Alaska management authority for commercial and sport salmon fisheries in the EEZ. Now, in response to a United States Court of Appeals Ninth Circuit ruling, the Council is considering how to revise the FMP to manage the commercial salmon fishery that occurs in the EEZ waters of Cook Inlet that had been removed from Federal management with the 2012 revisions to the FMP. The Council is considering new management measures that comply with Magnuson-Stevens Act requirements for the Cook Inlet commercial salmon fishery in the EEZ, such as status determination criteria, annual catch limits, and accountability measures.

1.1. History of the Salmon FMP

The North Pacific Fishery Management Council's (Council's or NPFMC's) *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* manages the Pacific salmon fisheries in the United States Exclusive Economic Zone (EEZ) from 3 nautical miles to 200 nautical miles off Alaska. The Council developed this fishery management plan (FMP) under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA). Upon approval by the Secretary of Commerce (Secretary), the FMP became effective in 1979 (1979 FMP) and was comprehensively revised in 1990 (1990 FMP, NPFMC 1990b) and in 2012 (FMP).¹

The 1979 *Fishery Management Plan for the High Seas Salmon Fishery off the Coast of Alaska East of 175 Degrees East Longitude* established the Council's authority over all five species of Pacific salmon and the fisheries for those salmon in the EEZ, then known as the U.S. Fishery Conservation Zone. The five species of Pacific salmon managed by the FMP are:

Chinook salmon (king), *Oncorhynchus tshawytscha*;
Coho salmon (silver), *Oncorhynchus kisutch*;
Pink salmon (humpy), *Oncorhynchus gorbuscha*;
Sockeye salmon (red), *Oncorhynchus nerka*; and
Chum salmon (dog), *Oncorhynchus keta*.

The Council excluded from FMP coverage the Federal waters west of 175° east longitude (near Attu Island) because the salmon fisheries in that area were under the jurisdiction of the *International Convention for the High Seas Fisheries of the North Pacific Ocean*.

The Council divided the U.S. Fishery Conservation Zone covered by the plan into a West Area and an East Area with the boundary between the two areas at Cape Suckling, at 143°53.6' W. longitude. It authorized sport salmon fishing in both areas, prohibited commercial salmon fishing in the West Area (except in three traditional net fishing areas managed by the State of Alaska [State]),² and authorized commercial troll fishing only in the East Area. These prohibitions maintained the 1952 prohibition on commercial net salmon fishing and the 1973 prohibition on commercial troll salmon fishing in the West Area. The 1979 FMP's primary management measure was to limit entry in the commercial troll fishery in

¹The Salmon FMP is available at <https://www.npfmc.org/wp-content/PDFdocuments/fmp/Salmon/SalmonFMP.pdf>

² These areas are Cook Inlet, Prince William Sound, and South Alaska Peninsula and are depicted in Figures 1-2, 1-3, and 1-4.

the East Area. Most of the other management measures for the salmon fisheries in the U.S. Fishery Conservation Zone were equivalent to State regulations in the adjacent State waters.

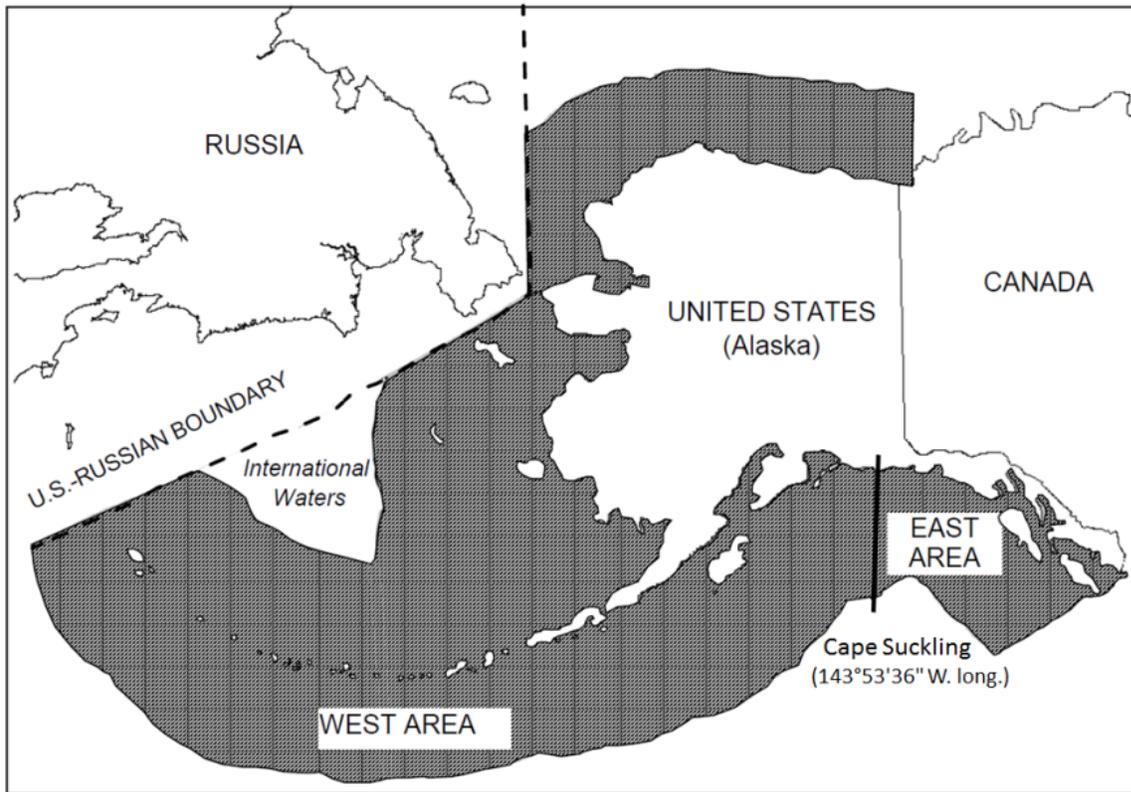
The 1979 FMP did not extend the general fishing prohibition in the West Area to the three traditional net fishing areas because, as the 1979 FMP notes, fishing was authorized by other Federal law, specifically the *International Convention for the High Seas Fisheries of the North Pacific Ocean*, as implemented by the *North Pacific Fisheries Act of 1954* (1954 Act). Under the authority of the 1954 Act, NMFS issued regulations that set the outside fishing boundaries for salmon net fishing in Alaska as those set forth under State regulations and provided that the Federal regulations for any fishing conducted in legal waters outside of State jurisdiction shall be conducted under fishing regulations promulgated by the State.³

With time, the 1979 FMP became outdated and some of Alaska's management measures had changed. In 1990, the Council amended the FMP to update it, correct minor errors, and remove itself from routine management of the salmon fisheries in the East Area. Also, a provision of the MSA required that any plan amendment submitted after January 1, 1987, consider fish habitat and accommodate vessel safety. Finally, the 1979 FMP needed to incorporate the Pacific Salmon Treaty's restrictions on Alaskan salmon fisheries. The 1990 FMP included these changes in a reorganized and shortened document with a more appropriate title, *Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska*.

In the 1990 FMP, the Council reaffirmed its decision that existing and future salmon fisheries occurring in the EEZ require varying degrees of Federal management and oversight. The 1990 FMP (1) continued to authorize commercial hand-troll and power-troll salmon fishing in the East Area, (2) allowed sport fishing in the EEZ in the East and West Areas, (3) delegated regulation of the sport and commercial fisheries in the East Area to the State, (4) retained the general prohibition on salmon fishing with nets in the EEZ, with the exception of commercial net salmon fisheries that occur in three delineated areas of the EEZ, (5) retained the prohibition on commercial salmon fishing in the West Area, with the exception of commercial net salmon fisheries that occur in three delineated areas of the EEZ, and (6) expanded the scope of the 1990 FMP to include the EEZ waters west of 175° east longitude (see Figure 1-1).

³ 35 FR 7070, May 5, 1970. 50 CFR 210.1.

Figure 1-1 The 1990 FMP's management area, showing the East and West Areas.



Description of the East Area under the 1990 FMP

The East Area is that portion of the EEZ off Alaska east of Cape Suckling.⁴ Under the 1990 FMP, the Council delegated the regulation of the commercial troll and sport salmon fisheries in the East Area to the State of Alaska, pursuant to the MSA. The Southeast Alaska commercial salmon troll fishery was the only commercial fishery authorized in the East Area. The Southeast Alaska commercial troll fishery in the EEZ is a mixed-stock, mixed-species fishery that primarily targets Chinook and coho salmon; pink, chum, and sockeye salmon are also taken. The 1990 FMP set forth the Council's management goals and objectives for the salmon fisheries in the East Area, which accordingly focused on the Southeast Alaska commercial troll fishery.⁵ The 1990 FMP deferred management of the Southeast Alaska troll fishery to the State. Commercial salmon fishing with net gear was prohibited in the East Area.

The troll fishery operates in both State and Federal waters, although the majority of the catch and effort occurs in State waters. The State collects fisheries information from the troll fishery as a whole and does not separate the fishery in the EEZ from the State-waters fishery. The troll fishery harvests less than 1% of the total harvest of pink, chum, and sockeye salmon occurring in southeast waters. The troll fishery has two seasons, the winter season, October 11 through April 30, and the summer season, May 1 through September 30. The winter troll fishery is limited to within State waters; the summer troll fishery occurs in Federal and State waters. More information on this fishery is provided in the EA for Amendment 12.

⁴ Note that the East Area is outside of Alexander Archipelago and does not include the waters between the islands and the mainland, per MSA § 306(a)(2)(C).

⁵ 1990 FMP, Section 4.2, including subsections.

Description of the West Area under the 1990 FMP

The 1990, FMP defined the West Area as that portion of the EEZ off Alaska west of Cape Suckling. It includes the EEZ in the Bering, Chukchi, and Beaufort Seas, the Arctic Ocean, and North Pacific Ocean west of Cape Suckling. The 1990 FMP prohibited commercial salmon fishing in most of the West Area but permitted commercial fishing for salmon with nets in three small areas of the EEZ adjacent to State net fisheries. The 1990 FMP described these areas in Section 2.2.2 and Appendix C of the 1990 FMP as the Alaska Peninsula area, the Prince William Sound area, and the Cook Inlet area.

The 1990 FMP was vague on the function of the FMP in the three areas. Although the FMP broadly included these three areas and the salmon and fisheries that occur there within the fishery management unit and Stated that management of these areas was left to the State under other Federal law, the 1990 FMP did not explicitly delegate management of these salmon fisheries to the State.⁶ The 1990 FMP did not contain any management goals or objectives for these three areas or any provisions with which to manage salmon fishing. The 1990 FMP only refrained from extending the general fishing prohibition to those areas, where, as the 1990 FMP notes, fishing was authorized by other Federal law, specifically the *International Convention for the High Seas Fisheries of the North Pacific Ocean* as implemented by the *North Pacific Fisheries Act of 1954* (1954 Act).⁷

Changes since 1990

On October 29, 1992, Congress repealed the 1954 Act and implemented the *North Pacific Anadromous Stocks Act of 1992* (1992 Stocks Act).⁸ The 1992 Stocks Act implements the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean, which replaced the International Convention for the High Seas Fisheries of the North Pacific Ocean. However, the 1992 Stocks Act and the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean differ from the 1954 Act and International Convention for the High Seas Fisheries of the North Pacific Ocean in that they do not extend into the U.S. EEZ. Therefore, the other Federal law that authorized State management of the net fisheries, in lieu of the 1990 FMP, no longer existed. In 1995, as a result of this change in Federal law, NMFS repealed the regulations at 50 CFR 210.1 because they were without statutory basis.⁹ At that time, the 1990 FMP was not amended to reflect these changes in international law.

In 2010, the Council began a comprehensive review of the 1990 FMP and consideration of its management strategy and scope of coverage. Since 1990, State fishery regulations and Federal and international laws affecting Alaska salmon had changed and the reauthorized MSA expanded the requirements for fishery management plans. The Council also recognized that the 1990 FMP was vague with respect to management authority for the three directed commercial salmon fisheries that occur in the West Area. The Council decided to update the 1990 FMP to comply with the current MSA requirements and to more clearly reflect the Council's policy with regard to the State of Alaska's management authority over commercial fisheries in the West Area, the commercial troll fishery in the East Area, and the sport fishery.

In December 2010, Council staff presented a discussion paper on the FMP that described the scope of the 1990 FMP and identified options for, and discussed the issues with, modifying the scope of the FMP (NPFMC 2010). The discussion paper also presented options for updating the 1990 FMP to comply with the MSA and the National Standard 1 (NS1) Guidelines requirements for annual catch limits (ACLs) and accountability measures for stocks managed under an FMP. In December 2010, the Council unanimously

⁶ 1990 FMP, Section 2.2.2.

⁷ 1990 FMP, Section 2.2.2.

⁸ The North Pacific Anadromous Stocks Act of 1992, Public Law 102-567, is codified at 16 USC. §§ 5001-5012.

⁹ 60 FR 39272, August 2, 1995.

passed a motion that directed staff to initiate analysis of updates to the 1990 FMP based on the Council's draft problem Statement, alternatives, and options.

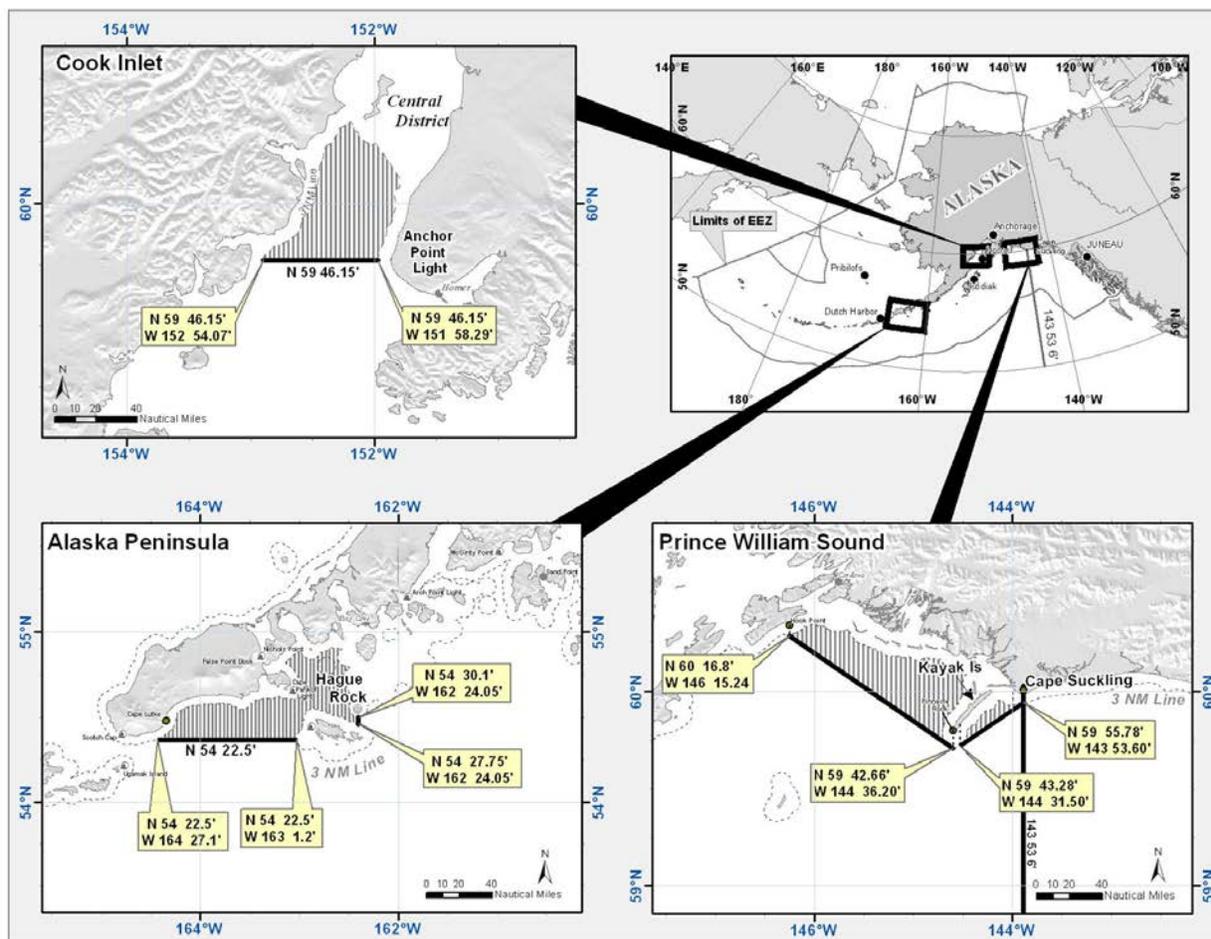
In April 2011, the Council reviewed a preliminary document that, along with a draft of the FMP that combined the 1990 FMP with all of the subsequent amendments, provided a thorough review of the amended 1990 FMP and a basic discussion of how and to what degree Federal requirements were addressed in the amended 1990 FMP. That document also provided some preliminary options for modifying FMP provisions and highlighted areas where the Council may want to recommend changes to the FMP's management measures. With this background and suite of possible options, the Council gave further direction on how to move forward with revising and analyzing the FMP and identified a preliminary preferred alternative.

In September 2011, the Council reviewed an initial review draft analysis and a working draft FMP and received public comments on both documents. In December 2011, the Council took final action to recommend Amendment 12.

Amendment 12 retained the same fishery management unit for the East Area as the 1990 FMP and retained the delegation of the regulation of the commercial troll and sport salmon fisheries in the East Area to the State of Alaska, pursuant to the MSA. Amendment 12 also retained the five species of Pacific salmon in the EEZ in the FMU.

Amendment 12 retained the commercial salmon fishing closure for the vast majority of the EEZ west of Cape Suckling. The primary difference in the FMU for the West Area is that instead of keeping the three traditional net areas in the FMU, imposing Federal management on the salmon fisheries in these three traditional areas, and delegating management to the State, Amendment 12 removed these areas from the FMU, thereby allowing the State to manage these fisheries independently and not through a Federal delegation of management authority under an FMP. Figure 1-2 shows the three traditional net areas excluded from the West Area. The EA prepared for Amendment 12 provides a detailed comparison of the changes from the 1990 FMP to the FMP with Amendment 12. This section focuses on a comparison for the three traditional net fishing areas.

Figure 1-2 The FMP’s management area, showing the East and West Areas and the three traditional net fishing areas.



Removing these three areas from the Salmon FMP’s management area excluded the salmon fisheries that occur in those areas from Federal fisheries management. Any commercial fishing for salmon by State registered vessels in the EEZ in these three areas is managed by the State. The Salmon FMP continued to prohibit commercial salmon fishing in the redefined West Area. Amendment 12 also removed the sport fishery in the West Area from Federal management. Any sport fishing for salmon by State registered vessels in the EEZ west of Cape Suckling is managed by the State.

Removing the three traditional net fishing areas from the Salmon FMP resulted in pockets of EEZ waters where commercial salmon fisheries occur but are not managed under the FMP. The State continues to manage salmon fisheries in these three traditional net fishing areas, including the portion of the fisheries within EEZ waters. Management of these fisheries is not delegated to the State under the Salmon FMP as there was no assertion of Federal authority over the commercial fisheries in these areas that could be delegated. The State has the authority to regulate State registered vessels and there is no Federal management scheme for these areas or the sport fishery in the West Area.

In developing Amendment 12, the Council considered Federal management of the three traditional net fishing areas and the salmon fisheries that occur within them, but determined that (1) the State was managing the salmon fisheries within these three area consistent with the policies and standards of the MSA, (2) the Council and NMFS did not have the expertise or infrastructure to manage Alaska salmon

fisheries, and (3) Federal management of these areas would not serve a useful purpose or provide additional benefits and protections to the salmon fisheries within these areas. The Council recognized that salmon are best managed as a unit throughout their range and parsing out a portion of a fishery because it occurred in Federal waters and applying a separate management structure on that piece of the fishery would not be the optimal way to manage salmon. The Council also recognized the State's long-standing expertise and infrastructure for salmon management and the fact that the State has been adequately managing the salmon fisheries in Alaska since Statehood. The Council determined that the Salmon FMP maintained the Council's policy for salmon management established with the original FMP in 1979.

NMFS published a notice of availability for Amendment 12 on April 2, 2012 (77 FR 19605) and a proposed rule on April 11, 2012 (77 FR 21716). The proposed rule to implement Amendment 12 revised specific regulations and removed obsolete regulations in accordance with the modifications proposed by Amendment 12. NMFS approved Amendment 12 on June 29, 2012 and published the final rule on December 21, 2016 (77 FR 75570). The *Fishery Management Plan for the Salmon Fisheries in the EEZ Off Alaska*, as amended through Amendment 13, is referred to as the Salmon FMP in this document.

Table 1-1 details each of the thirteen amendments to the FMP since 1979.

Table 1-1 Amendments to the Salmon FMP.

Amendment	Year Approved	Pertinent Function(s)	Federal Register document citation
<i>FMP for the High Seas Salmon Fisheries off the Coast of Alaska East of 175 Degrees East Longitude</i>	1979 - 1981	<ul style="list-style-type: none"> Establishes Council and NMFS authority over the salmon fisheries in Federal waters from 3 to 200 miles seaward. Excluded waters west of 175°E. long. from FMP. 	
<i>Amendment 1</i>	1980	<ul style="list-style-type: none"> Makes several changes to conform the FMP and implementing regulations to State regulations. 	45 FR 34020
<i>Amendment 2</i>	1981	<ul style="list-style-type: none"> Makes several changes to conform the FMP and implementing regulations to State regulations. Modifies the objectives of the plan. Reduces the ABC and OY for Chinook salmon in the East Area by 15 percent. 	46 FR 57299
<i>Amendment 3 FMP for the Salmon Fisheries in the EEZ off the Coast of Alaska</i>	1990	<ul style="list-style-type: none"> Extends jurisdiction of FMP to EEZ west of 175°E. long. Defers regulation of sport and commercial fisheries to State. Effectively removes Council and NMFS from routine management but expressly maintained Federal participation, oversight, and final authority. 	55 FR 47773
<i>Amendment 4 (modified by Amend 6)</i>		<ul style="list-style-type: none"> Provides a definition of overfishing, as required by National Oceanic and Atmospheric Administration (NOAA) regulations at 50 CFR 602. 	56 FR 12385
<i>Amendment 5 (superseded by Amend 7)</i>	1998	<ul style="list-style-type: none"> Implements Essential Fish Habitat (EFH) provisions contained in the MSA and 50 CFR 600.815. Describes and identifies EFH fish habitat for anadromous fish. Describes and identifies fishing and non-fishing threats to salmon EFH, research needs, habitat areas of particular concern, and EFH conservation and enhancement recommendations. 	65 FR 20216
<i>Amendment 6 Revise Definitions of Overfishing, MSY, and OY</i>	2002	<ul style="list-style-type: none"> Updates the FMP with new definitions of overfishing in compliance with the MSA, consistent with the NS Guidelines and State and Federal cooperative management and based on the State's salmon management and the Pacific Salmon Treaty. Implements a maximum sustainable yield control rule, maximum fishing mortality rate, and minimum stock size threshold for the Southeast Alaska troll fishery 	67 FR 1163
<i>Amendments 7 and 8 Essential Fish Habitat and Habitat Areas of Particular Concern</i>	2006	<ul style="list-style-type: none"> Amendment 7 supersedes Amendment 5 Updates descriptions of EFH and Habitat Areas of Particular Concern (HAPC) within the FMP Makes conservation and enhancement recommendations for EFH and HAPCs Identifies and authorizes protection measures for EFH and HAPCs 	71 FR 36694
<i>Amendment 9 Aleutian Islands Habitat Conservation Area</i>	2008	<ul style="list-style-type: none"> Revises the boundaries of the Aleutian Islands Habitat Conservation Area described in the FMP 	73 FR 9035
<i>Amendment 10 Permit Fees</i>	2012	<ul style="list-style-type: none"> Establish a system to collect fees for permits 	77 FR 75570
<i>Amendment 11 Essential Fish Habitat</i>	2012	<ul style="list-style-type: none"> Updates description of EFH impacts from non-fishing activities, and EFH conservation recommendations for non-fishing activities. Revises the timeline associated with the HAPC process to a five-year timeline. Updates EFH research priority objectives. 	77 FR 75570
<i>Amendment 12 Revise Salmon FMP</i>	2012	<ul style="list-style-type: none"> Updates FMP to comply with the MSA Redefines the fishery management unit (FMU) in the West Areas to remove Cook Inlet, Prince William Sound, and the South Alaska Peninsula. Renames the FMP to "Fishery Management Plan for the Salmon Fisheries in the EEZ Off Alaska." 	77 FR 75570
<i>Amendment 13 Essential Fish Habitat</i>	2018	<ul style="list-style-type: none"> Updates EFH descriptions Replaces existing marine EFH maps in the FMP with the model-based maps for each species and life stage, as available. 	83 FR 31340

1.2. Salmon FMP litigation

The final rule implementing Amendment 12 was published in the *Federal Register* on December 21, 2012 (77 FR 75570). On January 18, 2013, Cook Inlet commercial salmon fishermen and seafood processors filed a lawsuit in Federal district court challenging Amendment 12 and its implementing regulations. *United Cook Inlet Drift Association, et al, v. NMFS*, 2014 WL 10988279 (D. Alaska 2014).

The lawsuit focused on Amendment 12's removal of the Cook Inlet Area from the Salmon FMP. Plaintiffs argued that removal of the Cook Inlet Area from the Salmon FMP violated section 302(h)(1) of the MSA. Section 302(h)(1) States "Each Council shall, [] for each fishery under its authority that requires conservation and management, prepare and submit to the Secretary (A) a fishery management plan, and (B) amendments to each such plan that are necessary from time to time..." Because the Council and NMFS had determined that the salmon fishery in the EEZ requires conservation and management, Plaintiffs argued that section 302(h)(1) required the Salmon FMP to include all areas of the EEZ, including Federal waters in Cook Inlet, Prince William Sound, and the South Alaska Peninsula, in which the fishery requires conservation and management. Plaintiffs did not agree with NMFS's arguments that provisions of the MSA and the National Standard Guidelines provided the Council and NMFS with discretion in determining the scope of an FMP and that the FMP could exclude areas of the EEZ when the fishery in those areas was being adequately managed by another entity (i.e., the State of Alaska) and when the Council and NMFS determined that Federal management under an FMP would serve no useful purpose or provide additional conservation or management benefits. Plaintiffs also argued that Amendment 12 violated several provisions of the MSA, including National Standards 3 and 7, the Administrative Procedure Act (APA), and the National Environmental Policy Act (NEPA) because NMFS: (1) should have prepared an Environmental Impact Statement, rather than an Environmental Assessment, for Amendment 12; (2) failed to consider a reasonable range of alternatives; and (3) failed to adequately consider the impacts of its action. Shortly after the lawsuit was filed, the State of Alaska intervened as a defendant in the lawsuit.

In September 2014, the district court ruled in favor of NMFS and the State of Alaska. The district court concluded that the MSA was ambiguous as to whether NMFS could remove the Cook Inlet Area from the Salmon FMP and thereby defer management of the fishery within the Cook Inlet Area to the State of Alaska, but determined NMFS's interpretation of the MSA was reasonable. The district court also determined that NMFS had not violated other provisions of the MSA, NEPA, or the APA.

In November 2014, Plaintiffs appealed the district court decision, reiterating the arguments they made before the district court. *United Cook Inlet Drift Association, et al., v. NMFS*, 837 F.3d 1055 (9th Cir. 2016). In September 2016, the Ninth Circuit issued its decision, reversing the district court decision and ruling in favor of the Plaintiffs. The Ninth Circuit's decision focuses solely on section 302(h)(1), determining that the language of section 302(h)(1) clearly and unambiguously requires a Council to prepare and submit FMPs for each fishery under its authority that requires conservation and management. The Ninth Circuit found that no other provision in the MSA creates an exception to this statutory requirement or supports NMFS's arguments that this requirement applies to fisheries that require *Federal* conservation and management. The Ninth Circuit noted that when a Regional Fishery Management Council wants to opt for State management of a fishery that requires conservation and management, it can do so under section 306(a)(3)(B) of the MSA, which authorizes delegation of management authority to a State under an FMP. Because the Council and NMFS concluded that the Cook Inlet salmon fishery requires conservation and management by some entity, the Ninth Circuit found that the Cook Inlet Area portion of the salmon fishery must be included in the FMP given the statutory language at section 302(h)(1) of the MSA. For these reasons, the Ninth Circuit concluded that Amendment 12 was contrary to law to the extent that it removed Cook Inlet Area from the FMP. Because the Ninth Circuit determined that Amendment 12 violated section 302(h)(1) of the MSA, it did not have to rule on any of Plaintiffs'

other claims. The State of Alaska filed a request for rehearing, but the request was denied in November 2016.

On February 27, 2017, the State of Alaska filed a petition of writ of certiorari with the U.S. Supreme Court, asking the Court to hear the case. After briefing, the Supreme Court denied the State's petition on October 2, 2017.

Because the Ninth Circuit's decision is now final,¹⁰ the Council and NMFS must amend the FMP to bring it into compliance with the Ninth Circuit's decision, the provisions of the MSA, and other applicable law. The Ninth Circuit's decision focuses on the Cook Inlet Area because that was the only net fishing area challenged by Plaintiffs. However, the Council and NMFS' record and rationale for excluding the Cook Inlet Area from the FMP are the same for the Alaska Peninsula Area and Prince William Sound Area. Therefore, the FMP will have to be amended to address all three traditional net fishing areas.

1.3. Amending the FMP to address the Ninth Circuit's decision

At its April 2017 meeting, the Council was presented with a discussion paper that provided a preliminary review of the steps needed to impose Federal jurisdiction over portions of three traditional salmon net fishing areas currently managed by the State of Alaska. These net areas include Federal waters in Cook Inlet, Prince William Sound, and the South Alaska Peninsula. The April 2017 discussion paper provided information on (1) the MSA requirements for the three traditional net areas that are not addressed in the FMP, (2) State salmon management in the three traditional net fishing areas, (3) the Pacific Council's and NMFS West Coast Region's complex process for establishing optimum yield, maximum sustainable yield, allowable biological catch, overfishing levels, minimum stock size thresholds, and annual catch limits for the salmon stocks caught in West Coast salmon fisheries, and (4) additional issues, such as fishery interactions with marine mammals and seabirds, that will be analyzed in the Environmental Assessment prepared for the proposed action and its alternatives.

In April 2017, the Council developed preliminary alternatives for FMP management in the three traditional net fishing areas. The alternatives included an alternative that would delegate specific management measures to the State to use existing State salmon management to the extent possible and an alternative that would directly Federally manage the fisheries occurring within the EEZ portion of these areas. The Council also directed staff to develop a range of options for the conservation and management measures required under 303(a) of the MSA and related MSA provisions.

Preliminary Purpose and Need

The Council intends to amend the Salmon FMP to manage the three traditional net fishing areas that occur in Federal waters; Cook Inlet, Prince William Sound, and South Alaska Peninsula. Federal management in an FMP must meet the Magnuson-Stevens Act required provisions for an FMP in section 303(a) and related Magnuson-Stevens Act provisions. This proposed action is necessary to bring the Salmon FMP into compliance with the

¹⁰ On August 3, 2017, the Alaska district court ordered a judgment that had been jointly submitted by the parties to the litigation. The judgment order 1) States that Amendment 12 is in effect for the three traditional net areas until superseded by FMP amendments that incorporate those areas into the Salmon FMP, (2) requires NMFS to file tri-annual status reports with the district court, and 3) establishes a process for the completion of a new amendment for the Cook Inlet EEZ that is complementary to the process set forth in the Magnuson-Stevens Act, including a requirement that NMFS issue a decision and final rulemaking for the Cook Inlet EEZ FMP amendment no later than 12 months following Council final action. Subsequent to issuing the judgment order, the Alaska district court also ordered that final action by the Council on the Cook Inlet EEZ FMP amendment be taken no later than December 2020.

Magnuson-Stevens Act consistent with the recent Ninth Circuit ruling (UCIDA et al. v. NMFS).

Preliminary Alternatives

Alternative 1: Status quo – no amendments to the 2012 Salmon FMP.

Alternative 2: Amend the Salmon FMP to include three traditional net fishing areas in the FMP’s fishery management unit in the West Area and establish cooperative management for these salmon fisheries that delegates specific management measures to the State of Alaska, to use existing State salmon management to the extent possible, in compliance with the Magnuson-Stevens Act and Ninth Circuit ruling. Alternative 2 would identify those management functions that would be under Federal jurisdiction or delegated to the State and the process for delegation and cooperative management.

Alternative 3: Amend the Salmon FMP to include three traditional net fishing areas in the FMP’s fishery management unit in the West Area and apply Federal management to those portions of the fisheries that occur in the EEZ.

Options for Alternative 2 and Alternative 3: Direct staff to develop a range of options for the conservation and management measures required under 303(a) of the Magnuson-Stevens Act and related Magnuson-Stevens Act provisions. Staff should prioritize their work on the following requirements —

- *management policy and objectives,*
- *conservation and management measures,*
- *status determination criteria,*
- *annual catch limits and accountability measures,*
- *methods to report bycatch and measures to minimize bycatch and the mortality of unavoidable bycatch,*
- *a salmon plan team or other process for annually determining status of the stocks and providing stock assessment and fishery evaluation information, and*
- *the process for review and appeal of State management measures applicable under the FMP.*

The Council also announced that it intended to form a workgroup comprised of stakeholders from Cook Inlet, Prince William Sound, and the South Alaska Peninsula, as well as the East Area to ensure that the affected public has appropriate input in the development of a new Salmon FMP amendment. The composition, scope, and schedule for a stakeholder workgroup was determined at subsequent meetings.

At its October 2017 meeting, the Council received an update from staff on preliminary development of a Salmon FMP amendment that would extend Federal management authority to the three traditional net fishing areas that are located in Federal waters but are currently exempt from the FMP. The expanded discussion paper presented at the October 2017 meeting provided potential options under the alternative management approaches currently under consideration. The expanded discussion paper addressed options for addressing specific MSA requirements for Federal FMPs. The options were developed by NMFS, State, and Council staff to address management policy and objectives, conservation and management measures, status determination criteria, annual catch limits and accountability measures, methods to report bycatch and measures to minimize bycatch and the mortality of unavoidable bycatch, a Fishery Impact Statement, the salmon plan team or other process for annually determining status of the stocks and providing stock assessment and fishery evaluation information, and the process for Federal oversight and review of State management measures applicable under the FMP.

Council and NMFS staff conducted an outreach meeting to gather input from interested salmon stakeholders before the Council discussed this agenda item. Information was gathered for the purpose of informing the Council on stakeholder opinion about the appropriate scope of a workgroup that would be involved in the development of an amendment that addresses the salmon fisheries in the Federal waters of Cook Inlet, Prince William Sound, and the Alaska Peninsula. Specifically, the panel was interested in stakeholder viewpoints on (1) specific issues the workgroup should focus on to be most effective, (2) the appropriate composition of the stakeholder workgroup, and (3) any other concerns stakeholders may have at present. Attendance at the meeting was approximately 30, including approximately 20 salmon stakeholders and 10 attendees from various government entities, including Council members.

At the October 2017 meeting, the Council decided to amend the Salmon FMP to manage the commercial salmon fishery in the Cook Inlet EEZ. Throughout this document, the term “Cook Inlet EEZ” refers to the traditional net fishing area north of the Anchor Point line¹¹ within Federal waters. While Cook Inlet also encompasses EEZ waters south of the Anchor Point line (considered the Lower Cook Inlet), commercial salmon fishing has not traditionally occurred in this portion of the EEZ, has been expressly prohibited in the FMP since 1979, and is not under consideration in this action. Furthermore, the Council determined that focusing on adding the Cook Inlet EEZ to the FMP first allows the Council to design a fishery management regime for the Cook Inlet EEZ that recognizes the complex issues in Cook Inlet. The Council intends to consider an FMP amendment to address the salmon fisheries in the EEZ of Prince William Sound and South Alaska Peninsula under a separate and subsequent action.¹²

In October 2017, the Council modified the preliminary purpose and need to read as follows.

Preliminary Purpose and Need

The Council intends to amend the Salmon FMP to manage the traditional net fishing area that occurs in Federal waters of Cook Inlet. Federal management in an FMP must meet the Magnuson-Stevens Act required provisions for an FMP in section 303(a) and related Magnuson-Stevens Act provisions. This proposed action is necessary to bring the Salmon FMP into compliance with the Magnuson-Stevens Act consistent with the recent Ninth Circuit ruling and the Judgement of the District Court in UCIDA et al., v. NMFS.

The Council also directed NMFS and Council staff to continue to work with the State of Alaska to develop options for the conservation and management measures required under 303(a) of the MSA and related MSA provisions and prioritize their work on the following requirements:

- management policy and objectives,
- conservation and management measures,
- status determination criteria,
- annual catch limits and accountability measures,
- methods to report bycatch and measures to minimize bycatch and the mortality of unavoidable bycatch,

¹¹ This line at 59°46.15' N. latitude is the boundary between ADF&G's Upper and Lower Cook Inlet Management Areas.

¹² For its April 2018 meeting, NMFS provided the Council with a letter recommending that the Council also initiate a determination as to whether the salmon sport fishery in the West Area requires conservation and management under the Salmon FMP in light of the Ninth Circuit's decision on Amendment 12. ([See here](#)) NMFS explained that this determination is needed because the rationale for its removal was the same rationale for the removal of the three traditional net areas, which the Ninth Circuit found to be inconsistent with the MSA. NMFS advised that although this determination for the sport fishery in the West Area should be undertaken by the Council, it could be undertaken at a later time, possibly in tandem with the Council's plan for a separate and subsequent FMP amendment to address the commercial salmon fisheries in the EEZ of Prince William Sound and the South Alaska Peninsula.

- the salmon plan team or other process for annually determining status of the stocks and providing stock assessment and fishery evaluation information, and
- the process for review and appeal of State management measures applicable under the FMP.

The Council also announced the formation of a Salmon Committee for stakeholders to address the required provisions for an FMP amendment to manage the commercial salmon fishery in the Federal waters of Cook Inlet.

As part of the Council and NMFS' ongoing process of direct engagement with Cook Inlet salmon stakeholders, and to develop the scope of work for the Salmon Committee, the Council solicited written proposals from the public to help the Council identify the specific required conservation and management measures under 303(a) of the MSA and related MSA provisions where a committee would assist in the evaluation of information relevant to the development of options for a fishery management plan amendment and serve a useful purpose.

At its April 2018 meeting, the Council reviewed stakeholder proposals on management of the commercial salmon fishery and used that information to develop an initial scope of work for a Salmon Committee and solicited nominations for committee membership. Council staff held a call for nominations from April 12, 2018 to June 1, 2018. The Council received 33 nominations for individuals to be members of the Cook Inlet Salmon Committee.

At its December 2019 meeting, the Council clarified Alternative 2, emphasizing that if adopted, the FMP would establish Federal management of salmon fisheries in the Cook Inlet EEZ, with specific management measures being delegated to the State. Thus, the draft Purpose and Need and Alternatives were:

Draft Purpose and Need

The Council intends to amend the Salmon FMP to manage the traditional net fishing area that occurs in Federal waters of Cook Inlet. Federal management in an FMP must meet the Magnuson-Stevens Act required provisions for an FMP in section 303(a) and related Magnuson-Stevens Act provisions. This proposed action is necessary to bring the Salmon FMP into compliance with the Magnuson-Stevens Act consistent with the recent Ninth Circuit ruling and the Judgement of the District Court in UCIDA et al., v. NMFS.

Draft Alternatives

Alternative 1: *No Action. No amendment to the Salmon FMP. This alternative would maintain status quo. Alternative 1 is not a viable alternative given the Ninth Circuit decision, however, NEPA requires that Federal agencies analyze a no action alternative.*

Alternative 2: *Federal management with specific management measures delegated to the State. Amend the Salmon FMP to include the Cook Inlet EEZ in the FMP's fishery management unit in the West Area and establish a Federal management regime for these salmon fisheries that delegates specific management measures to the State of Alaska, to use existing State salmon management infrastructure, in compliance with the Magnuson-Stevens Act and Ninth Circuit ruling. Alternative 2 would identify the management measures that would be managed by the Council and NMFS, the management measures that would be delegated to the State to manage with Federal oversight, and the process for delegation and oversight of management.*

Alternative 3: Federal management. Amend the Salmon FMP to include the Cook Inlet EEZ in the FMP's fishery management unit in the West Area and apply Federal management to those portions of the fisheries that occur in the EEZ.

1.4. NPFMC Cook Inlet Salmon Committee

The Council established the ad hoc Cook Inlet Salmon Committee (Committee) to assist in the development of measures necessary to amend the Salmon FMP to include the traditional net-fishing area in the EEZ adjacent to Cook Inlet in the FMP. The Council envisioned the Committee's primary tasks as (1) reviewing and providing comments on specific, Council-identified issues; (2) developing options for fishery management measures for specific, Council-identified management needs, and (3) providing perspectives on potential social and economic impacts of proposed fishery management measures.

At its June 2018 meeting, the Council appointed five members to the Committee. The Council tasked the Committee with review of issues related to the commercial drift gillnet salmon fishery in the Cook Inlet EEZ, and accordingly, that sector comprised most of the Committee's membership. When making initial appointments to the Committee, the Chairman of the Council Stated that input from the commercial drift gillnet sector would be the major focus of the Committee, but also that other stakeholder groups could be added as the Council's needs of the Committee developed. Following the initial appointments, representatives from the salmon processing sector¹³ and recent entrants¹⁴ to the Cook Inlet commercial salmon drift gillnet fishery were added to the Committee.

Council solicitation of stakeholder involvement in the Committee was consistent with standard Council practice¹⁵ and the Council SOPPs,¹⁶ and so individuals were nominated from the public for appointment by the Council Chairman who announces any appointments to committees and other subsidiary bodies at the end of each Council meeting. Appointment of the initial Cook Inlet Salmon Committee membership was done in June 2018, just as the salmon drift gillnet season was beginning. The timing was intended by the Chairman to allow the appointees adequate time to prepare for their review of an initial FMP analysis in the fall of 2018. Additionally, when the Committee was formed, a "Scope of Work and Guiding Principles"¹⁷ was provided to assist Committee members in participating effectively.

In 2018, the Council received written proposals from the public to help the Council identify the specific required conservation and management measures under 303(a) of the MSA and related MSA provisions where a committee would assist in the evaluation of information relevant to the development of options for a fishery management plan amendment and serve a useful purpose. The Council received proposals from individuals representing themselves and individuals representing both the United Cook Inlet Drift Association and Cook Inlet Fishermen's Fund (UCIDA/CIFF), the Cook Inlet Aquaculture Association, the Matanuska-Susitna Borough Fish and Wildlife Commission, the Community of Nikolaevsk, and the Kenai River Sportfishing Association.

A total of 6 Committee meetings were held from 2018 to 2020. All Committee meetings were announced according to Federal public noticing procedures¹⁸ including publication in the *Federal Register*. Prior to each meeting, an agenda was prepared by the Committee Chairs and Council staff and was then reviewed by the members of the Committee for further refinement. Subsequently, the agenda and any meeting documents, including those suggested and/or prepared by Committee members was provided to the public

¹³ <https://www.npfmc.org/call-for-nominations-5/>

¹⁴ <https://www.npfmc.org/call-for-nominations-6/#CISC1>

¹⁵ https://npfmc.org/wp-content/PDFdocuments/membership/Brief_Guide_to_NPFMC_Committees.pdf

¹⁶ https://www.npfmc.org/wp-content/PDFdocuments/membership/Council/NPFMC_SOPP_October2019.pdf

¹⁷ https://www.npfmc.org/wp-content/PDFdocuments/membership/CISC/CISC_Scope_of_work_and_organizing_principles.pdf

¹⁸ 5 U.S.C §552b

via the Council's website.¹⁹ At the Committee meetings, the Chairs provided generously for comment and participation by any members of the public in attendance, including impromptu presentations as allowed by the rest of the Committee.

Following each meeting, Committee members reviewed the draft meeting report and provided edits, as necessary, which were incorporated into the final meeting report. At the Council meeting following a given Committee meeting, the Council reviewed the final Committee meeting report, discussed meeting outcomes with the Committee Chair, Council staff and any Committee members providing public testimony, and took action as necessary.

Management measure recommendations to the Council, in fulfillment of the intended purpose of the Committee, were slow to develop as reflected in the timeline of Committee Reports provided on the Council's webpage.²⁰ Most stakeholder members of the Committee had little or no previous involvement with the Council, so staff provided ongoing guidance to Committee members on procedure, the primacy of their role in developing viable management approaches, and the jurisdictional limits of Federal fisheries management. For example, it was pointed out that the MSA addresses State jurisdiction explicitly, stating that nothing in the MSA should be construed as "extending or diminishing the jurisdiction or authority of any State within its boundaries." Nevertheless, the issue of jurisdiction was brought up at every Committee meeting, with many members strongly adhering to a perspective that the Federal FMP could supersede the State of Alaska on its management of salmon fisheries occurring solely within State waters, and also direct State decisions on setting salmon escapement goals. Additionally, many Committee members and public attendees considered past State salmon management decisions that resulted in less than maximum harvest to have violated the MSA by allowing "underfishing" to occur and looked forward to the Federal FMP as a means to correct this occurrence.

After debate over these issues at several meetings constrained productive action by the Committee, the Council instructed the Committee to meet prior to the April 2020 Council meeting to develop final recommendations on management measures. The Committee held a two-day meeting on February 25-26, 2020 in Anchorage. Subsequent cancellation of the April 2020 Council meeting in response to the COVID-19 pandemic allowed for an additional Committee meeting, which was held online on May 26, 2020. Committee development of management mechanisms for achieving their desired outcomes occurred primarily at the February and May 2020 Committee meetings. Up to and including those Committee meetings stakeholders both on the Committee and those in attendance indicated opposition to Alternative 3 because they felt it would reduce harvest opportunities in the Cook Inlet EEZ largely because of a need for precautionary management in the absence of a Federal salmon infrastructure in Alaska. Alternative 2, on the other hand, was expected to utilize the State of Alaska's widespread salmon data collection capabilities and was less likely to reduce harvest potential. In preparation for the February 2020 meeting, Committee members were provided with online tools for overwriting draft management measures developed by staff for Alternative 2, and replacing it with their preferred measures. The Reports from the February and May 2020 Committee meetings reflect a decision by staff to facilitate full expression of the Committee's desired outcomes by suspending any discussion of the legality of their recommendations. All Committee Reports, Committee meeting agendas and materials, and additional information is available on the Council web page for the Committee.²¹

¹⁹ <https://www.npfmc.org/>

²⁰ <https://www.npfmc.org/>

²¹ <https://www.npfmc.org/committees/cook-inlet-salmon-committee/>

1.4.1. Cook Inlet Salmon Committee's Recommendations

A summary of the Committee's recommendations is provided below in order to ease review, while the Committee's full recommendations are provided in the May 2020 Committee Report (available on the Council's web page, see footnote 20).

1.4.1.1. Collaborative Federal and State Data Collection in Support of Salmon Management, Including Availability of Federal Resources

The Committee recommended that ADF&G and NMFS work in collaboration to provide information on which to base fishing regulations. Additionally, Federal resources could be provided to obtain the best scientific information available when determining Cook Inlet salmon stock assessment, both in river and for the off-shore test boat fishery. This recommendation, provided by the Committee at the February 2020 Committee meeting, was provided separately from the Committee's Alternative 2 – Expanded Scope recommendation, which is summarized below.

1.4.1.2. Summary of the Committee's recommended Alternative 2-Expanded Scope

The Committee's other recommendation was for an Alternative 2 – Expanded Scope (Alt 2-ES), a wholly new approach to Cook Inlet salmon management based on Federal jurisdictional override. The Committee recommended the Council accept Alt 2-ES for analysis and have it replace the existing Alternative 2 (i.e., that it not be added as a fourth alternative). At the June 2020 Council meeting, the Council chose not to include the Committee's recommend alternative in the range of alternatives analyzed, as discussed in detail in section 2.6 Alternatives Considered but not Moved Forward for Analysis.

Revise the Management Objectives in the FMP

1. Prevent overfishing and achieve optimum yield
 - a. Add preventing *underfishing* and achieve *MSY*
2. Manage salmon as a unit throughout their range.
 - a. Allow the Federal FMP to apply management throughout “the EEZ offshore of Alaska and all State waters including the benthic, estuarine and freshwater habitats necessary to salmon for spawning, breeding, feeding, or growth to maturity.”
3. Minimize bycatch and bycatch mortality
 - a. Add prohibitions on
 - i. all fishing activities in salmon spawning areas during spawning activities,
 - ii. catch and release fishing for returning/spawning salmon in estuaries or freshwater,
 - iii. snagging of naturally spawning salmon stocks in sport fisheries.
4. Maximize economic and social benefits to the nation over time (minor edits)
5. Protect wild stocks and fully utilize hatchery production
 - a. Add *MSY*
6. Promote safety (minor edits)
7. Identify and Protect Salmon Habitat (NEW Objective)

Revise the “Procedures for Implementation” under Alternative 2

Category 1 measures (Federal management measures that are fixed in the FMP, implemented by Federal regulation, and require an FMP amendment to change).

1. Create a *Salmon Technical Team* to set escapement goals under Federal law rather than allow the State to do this.
 - a. The State could close seasons or areas to ensure that escapement goals are met.
2. *Legal Gear*
 - a. Salmon in Cook Inlet are taken with a variety of gear types. The FMP would not authorize the State to change the types of legal net gear fishermen are permitted to use when harvesting salmon in Cook Inlet nor to modify gear specifications.

Category 2 measure criteria (Management measures delegated to the State of Alaska). The following provides possible criteria for the Category 2 management measures identified above.

1. Fishing Seasons
 - a. Achieve stability in openings and ensure efficiency in fishing operations to achieve MSY
 - b. Abundance-based management informed by historic management, balancing practices to provide flexibility to harvest fish in excess of MSY-based escapement goals, under-utilized stocks, and that considers relative run strength for all stocks, and that achieves MSY.
2. Closed Waters
 - a. Achieve stability in areas open to fishing and ensure efficiency in fishing operations to achieve MSY
3. Inseason Management
 - a. Goal is to achieve a long term average harvest level between MSY and 90% of MSY.
4. Management Area, District, Subdistrict, Section, and Statistical Area Boundaries
 - a. Consider revision of management boundaries to reflect historic and current data on salmon distribution and salmon harvest effort
5. Recordkeeping and Reporting
 - a. Develop alternative reporting mechanisms for timely reporting of harvest by all user groups including electronic reporting for recreational and personal use fisheries

Revise the “Annual Process for Determining the Status of the Stocks”

1. Salmon Plan Team
 - a. Add that the Plan Team would also make recommendations *on State waters fisheries*.
2. Salmon Technical Team
 - a. Create this group
 - b. Function
 - i. Set the State escapement goals
 - ii. Review inseason management actions and fishery performance relative to achieving MSY.
 - iii. Review of appeals
 - c. Composition

- i. Stakeholders from all Cook Inlet salmon fisheries, ADF&G, NMFS, Salmon Commission, Universities

Revise the “Appeal Process for all Salmon Fisheries in the EEZ

Remove major sections of this process to allow for a petition to NMFS for any objection someone may have to a State decision.

Revise the Scope of the FMP

Section 2 of the FMP would be revised to reflect that the FMP’s authority would extend to all State waters west of Cape Suckling including “all benthic, estuarine and freshwater habitats necessary to salmon for spawning, breeding, feeding, or growth to maturity.” Further, the FMP would apply “Magnuson-Stevens Act, policies, regulations and practices and directs management of these areas and the salmon fisheries that occur there in compliance with the MSA and the Pacific Salmon Treaty and other applicable Federal law.”

1.5. Magnuson-Stevens Fishery Conservation and Management Act

The MSA contains three primary sections that govern the development and contents of fishery management plans: (1) section 302(h); (2) the 10 national standards in section 301; and (3) required contents of fishery management plans in section 303(a). MSA section 303(b) identifies discretionary provisions that a council may include in an FMP. These sections are excerpted below.²² Additionally, NMFS published National Standard Guidelines (NS Guidelines; 50 CFR 600.305-600.355) to provide comprehensive guidance for the development of FMPs and FMP amendments that comply with the MSA and the national standards.

SEC.3. DEFINITIONS

(5) The term "conservation and management" refers to all of the rules, regulations, conditions, methods, and other measures

(A) which are required to rebuild, restore, or maintain, and which are useful in rebuilding, restoring, or maintaining, any fishery resource and the marine environment; and

(B) which are designed to assure that—

(i) a supply of food and other products may be taken, and that recreational benefits may be obtained, on a continuing basis;

(ii) irreversible or long-term adverse effects on fishery resources and the marine environment are avoided; and

(iii) there will be a multiplicity of options available with respect to future uses of these resources.

SEC. 301. NATIONAL STANDARDS FOR FISHERY CONSERVATION AND MANAGEMENT

(a) IN GENERAL. —Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the following national standards for fishery conservation and management:

²² The complete Magnuson-Stevens Fishery Conservation and Management Act is available at http://www.nmfs.noaa.gov/sfa/magact/MSA_Amended_2007%20.pdf.

- (1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
- (2) Conservation and management measures shall be based upon the best scientific information available.
- (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.
- (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 United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
- (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.
- (6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
- (7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.
- (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 by utilizing economic and social data that meet the requirements of paragraph (2), 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.
- (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.
- (10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

SEC. 302. REGIONAL FISHERY MANAGEMENT COUNCILS

- (h) **FUNCTIONS.** —Each Council shall, in accordance with the provisions of this Act—
- (1) for each fishery under its authority that requires conservation and management, prepare and submit to the Secretary (A) a fishery management plan, and (B) amendments to each such plan that are necessary from time to time (and promptly whenever changes in conservation and management measures in another fishery substantially affect the fishery for which such plan was developed);
 - (2) prepare comments on any application for foreign fishing transmitted to it under section 204(b)(4)(C) or section 204(d), and any fishery management plan or amendment transmitted to it under section 304(c)(4);

(3) conduct public hearings, at appropriate times and in appropriate locations in the geographical area concerned, so as to allow all interested persons an opportunity to be heard in the development of fishery management plans and amendments to such plans, and with respect to the administration and implementation of the provisions of this Act (and for purposes of this paragraph, the term "geographical area concerned" may include an area under the authority of another Council if the fish in the fishery concerned migrate into, or occur in, that area or if the matters being heard affect fishermen of that area; but not unless such other Council is first consulted regarding the conduct of such hearings within its area);

(4) submit to the Secretary such periodic reports as the Council deems appropriate, and any other relevant report which may be requested by the Secretary;

(5) review on a continuing basis, and revise as appropriate, the assessments and specifications made pursuant to section 303(a)(3) and (4) with respect to the optimum yield from, the capacity and extent to which United States fish processors will process United States harvested fish from, and the total allowable level of foreign fishing in, each fishery (except as provided in section subsection (a)(3)) within its geographical area of authority;

(6) develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee or the peer review process established under subsection (g);

(7) develop, in conjunction with the scientific and statistical committee, multi-year research priorities for fisheries, fisheries interactions, habitats, and other areas of research that are necessary for management purposes, that shall—

(A) establish priorities for 5-year periods;

(B) be updated as necessary; and

(C) be submitted to the Secretary and the regional science centers of the National Marine Fisheries Service for their consideration in developing research priorities and budgets for the region of the Council; and

(8) conduct any other activities which are required by, or provided for in, this Act or which are necessary and appropriate to the foregoing functions.

SEC. 303. CONTENTS OF FISHERY MANAGEMENT PLANS

(a) **REQUIRED PROVISIONS.** —Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, shall—

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are—

(A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery;

(B) described in this subsection or subsection (b), or both; and

(C) consistent with the national standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law;

- (2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;
- (3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;
- (4) assess and specify—
 - (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3),
 - (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing, and
 - (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;
- (5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, charter fishing, and fish processing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, economic information necessary to meet the requirements of this Act, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;
- (6) consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery;
- (7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat;
- (8) in the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;
- (9) include a fishery impact Statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for—
 - (A) participants in the fisheries and fishing communities affected by the plan or amendment;

(B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants; and

(C) the safety of human life at sea, including whether and to what extent such measures may affect the safety of participants in the fishery;

(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

(11) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority—

(A) minimize bycatch; and

(B) minimize the mortality of bycatch which cannot be avoided;

(12) assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery, including its economic impact, and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors;

(14) to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate, taking into consideration the economic impact of the harvest restrictions or recovery benefits on the fishery participants in each sector, any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery and;

(15) establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

Magnuson-Stevens Act § 303 note

EFFECTIVE DATES; APPLICATION TO CERTAIN SPECIES. —The amendment made by subsection (a)(10)¹⁶—

(1) shall, unless otherwise provided for under an international agreement in which the United States participates, take effect—

(A) in fishing year 2010 for fisheries determined by the Secretary to be subject to overfishing; and

(B) in fishing year 2011 for all other fisheries; and

(2) shall not apply to a fishery for species that have a life cycle of approximately 1 year unless the Secretary has determined the fishery is subject to overfishing of that species; and

(3) shall not limit or otherwise affect the requirements of section 301(a)(1) or 304(e) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1851(a)(1) or 1854(e), respectively).

¹⁶ Section 104(a)(10) of P.L. 109-479 added section 303(a)(15).

1.6. Discussion of each of the MSA Requirements

This section discusses each of the MSA requirements as they apply to the salmon fishery in the Cook Inlet EEZ. Table 1-2 provides the Magnuson-Stevens Act § 303(a) requirements for the contents of Fishery Management Plans, considerations for including the required provisions in an FMP, and options under Alternatives 2 and 3 for including the required provisions in an FMP that manages commercial salmon fishing in the Cook Inlet EEZ. Sections 1.6.1 through 1.6.8 provide additional discussion on the MSA required provisions in the context of the Salmon FMP.

Table 1-2 Magnuson-Stevens Act § 303 Contents of Fishery Management Plans and considerations and options under Alternative 2 and Alternative 3 to include the required provisions in an FMP for Cook Inlet

MSA § 303 Fishery Management Plan Contents (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Options under Alternative 2 Federal Management/Delegation to the State	Options under Alternative 3 Federal Management/No Delegation to the State
(1) <i>contain the conservation and management measures</i> , which are necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery.	What are the necessary conservation and management measures for the commercial salmon fishery in the EEZ? Which measures should be delegated to the State under MSA § 306(a)(3)(B)(3)? What is the process for delegating specific management measures to the State? Should the FMP establish categories like the Crab FMP?	Section 2.4.2 contains procedures for implementation and two categories of management measures; <i>Category 1 - Federal</i> and <i>Category 2 - State</i> Conservation and management measures delegated to the State are in section 2.4.3	Conservation and management measures are developed under the options in Section 2.5.2.
(2) <i>contain a description of the fishery</i> (the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location), the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery.	Work with ADF&G to compile this information. Could be part of the Fishery Impact Statement.	Provided in the Fishery Impact Statement.	Not developed. Would be based on the Fishery Impact Statement but modified to reflect changes to the fishery under Federal management.
(3) <i>assess and specify</i> the present and probable future condition of, and <i>the maximum sustainable yield and optimum yield (OY)</i> from, the fishery, and include a summary of the information utilized in making such specification	Under <i>Magnuson-Stevens Act § 302(h)(5)</i> , the Council shall review on a continuing basis the assessment and specification of OY so that it is responsive to changing circumstances in the fishery. The <i>NS (National Standard) 1 guidelines at 50 CFR (Code of Federal Regulations) 600.310</i> specify that assessment and specification of OY in the FMP should include: a summary of information utilized in making such specification; an explanation of how the OY specification will produce the greatest benefits to the nation and prevent overfishing and rebuild overfished stocks; and a consideration of the economic, social, and ecological factors relevant to the management of a particular stock, stock complex, or fishery.	MSY and OY are developed for the salmon stocks with escapement goals (See section 2.4.6).	Would be based on the status determination criteria developed for Alternative 3. (See section 2.5.3)

MSA § 303 Fishery Management Plan Contents (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Options under Alternative 2 Federal Management/Delegation to the State	Options under Alternative 3 Federal Management/No Delegation to the State
<p>(4) assess and specify— (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing, and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States.</p>	<p>Addressed in Section 6.3 and 6.4 of the FMP.</p>	<p>No change identified at this time.</p>	<p>No change identified at this time.</p>
<p>(5) <i>specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, charter fishing, and fish processing in the fishery</i>, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, economic information necessary to meet the requirements of this Act, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors</p>	<p>What data does the Council need from the State? Should there be new recordkeeping and reporting requirements for fishery participants? How should the data be submitted to NMFS? MSA § 313(h) States that the North Pacific Council shall submit, and the Secretary may approve, consistent with the other provisions of this Act, conservation and management measures to ensure total catch measurement in each fishery under the Council's jurisdiction and such measures shall ensure the accurate enumeration, at a minimum, of target species, economic discards, and regulatory discards.</p>	<p>SAFE Report prepared by the Salmon Plan Team</p>	<p>SAFE Report prepared by the Salmon Plan Team</p>
<p>(6) <i>consider and provide for temporary adjustments</i>, after consultation with the Coast Guard and persons utilizing the fishery, <i>regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery</i>; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery</p>		<p>Temporary adjustments are inseason management actions delegated to the State under Category 2. (See section 2.4.3)</p>	<p>NMFS inseason management actions.</p>

MSA § 303 Fishery Management Plan Contents (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Options under Alternative 2 Federal Management/Delegation to the State	Options under Alternative 3 Federal Management/No Delegation to the State
(7) <i>describe and identify essential fish habitat</i> for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat	Revisions through EFH 5-year review process, Amendment 13.	Revisions through EFH 5-year review process, Amendment 13.	Revisions through EFH 5-year review process, Amendment 13.
(8) <i>assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan</i>	What scientific data does the Council and NMFS need to implement the FMP? How would the data be reported to the Council and NMFS?	SAFE Report prepared by the Salmon Plan Team	SAFE Report prepared by the Salmon Plan Team
(9) include a <i>fishery impact Statement</i> for the plan or amendment which shall assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for— (A) participants in the fisheries and fishing communities affected by the plan or amendment; (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants; and (C) the safety of human life at sea, including whether and to what extent such measures may affect the safety of participants in the fishery.	The FIS can also address the <i>MSA § 303(a)</i> 's related requirements for fishery information: (1) a description of the fishery, including the number of vessels, the type and quantity of fishing gear, the species of fish and their location, actual and potential revenues from the fishery, and any recreational interest in the fishery; (2) a specification of the present and probable future condition of the fishery, and include a summary of the information utilized in making such specification; and (3) a description of the commercial, recreational, and charter fishing sectors which participate in the fishery, its economic impact, and, to the extent practicable, quantify trends in landings of the managed fishery by the commercial, recreational, and charter fishing sectors (16 U.S.C. 1853(a)). <i>NS Guidelines</i> provide direction on the types of information to include in a FIS. For example, the NS8 Guidelines State that FMPs must examine the social and economic importance of fisheries to communities potentially affected by management measures.	Provided in the RIR.	Provided in the RIR.

MSA § 303 Fishery Management Plan Contents (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Options under Alternative 2 Federal Management/Delegation to the State	Options under Alternative 3 Federal Management/No Delegation to the State
<p>(10) <i>specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished</i> (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery.</p>	<p>FMP must have a process for specifying status determination criteria (overfishing and overfished) that comply with the <i>NS 1 guidelines (50 CFR 600.310), NS 2, and the review process at MSA 302(g) and (h).</i> <i>MSA 302(g)(1)(B)</i> "Each scientific and statistical committee shall provide its Council ongoing scientific advice for fishery management decisions, including recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield, and achieving rebuilding targets, and reports on stock status and health, bycatch, habitat status, social and economic impacts of management measures, and sustainability of fishing practices". <i>MSA § 304(e)(1)</i>, "NMFS reports annually to Congress and the Council on the status of the fisheries relative to the status determination criteria in the FMP."</p>	<p>Criteria are developed for three tiers of salmon stocks: <i>Tier 1: Salmon stocks with escapement goals and stock-specific catches.</i> <i>Tier 2: Salmon stocks managed as a complex.</i> <i>Tier 3: Salmon stocks with no reliable estimates of escapement.</i> (See section 2.4.4).</p>	<p>Criteria are developed for the salmon stocks with escapement goals (See section 2.5.3) Two options: Option 1 - Specify salmon status determination criteria using the three-tier system and a harvest limit in Federal waters of Cook Inlet through the Council's review process that includes recommendations of OFL/ABC by a Salmon Plan Team, and subsequent approval by the SSC/Council. Option 2 - Prohibit salmon harvest in Federal waters of Cook Inlet.</p>
<p>(11) <i>establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery</i>, and include conservation and management measures that, to the extent practicable and in the following priority— (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided</p>	<p>What would the standardized reporting methodology be for the salmon fishery to accurately account for catch and bycatch in the EEZ? What are the conservation and management measures necessary to minimize bycatch that comply with <i>50 CFR Subpart R—Standardized Bycatch Reporting Methodology?</i></p>	<p>Option 1- Fish tickets/eLandings Sub-Option 1- Full retention of bycatch. Sub-Option 2- Prohibit groundfish retention, all discards recorded and reported. <i>Reporting methods considered:</i></p> <ul style="list-style-type: none"> • VMS • Paper logbook • Electronic logbook • Electronic monitoring • Observers • eLandings 	<p>Option 1- eLandings Sub-Option 1- Full retention of bycatch Sub-Option 2- Prohibit groundfish retention, all discards recorded and reported. <i>Reporting methods cons:</i></p> <ul style="list-style-type: none"> • VMS • Paper logbook • Electronic logbook • Electronic monitoring • Observers • eLandings

MSA § 303 Fishery Management Plan Contents (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Options under Alternative 2 Federal Management/Delegation to the State	Options under Alternative 3 Federal Management/No Delegation to the State
(12) <i>assess the type and amount of fish caught and released alive during recreational fishing</i> under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish	Work with the ADF&G to compile this information for the FMP.	Required reporting at the time of landing Logbooks	Required reporting at the time of landing Logbooks
(13) <i>include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery</i> , including its economic impact, and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors	Work with the ADF&G to compile this information for the FMP. Could be part of the Fishery Impact Statement.	Provided in the RIR.	Provided in the RIR.
(14) <i>to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate, taking into consideration the economic impact of the harvest restrictions or recovery benefits on the fishery participants in each sector, any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery</i>	Consider a process for allocating EEZ harvest fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery.	If a stock or stock complex is declared overfished or if overfishing is occurring, the State of Alaska and Salmon Plan Team would propose rebuilding measures sufficient to comply with Magnuson-Stevens Act requirements.	If a stock or stock complex is declared overfished or if overfishing is occurring, the Salmon Plan Team would prepare a rebuilding plan for Council review sufficient to comply with Magnuson-Stevens Act requirements.
(15) <i>establish a mechanism for specifying annual catch limits in the plan</i> (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, <i>including measures to ensure accountability</i>	What is the process for the Council to specify annual catch limits and accountability measures that comply with the <i>NS 1 guidelines (50 CFR 600.310)</i> ? <i>MSA 302(h)(6)</i> Each Council shall develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its SSC or the peer review process established under subsection (g).	Establish an ABC and ACL using the three tier system for salmon stocks caught in the Cook Inlet EEZ (See section 2.4.4.).	Establish an ABC and ACL using the three tier system for salmon stocks caught in the Cook Inlet EEZ (See section 2.4.4.).

1.6.1. Management Policy and Objectives

For Amendment 12, the Council developed a new management policy and six objectives that apply to both the East and West Areas. The FMP's management policy and objectives guide the development of the Council's management recommendations to the Secretary of Commerce (Secretary) and guide State management of the salmon fisheries in the East Area. In developing the management policy and objectives, the Council recognized that these objectives cannot be accomplished by an FMP alone. To that end, the FMP represents the Council's and NMFS' contribution to a comprehensive management regime for the salmon fishery that will be achieved in concert with actions taken by the Pacific Salmon Commission and the State. The Council and NMFS, in cooperation with the State, are committed to the long-term sustainable management of the salmon fishery off Alaska. The goal is to promote stable management and maintain the health of the salmon fishery resource and environment.

To expand Federal management to the Cook Inlet EEZ in the West Area, the Council will need to consider whether to develop a new management policy and objectives for or revise the current management policy and/or the objectives to apply to, the commercial salmon fishery in the Cook Inlet EEZ.

1.6.2. Procedures for FMP Implementation

To amend the FMP to manage the commercial salmon fishery in the Cook Inlet EEZ, the FMP would need to establish the roles of the appropriate State and Federal agencies in implementing FMP management in that area and the management functions under State or Federal jurisdiction.

1.6.3. Status Determination Criteria (overfishing and overfished) and Annual Catch Limits

To amend the FMP to manage the commercial salmon fishery in the Cook Inlet EEZ, the FMP would need to establish status determination criteria and annual catch limits.

To achieve NS1—prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery—the MSA requires each FMP to (1) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished or overfishing is occurring, called status determination criteria, and contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery (MSA § 303(a)(10)) and (2) establish mechanisms for specifying ACLs to prevent overfishing and include accountability measures (AMs) to prevent ACLs from being exceeded and to correct overages of the ACL if they do occur (MSA § 303(a)(15)).²³ MSA § 302(h)(6) requires each Council to develop ACLs for each of its managed fisheries, and the ACLs cannot exceed the fishing level recommendation of its SSC or the Council's peer review process established under MSA § 302(g). The NS 1 Guidelines provide guidance on how to meet these MSA requirements and describe fishery management approaches to meet the objectives of NS 1.²⁴ Under MSA § 304(e)(1), NMFS reports annually to Congress and the Council on the status of the FMP managed fisheries relative to the status determination criteria in the FMP.

Amendment 6 to the FMP specified status determination criteria for the East Area but did not specify status determination criteria for the three traditional net fishing areas in the West Area because, at that time, it was thought that these fisheries were exempt from the FMP requirements. To expand Federal management to the Cook Inlet EEZ, the Council would need to develop status determination criteria for the salmon stocks caught in the commercial salmon fishery in this area. The purpose of status

²³ MSA §303(a)(15) States "Establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability."

²⁴ The final rule for the revised NS 1 Guidelines is available at <https://alaskafisheries.noaa.gov/sites/default/files/81fr71858.pdf>.

determination criteria is to monitor the status of the stock by comparing the results of stock assessments against the criteria to determine if overfishing is occurring or the stock is overfished.

The NMFS Alaska Fisheries Science Center (AFSC) will review and certify the Council's proposed overfishing definitions in the FMP amendment for compliance with guidelines provided for National Standards 1 and 2 in 50 CFR part 600, including consideration of whether the proposed definitions (1) have sufficient scientific merit, (2) are likely to result in effective Council action to protect the stock from closely approaching or reaching an overfished status, (3) provide a basis for objective measurement of the status of the stock against the definition, and (4) are operationally feasible.

1.6.4. Accountability Measures

To amend the FMP to manage the commercial salmon fishery in the Cook Inlet EEZ, the FMP would need to establish accountability measures (AMs).

The National Standard 1 guidelines, at 50 CFR 600.310(g), define AMs as management controls to prevent ACLs, including sector-ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur. Overages are when catch exceeds the ACL. AMs should address and minimize both the frequency and magnitude of overages and correct the problems that caused the overage in as short a time as possible. NMFS identifies two categories of AMs—inseason AMs that try to keep catch within the ACL, and AMs for when the ACL is exceeded. The FMP should identify what sources of data will be used to implement AMs (e.g., inseason data, annual catch compared to the ACL, or multi-year averaging approach). Specifically applicable to this action, the guidelines at 50 CFR 600.310(g)(6), AMs for State-Federal Fisheries, State that:

For stocks or stock complexes that have harvest in State or territorial waters, FMPs and FMP amendments must, at a minimum, have AMs for the portion of the fishery under Federal authority. Such AMs could include closing the EEZ when the Federal portion of the ACL is reached, or the overall stock's ACL is reached, or other measures.”

1.6.5. Optimum Yield and Maximum Sustainable Yield

The Council will need to determine how to assess and specify optimum yield (OY) for salmon stocks harvested in the Cook Inlet EEZ areas. MSA § 303(a)(3) requires that an FMP assess and specify the OY from the fishery and include a summary of the information utilized in making such specification. Consistent with MSA § 302(h)(5), the Council shall review on a continuing basis the assessment and specification of OY so that it is responsive to changing circumstances in the fishery. The NS 1 Guidelines provide guidance on how to meet the OY requirement. The MSA § 3(33) defines OY 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 the 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 such fishery.

The new NS 1 guidelines specify that the FMP's assessment and specification of OY should include: a summary of information utilized in making such specification; an explanation of how the OY specification will produce the greatest benefits to the nation and prevent overfishing and rebuild overfished stocks; and a consideration of the economic, social, and ecological factors relevant to the management of a particular stock, stock complex, or fishery.

1.6.6. Annual Process for Determining the Status of the Salmon Stocks

To amend the FMP to manage the commercial salmon fishery in the Cook Inlet EEZ, the FMP would need to establish an annual process for determining the status of the salmon stocks.

A key part of determining the status of salmon stocks on an annual basis is establishing an annual process for specifying the numeric values that represent the maximum fishing mortality threshold (MFMT), overfishing level (OFL), and minimum stock size threshold (MSST)— the status determination criteria required under National Standard 1 guidelines— and assessing the status of managed stocks relative to those criteria. The FMP’s process for determining the status of salmon stocks must comply with § 302(g)(1)(B) of the MSA which specifies that each SSC shall provide its Council ongoing scientific advice for fishery management decisions, including recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield, and achieving rebuilding targets, and reports on stock status and health, bycatch, habitat status, social and economic impacts of management measures, and sustainability of fishing practices.

1.6.7. Standardized Bycatch Reporting Methodology

To amend the FMP to manage the commercial salmon fishery in the Cook Inlet EEZ, the FMP would need to establish a process or procedures that constitute the standardized bycatch reporting methodology for the commercial drift gillnet fishery in the Cook Inlet EEZ.

The MSA defines the term “bycatch” as fish which are harvested in a fishery, but which are not sold or kept for personal use, including economic discards and regulatory discards. For Cook Inlet, the FMP does not address MSA § 303(a)(11), which requires that an FMP establish a standardized reporting methodology to assess the amount and type of bycatch, and measures to minimize bycatch to the extent practicable and minimize the mortality of unavoidable bycatch. This requirement addresses NS9. According to the NS9 Guidelines, Councils must: (1) promote development of a database on bycatch and bycatch mortality in the fishery to the extent practicable; (2) for each management measure, assess the effects on the amount and type of bycatch and bycatch mortality in the fishery; (3) select measures that, to the extent practicable, will minimize bycatch and bycatch mortality; and (4) monitor selected management measures.²⁵

On January 19, 2017, NMFS published new requirements to comply with MSA § 303(a)(11) and to provide guidance to councils and NMFS regarding the development, documentation, and review of such methodologies, commonly referred to as Standardized Bycatch Reporting Methodologies (SBRMs, 82 FR 6317).²⁶ **Section 600.1610(a)(1) requires every FMP to identify the required procedure or procedures that constitute the SBRM for the fishery, and States, “[Such] procedures may include, but are not limited to, observer programs, electronic monitoring and reporting technologies, and self-reported mechanisms (e.g., recreational sampling, industry-reported catch and discard data).”** Section 600.1610(a)(1) also requires Councils to explain in an FMP how the SBRM meets the purpose described in § 600.1600. The purpose of a standardized reporting methodology is to collect, record, and report bycatch data in a fishery that, in conjunction with other relevant sources of information, are used to assess the amount and type of bycatch occurring in the fishery and inform the development of conservation and management measures that, to the extent practicable, minimize bycatch and bycatch mortality. Under § 600.1610(a)(2), when establishing a standardized reporting methodology, a Council must address the following:

- (i) *Information about the characteristics of bycatch in the fishery.* Including, but not limited to, the amount and type of bycatch occurring in the fishery, the importance of

²⁵ 50 CFR 600.350(d).

²⁶The final rule implementing SBRM is available at <https://www.Federalregister.gov/documents/2017/01/19/2017-00405/standardized-bycatch-reporting-methodology>.

bycatch in estimating the fishing mortality of fish stocks, and the effect of bycatch on ecosystems.

(ii) *Feasibility*. The implementation of a standardized reporting methodology must be feasible from cost, technical, and operational perspectives. However, feasibility concerns do not exempt an FMP from the requirement to establish a standardized reporting methodology. Recognizing that costs and funding may vary from year to year, a Council must also address how implementation of the standardized reporting methodology may be adjusted while continuing to meet the purpose described under § 600.1600.

(iii) *Data uncertainty*. The standardized reporting methodology must be designed so that the uncertainty associated with the resulting bycatch data can be described, quantitatively or qualitatively. The Council should seek to minimize uncertainty in the resulting data, recognizing that different degrees of data uncertainty may be appropriate for different fisheries.

(iv) *Data use*. How are data resulting from the standardized reporting methodology are used to assess the amount and type of bycatch occurring in the fishery? A Council must consult with its scientific and statistical committee and/or the regional NMFS science center on reporting methodology design considerations such as data elements, sampling designs, sample sizes, and reporting frequency. The Council must also consider the scientific methods and techniques available to collect, record, and report bycatch data that could improve the quality of bycatch estimates. Different standardized reporting methodology designs may be appropriate for different fisheries.

Finally, § 600.1610(a)(1) explains that, in addition to proposing regulations necessary to implement the standardized reporting methodology, a Council should provide in an FMP guidance to NMFS on how to adjust implementation of the methodology consistent with the FMP.

Additionally, MSA § 313(f) States that, in implementing § 303(a)(11) and this section, the North Pacific Council shall submit conservation and management measures to lower, on an annual basis for a period of not less than four years, the total amount of economic discards occurring in the fisheries under its jurisdiction. The Salmon FMP does not assess economic discards in the Cook Inlet commercial salmon fishery or contain measures to lower economic discards.

1.6.8. Process for Federal Oversight and Review

To amend the FMP to manage the commercial salmon fishery in the Cook Inlet EEZ, the FMP would need to amend Chapter 9, or establish a new process, for review and appeal of State management measures governing the commercial drift gillnet fishery in the Cook Inlet EEZ.

Delegation of salmon fishery management authority to the State of Alaska requires the Council and NMFS to stay apprised of State management measures governing the delegated fishery and, if necessary, to review those measures for consistency with the FMP, the MSA, and other applicable Federal law. FMPs that delegate management to the State include a process to address MSA § 306(a)(3)(B). This section provides that, if at any time the Secretary determines that a State law or regulation applicable to a fishing vessel is not consistent with the fishery management plan, the Secretary shall promptly notify the State and the appropriate Council of such determination and provide an opportunity for the State to correct any inconsistencies identified in the notification. If, after notice and opportunity for corrective action, the State does not correct the inconsistencies identified by the Secretary, the authority granted to the State shall not apply until the Secretary and the appropriate Council find that the State has corrected the inconsistencies.

1.7. Endangered Species Act

The Endangered Species Act of 1973 as amended (16 U.S.C. 1531 et seq.; ESA), provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The statute is administered by NMFS and by the U.S. Fish and Wildlife Service (USFWS). The designation of an ESA listed species is based on the biological health of that species. The status determination is either threatened or endangered. Threatened species are those likely to become endangered in the foreseeable future [16 U.S.C. § 1532(20)]. Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range [16 U.S.C. § 1532(20)]. Species can be listed as endangered without first being listed as threatened. The Secretary of Commerce, acting through NMFS, is authorized to list marine fish, plants, and mammals (except for walrus, polar bear, and sea otter) and anadromous fish species. The Secretary of the Interior, acting through the USFWS, is authorized to list walrus, polar bear, sea otter, seabirds, terrestrial plants and wildlife, and freshwater fish and plant species.

In addition to listing species under the ESA, the critical habitat of a newly listed species must be designated concurrent with its listing to the "maximum extent prudent and determinable" [16 U.S.C. § 1533(b)(1)(A)]. The ESA defines critical habitat as those specific areas that are essential to the conservation of a listed species and that may be in need of special consideration. Federal agencies are prohibited from undertaking actions that destroy or adversely modify designated critical habitat. Some species, primarily the cetaceans, which were listed in 1969 under the Endangered Species Conservation Act and carried forward as endangered under the ESA, have not received critical habitat designations.

The key section of the ESA relevant to Federal actions is section 7. Section 7 outlines procedures for interagency cooperation to conserve Federally listed species and designated critical habitat. Section 7 requires Federal agencies to consult to ensure that the actions are not likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. The State is also obligated under the ESA to ensure that it does not license operations to use fishing gear in a manner that is likely to result in a violation of the ESA.

For Federal fishery actions that may affect listed species or critical habitat, NMFS Sustainable Fisheries is the action agency that initiates section 7 consultation. Such consultation may be informal if the action is not likely to adversely affect any listed species or critical habitat, or formal if adverse effects are likely. The determination of whether the action "is likely to jeopardize the continued existence of" endangered or threatened species or to result in the destruction or modification of critical habitat is the responsibility of the appropriate consulting agency (NMFS Protected Resources or USFWS). If the action is likely to result in jeopardy, the biological opinion (BiOp) includes reasonable and prudent alternatives that are necessary to alter the action so that jeopardy is avoided. If incidental take of a listed species is expected to occur incidental to an otherwise lawful action, an incidental take Statement is appended to the BiOp.

Prior to Amendment 12, section 7 consultations had not been conducted for the FMP salmon fisheries in the three traditional net fishing areas, but these fisheries were included in the cumulative effects analysis for effects on ESA listed species under NMFS management in the 2010 North Pacific Groundfish Fishery BiOp (2010 BiOp, NMFS 2010). NMFS Sustainable Fisheries conducted a section 7 consultation on the decision to approve Amendment 12.

The proposed action to Federally manage the commercial salmon fishery in the Cook Inlet EEZ is a Federal action that may require NMFS to conduct a section 7 consultation if the action may affect listed species or critical habitat in the action area. If NMFS determines through consultation that the action is not likely to jeopardize the continued existence of any listed species but is reasonably certain to result in the incidental take of listed species, it will issue a BiOp including an incidental take Statement authorizing such take. The information on the interactions between the drift gillnet salmon fishery in

Cook Inlet and ESA-listed Pacific salmon, marine mammals, and seabirds are provided in Section 2 of this document.

2. Alternatives for amending the Salmon FMP to manage the commercial salmon fishery in the Cook Inlet EEZ

In light of the Ninth Circuit's decision, the Council and NMFS must amend the FMP to include the three traditional net fishing areas in the FMU for the West Area and to manage the commercial salmon fisheries that occur in the EEZ waters of these three areas. The Council has focused its first action to address the Ninth Circuit decision by amending the FMP to manage the commercial salmon fishery in the Cook Inlet EEZ.

A new management regime would need to be created and implemented for the commercial salmon fishery in the Cook Inlet EEZ. Specific objectives and management measures would be required in the FMP to comply with the MSA. The MSA is the primary domestic legislation governing management of the nation's marine fisheries. The MSA requires FMPs to be consistent with a number of provisions with which all FMPs must conform and which guide fishery management. Section 303(a) of the MSA requires a fishery management plan contain specific conservation and management measures. Section 301(a) of the MSA requires a fishery management plan be consistent with ten National Standards. Additionally, NMFS published National Standard Guidelines (NS Guidelines; 50 CFR 600.305-600.355) to provide comprehensive guidance for the development of FMPs and FMP amendments that comply with the MSA and its national standards, and these should be closely considered when developing options for meeting the MSA requirements. Currently, the FMP does not address any of these requirements for the commercial salmon fishery in the Cook Inlet EEZ, except for Essential Fish Habitat (EFH).

Updating the FMP will require extensive exchanges of information and continued coordination among Alaska Department of Fish and Game (ADF&G), NMFS, and Council staff, as well as coordination with the Alaska Board of Fisheries (BOF). The FMP must be updated and revised to establish management measures that meet MSA requirements and NS Guidelines for the Cook Inlet EEZ. This chapter describes the Council's alternatives and options that are being considered to manage the commercial salmon fishery in the Cook Inlet EEZ.

The alternatives would clarify the FMP's management policy and objectives for the commercial salmon fishery in Cook Inlet EEZ. To address MSA provisions, Alternatives 2 and 3 contain new management measures that do not currently exist and would need to be developed for the commercial salmon fishery in the Cook Inlet EEZ, such as status determination criteria, a mechanism for specifying annual catch limits, a mechanism for standardized bycatch reporting, and measures to minimize bycatch to the extent practicable. Additionally, the Council or NMFS may decide that it is necessary to apply additional Federal requirements to salmon vessels commercially fishing in the Cook Inlet EEZ, such as electronic monitoring requirements, recordkeeping and reporting requirements, or vessel monitoring systems.

Defining the FMP's role in the Cook Inlet EEZ will be key to amending the FMP. Some public comments submitted during the development and implementation of Amendment 12 expressed interest for the FMP's role to be limited to oversight of State management measures that apply to all of the salmon fisheries in the Cook Inlet region, including measures that only apply to salmon fisheries occurring exclusively in State waters. Specifically, these public comments requested oversight of escapement goals and decisions to allocate salmon among user groups (subsistence, personal use, sport, and the different commercial gear types). However, it is not possible to have an FMP that only serves an oversight function and does not contain management measures for FMP fisheries that address the Magnuson-Stevens Act requirements.

Additionally, FMP management cannot extend into State waters absent preemption under MSA § 306(b) and therefore would not be able to regulate State waters salmon fisheries or control harvests in State waters. In order to avoid overfishing, Federal management of the commercial salmon fishery in the Cook

Inlet EEZ would have to be responsive to salmon harvests in State waters. In other words, the commercial salmon fishery in the Cook Inlet EEZ would only occur if there was a harvestable surplus after accounting for anticipated removals in State waters, just as is done in the case of Pacific cod, pollock, and other fisheries that are harvested in both State and Federal waters. In other instances where there is fishing for a species in both State and Federal waters, Federal management of fishing for that species within the EEZ is responsive to State management of fishing for that same species in State waters. An example of this occurs in the Pacific cod fisheries in the Gulf of Alaska and Aleutian Islands. The Federal Pacific cod total allowable catch (TAC) takes into account the State guideline harvest level so that total catch of Pacific cod in Federal and State waters does not exceed the Pacific cod annual catch limit. Further, for some State waters fisheries, State regulations are structured such that the State waters fishery is concurrent with the Federal waters fishery (e.g., State parallel fisheries). However, other State waters fisheries that are managed by the State separately from the Federal waters fishery (i.e., State guideline harvest level fisheries) are still accounted and applied against Federal status determination criteria and annual catch limits.

Pre-emption of State management in State waters

Per the MSA, FMP management would only apply to the Cook Inlet EEZ and the commercial salmon fishery that occurs within the Cook Inlet EEZ. Under the MSA, an FMP only has authority to manage (i.e., directly regulate) the fisheries that occur in the EEZ. The MSA is clear that nothing in the MSA shall be construed as extending or diminishing the jurisdiction or authority of any State within its boundaries.²⁷ Absent formal preemption in accordance with MSA § 306(b), the MSA does not provide authority for the Council to manage fisheries in State waters, which would be required for the Council to change the State's escapement goals or to allocate more salmon to a specific gear group, or to direct the State to make these types of changes.

The MSA does provide the Secretary with the ability to preempt State management and assume responsibility for the regulation of a fishery in State waters under two conditions:

1. The fishery must occur predominantly within the EEZ.
2. The results of the State's action or inaction must substantially and adversely affect the carrying out of the fishery management plan.

Both of these criteria must be met for preemption of State management. If both these criteria were met, NMFS would need to determine how it would regulate the salmon fisheries in State waters and the information it would use to make management decisions. Federal fishery regulations require data, analysis, and an extensive process.

2.1. Purpose and Need

In June 2020, the Council adopted the following purpose and need:

The Council intends to amend the Salmon FMP to manage the traditional net fishing area that occurs in Federal waters of Cook Inlet. Federal management in an FMP must meet the Magnuson-Stevens Act required provisions for an FMP in section 303(a) and related Magnuson Stevens Act provisions. This proposed action is necessary to bring the Salmon FMP into compliance with the Magnuson-Stevens Act consistent with the recent Ninth Circuit ruling and the Judgement of the District Court in UCIDA et al., v. NMFS.

²⁷ MSA § 306(a) IN GENERAL. – (1) Except as provided in subsection (b), nothing in this Act shall be construed as extending or diminishing the jurisdiction or authority of any State within its boundaries.

2.2. Alternatives

The Council is considering the following range of alternatives and directed staff to develop a range of options for the conservation and management measures required under section 303(a) of the MSA and related MSA provisions.

Alternative 1: No Action. No amendment to the Salmon FMP. This alternative would maintain the existing management regime, which excludes the Cook Inlet EEZ and the commercial salmon fishery within it from Federal management under the FMP. Alternative 1 is not a viable alternative given the Ninth Circuit decision, however, NEPA requires that Federal agencies analyze a no action alternative.

Alternative 2: Federal management with specific management measures delegated to the State. Amend the Salmon FMP to include the Cook Inlet EEZ in the FMP's fishery management unit in the West Area and establish a Federal management regime for the commercial salmon fishery that delegates specific management measures to the State of Alaska, to use existing State salmon management infrastructure, in compliance with the MSA and Ninth Circuit ruling. Alternative 2 would identify the management measures that would be managed by the Council and NMFS, the management measures that would be delegated to the State to manage with Federal oversight, and the process for delegation and oversight of management.

Alternative 3: Federal management. Amend the Salmon FMP to include the Cook Inlet EEZ in the FMP's fishery management unit in the West Area and apply Federal management to the commercial salmon fishery that occurs in the EEZ.

Each Alternative contains elements that address:

- management policy and objectives,
- conservation and management measures,
- status determination criteria,
- annual catch limits and accountability measures,
- methods to report bycatch and measures to minimize bycatch and the mortality of unavoidable bycatch,
- a process to annually determine the status of the stocks and provide stock assessment and fishery evaluation information, and
- the process for Federal oversight and review of State management measures applicable to the commercial salmon fishery in the Cook Inlet EEZ and implemented under the authority delegated to the State by the FMP.
- monitoring, recordkeeping, and reporting requirements.

2.3. Alternative 1: No Action

Under Alternative 1, the Council would not amend the Salmon FMP to manage the commercial salmon fishery in the Cook Inlet EEZ. This alternative would maintain the existing management regime, which excludes the Cook Inlet EEZ and the commercial salmon fishery within it from Federal management under the FMP. Alternative 1 is not a viable alternative given the Ninth Circuit decision, however, NEPA requires that Federal agencies analyze a no action alternative. This description of Alternative 1 explains the existing management regime currently in the Salmon FMP.

2.3.1. Management Policy and Objectives

The following are the Council's management policy and management objectives as Stated in sections 3.1 and 3.2 of the FMP—

2.3.1.1. Management Policy

The Council's salmon management policy is to facilitate State of Alaska salmon management in accordance with the Magnuson-Stevens Act, Pacific Salmon Treaty, and applicable Federal law. This FMP represents the Council's contribution to a comprehensive management regime for the salmon fishery that will be achieved in concert with actions taken by the Pacific Salmon Commission and the State. This policy ensures the application of judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future, as well as current generations.

Under this policy, all management measures will be based on the best scientific information available. This management policy recognizes the need to balance many competing uses of marine resources and different social and economic objectives for sustainable fishery management, including protection of the long-term health of the resource and the optimization of yield. This policy uses and improves upon the Council's and State's existing open and transparent process of public involvement in decision-making.

2.3.1.2. Management Objectives

The Council has identified the following six management objectives to guide salmon management under the FMP. The Council, NMFS, and the State of Alaska will consider the management policy and the following management objectives in developing amendments to this FMP and associated management measures. Because adaptive management requires regular and periodic review, the management objectives identified in this section will be reviewed periodically by the Council. The Council, NMFS, and the State of Alaska will also review, modify, eliminate, or consider new management measures, as appropriate, to best carry out the management objectives for the FMP.

Objective 1 – Prevent overfishing and achieve optimum yield

Manage the commercial and sport salmon fisheries in the East Area in concert with the Pacific Salmon Commission, and in accordance with the conservation and harvest sharing goals of the Pacific Salmon Treaty, to prevent overfishing and obtain the number and distribution of spawning fish capable of producing the optimum yield on a sustained basis (wild and hatchery). Prevent overfishing and achieve optimum yield in the West Area by prohibiting the commercial harvest of salmon. Prohibiting commercial harvest enables the State to manage salmon fisheries to achieve escapement goals and maximize economic and social benefits from the fishery.

Objective 2 – Manage salmon as a unit throughout their range

Manage salmon fisheries in the EEZ in a manner that enables the State to manage salmon stocks seamlessly throughout their range. In the East Area, this objective is achieved by delegating management of the sport and commercial troll fishery to the State, to manage consistent with State and Federal laws, including the Pacific Salmon Treaty. In the West Area, this objective is achieved by prohibiting commercial fishing for salmon in the West Area so that the State can manage Alaska salmon stocks as a unit.

Objective 3 – Minimize Bycatch and Bycatch Mortality

To the extent practicable, manage salmon fisheries to minimize bycatch and minimize the mortality of unavoidable bycatch. Decrease, where possible, the incidental mortalities of salmon hooked and released, consistent with allocation decisions and the objective of providing the greatest overall benefit to the people of the United States.

Objective 4 - Maximize economic and social benefits to the Nation over time.

Economic benefits are broadly defined to include, but are not limited to: profits, income, employment, benefits to consumers, and less tangible or less quantifiable benefits such as the economic stability of coastal communities, recreational value, non-consumptive use value, and non-use value. To ensure that economic and social benefits derived from fisheries covered by this FMP are maximized over time, the following will be examined in the selection of management measures:

- Control of fishing effort and salmon catches.
- Fair and equitable allocation of harvestable surpluses of salmon.
- Economic impacts on coastal communities and other identifiable dependent groups (e.g., subsistence users).

This examination will be accomplished by considering, to the extent that data allow, the impact of management measures on the size of the catch during the current and future seasons and their associated prices, harvesting costs, processing costs, employment, the distribution of benefits among members of the harvesting, processing and consumer communities, management costs, and other factors affecting the ability to maximize the economic and social benefits as defined in this section. Other benefits are tied to economic stability and impacts of commercial fishing, as well as, unguided and charter recreational fishing associated with coastal communities, subsistence fishing supporting traditional social and cultural ‘communities,’ and passive-use ‘communities’.

Objective 5 – Protect wild stocks and fully utilize hatchery production

Manage salmon fisheries to ensure sustainability of naturally spawning stocks, while providing access to hatchery production.

Objective 6 –Safety

Promote the safety of human life at sea in the development of fisheries management measures. Upon request, and from time to time as appropriate, the Council, NMFS, or the State may provide for temporary adjustments, after consultation with the U.S. Coast Guard and fishery participants, for vessels that are otherwise excluded because of weather or ocean conditions causing safety concerns while ensuring no adverse effect on conservation in other fisheries or discrimination among fishery participants.

2.3.2. Procedures for Implementation

Chapter 4 of the Salmon FMP establishes the roles of agencies in implementing the FMP. The FMP delegates most of the management of the commercial troll and all of the management of the sport salmon fisheries in the East Area to the State of Alaska. Under this delegation, the State of Alaska regulates the commercial troll and sport salmon fisheries and fishing vessels in the East Area as long as the State law and regulations for these fisheries in the East Area are consistent with the FMP, the MSA, and other applicable Federal law. Chapter 9 describes the ways in which the Council and NMFS will monitor State management measures for consistency and the process that will be followed if NMFS determines that a State management measure is inconsistent with the FMP, the MSA, or other applicable Federal law. In addition to this delegation, the FMP contains the required FMP measures under section 303(a) of the MSA for the East Area.

The FMP directly manages the West Area, with the primary management measures being the closure of the West Area to commercial salmon fishing. Because the Cook Inlet EEZ is not under the FMP, the FMP does not directly manage, or delegate management of, the commercial salmon fishery that occurs in the Cook Inlet EEZ to the State and does not contain any procedures for implementing the FMP in the Cook Inlet EEZ.

2.3.3. Management Measures

The Salmon FMP does not contain management measures for the commercial salmon fishery in the Cook Inlet EEZ. The State manages State registered vessels fishing commercially for salmon in the Cook Inlet EEZ, and an overview of State management measures for this fishery is provided in Sections 4.5.1.2 and 4.5.2.1.

Federal regulations for the commercial salmon fishery in the East Area include a prohibition on commercial fishing for salmon using any gear except troll gear.²⁸ Federal regulations at 50 CFR 679.2 also define the boundaries of the East and West Areas.

2.3.4. Status Determination Criteria

Chapter 6 of the FMP provides the status determination criteria.

East Area

The status determination criteria in section 6.1 of the FMP for the East Area are separated into three tiers for the purposes of status determination criteria. A maximum sustainable yield (MSY) control rule, a maximum fishery mortality threshold (MFMT), and a minimum stock size threshold (MSST) are established for each tier. Tier 1 stocks are Chinook salmon stocks covered by the Pacific Salmon Treaty. The overfishing definition is based on a harvest relationship between a pre-season relative abundance index generated by the Pacific Salmon Commission's Chinook Technical Committee and a harvest control rule specified in the Pacific Salmon Treaty. The Pacific Salmon Treaty also provides for an inseason adjustment to the harvest level based on an assessment of inseason data. In addition, decreases in the allowable catch are triggered by conservation concerns regarding specific stock groups. This abundance-based system reduces the risk of overharvest at low stock abundance while allowing increases in harvest with increases in abundance, as with the management of the other salmon species in the southeast Alaska salmon fishery.

Tier 2 and tier 3 are salmon stocks managed by the BOF and ADF&G. Tier 2 stocks are coho salmon stocks. Tier 3 stocks are coho, pink, chum, and sockeye salmon stocks managed as mixed-species complexes, with coho salmon stocks as indicator stocks. Management of coho is based on aggregate abundance. Lack of a general coho stock identification technique prevents assessment of run strength of individual stock groups contributing to these early-season mixed stock fisheries. Information available on individual coho indicator stocks is considered in management actions. The southeast Alaska wild coho indicator stocks are Auke Creek coho, Berners River coho, Ford Arm Lake coho, and Hugh Smith Lake coho. The overfishing definitions, OY, and ACLs for tier 2 and 3 are based on the State of Alaska's MSY escapement goal policies. The present policies and status determination criteria would prevent overfishing and provide for rebuilding of overfished stocks in the manner and timeframe required by the MSA.

For the East Area, the FMP does not establish a mechanism for specifying ACLs for Chinook salmon in the East Area because of the MSA exception from the ACL requirement for stocks managed under an international fisheries agreement in which the United States participates (§ 303 note). The FMP's mechanism for specifying ACLs for Tier 2 and 3 salmon stocks are the State of Alaska's scientifically based management measures used to determine stock status and control catch to achieve the biomass level necessary to produce MSY. These provisions use the National Standard 1 guidelines alternative approach for satisfying the ACL requirements. The State's salmon management program is based on scientifically defensible escapement goals and inseason management measures to prevent overfishing. Accountability

²⁸ 50 CFR 679.7(h) *Salmon fisheries*. (1) Engage in commercial fishing for salmon using any gear except troll gear, defined at §679.2, in the East Area of the Salmon Management Area, defined at §679.2 and Figure 23 to this part.

measures include the State's inseason management measures and the escapement goal setting process that incorporates the best available information on stock abundance.

West Area

The FMP prohibits commercial fishing in the West Area so that the State can manage the salmon fisheries in waters adjacent to the West Area. Salmon that spend part of their lifecycle in the West Area are subject to commercial salmon fisheries after they reach maturity and travel back to their natal rivers and streams. These directed commercial fisheries are managed by the State of Alaska and are not subject to this FMP. National Standard 1 is achieved by the State's scientifically based approach for controlling catch to achieve the biomass level necessary to produce MSY by ensuring that overfishing does not occur in the fishery. To ensure overfishing does not occur as a result of incidental catch of salmon by other fisheries not regulated under this FMP, this FMP relies on management measures adopted under Federal fishery management plans, together with the State's management program in waters adjacent to the West Area.

2.3.5. Annual Catch Limits and Accountability Measures

For the East Area, the FMP does not establish a mechanism for specifying ACLs for Chinook salmon because of the MSA exception from the ACL requirement for stocks managed under an international fisheries agreement in which the United States participates (§ 303 note). The FMP's mechanism for specifying ACLs for Tier 2 and 3 salmon stocks are the State of Alaska's scientifically based management measures used to determine stock status and control catch to achieve the biomass level necessary to produce MSY. These provisions use the National Standard 1 guidelines alternative approach for satisfying the ACL requirements. The State's salmon management program is based on scientifically defensible escapement goals and inseason management measures to prevent overfishing. Accountability measures include the State's inseason management measures and the escapement goal setting process that incorporates the best available information on stock abundance.

2.3.6. Optimum Yield

East Area

For the troll fishery in the East Area, several economic, social, and ecological factors are involved in the definition of OY. Of particular importance are the annual variations in the abundance, distribution, migration patterns, and timing of the salmon stocks; provisions of the Pacific Salmon Treaty; decisions of the Pacific Salmon Commission; allocations by the BOF; traditional times, methods, and areas of salmon fishing; and inseason indices of stock strength. Further, because the commercial troll fishery and the sport fishery take place in the EEZ and State waters without formal recognition of the boundary between these two areas, the OY should not and cannot be subdivided into separate parts for the EEZ and State waters.

MSY is established for each tier based on the MSY control rules in section 5.1. For Chinook salmon stocks in tier 1, an all-gear MSY is prescribed in terms of catch by the Pacific Salmon Treaty and takes into account the biological productivity of Chinook salmon and ecological factors in setting this limit. The portion of the all-gear catch limit allocated to troll gear represents the OY for that fishery and takes into account the economic and social factors considered by the BOF in making allocation decisions.

For stocks in tiers 2 and 3, MSY is defined in terms of escapement. MSY escapement goals account for biological productivity and ecological factors, including the consumption of salmon by a variety of marine predators. The OY for the troll fishery is that fishery's annual catch which, when combined with the catch from all other salmon fisheries, results in a post-harvest run size equal to the MSY escapement goal for each indicator stock. The portion of the annual catch harvested by the troll fishery reflects the biological, economic, and social factors considered by the BOF and ADF&G in determining when to open and close the coho salmon harvest by the troll fishery.

The MSA requires Regional Councils to “review on a continuing basis, and revise as appropriate, the assessments and specifications made ... with respect to the optimum yield.” In particular, OY may need to be respecified in the future if major changes occur in the estimate of MSY. 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.

West Area

The FMP prohibits commercial fishing in the West Area so that the State can manage the salmon fisheries in waters adjacent to the West Area. Salmon that spend part of their lifecycle in the West Area are subject to commercial salmon fisheries after they reach maturity and travel back to their natal rivers and streams. These directed commercial fisheries are managed by the State of Alaska and are not subject to this FMP. National Standard 1 is achieved by the State’s scientifically based approach for controlling catch to achieve the biomass level necessary to produce MSY by ensuring that overfishing does not occur in the fishery. To ensure overfishing does not occur as a result of incidental catch of salmon by other fisheries not regulated under this FMP, this FMP relies on management measures adopted under Federal fishery management plans, together with the State’s management program in waters adjacent to the West Area.

Commercial fishing is prohibited in the West Area; therefore, the directed harvest OY is zero. The West Area has been closed to commercial net fishing since 1952 and commercial troll fishing since 1973 and there has not been any yield from this area. This OY recognizes that salmon are fully utilized by State managed fisheries and that the State of Alaska manages fisheries based on the best available information using the State’s escapement goal management system. Additionally, management measures adopted under other Federal FMPs, together with the State’s scientifically-based management program in waters adjacent to the West Area, ensure that overfishing of salmon does not occur as a result of incidental catch of salmon by other EEZ fisheries not regulated under this FMP. This OY also recognizes that non-Alaska salmon are fully utilized and managed by their respective management authority when they return to their natal regions.

2.3.7. Annual Process for Determining the Status of the Stocks

Under Alternative 1, no annual process for determining the status of salmon stocks under the National Standard 1 guidelines would be established for the salmon stocks in Cook Inlet. The FMP currently prohibits commercial fishing in the West Area, which currently excludes the Cook Inlet EEZ. Because commercial fishing is prohibited in the entire West Area, the directed harvest optimum yield (OY) is zero. With a prohibition on commercial fishing and a directed harvest OY of zero for the West Area, there is no need for an annual process to determine the status of the salmon stocks. As explained earlier, Alternative 1 is not a viable approach given the decision by the Ninth Circuit.

Under Amendment 12, for the East Area, the Council chose to establish a peer review process in the FMP that utilizes existing State salmon expertise and review processes for the scientific information used to advise the Council about the conservation and management of the Southeast Alaska troll fishery. This ties into implementing the alternative approach for annual catch limits and the peer review process that utilizes existing State salmon expertise and review processes for the purposes of developing fishing level recommendations and providing scientific information to the Council. Using the State’s process as the peer review process recognizes the limited role of NMFS and the Council in salmon fishery management and the State’s existing expertise and infrastructure. The State, as the peer review body, works together with the Council to implement the provisions of the MSA. This enables the escapement goal recommendations from the State’s peer review process instead of SSC recommendations on acceptable biological catch under MSA § 302(h)(6).

2.3.8. Standardized Bycatch Reporting Methodology

Under Alternative 1, no standardized bycatch reporting methodology exists or would be established for the West Area.

For the East Area, ADF&G fish tickets serve as the standardized bycatch reporting methodology. Vessels trolling for salmon in EEZ waters are restricted to a Federal retainable percentage for Federally managed groundfish species (<http://www.alaskafisheries.noaa.gov/rr/tables/tab110.pdf>).

2.3.9. Federal Oversight and Review Process for the East Area

The FMP includes a process for the Council and NMFS to oversee and review, and for the public to request that NMFS review, State salmon management actions for consistency with the FMP, the MSA, and other applicable Federal law. Review is limited to whether the State statute or regulation is consistent with the FMP, MSA, or other applicable Federal law, and does not include requests that seek a different policy outcome. Although the FMP has included a review process since the 1990 FMP, NMFS received the first, and so far only, stakeholder request for review under the FMP process in 2008. State management measures include measures adopted by the Pacific Salmon Commission and the BOF as well as other State laws, regulations, and inseason actions.

Under the FMP, the oversight and review process only apply to the East Area. The FMP chapter 9 describes (1) how the Council and NMFS fulfill the oversight role, (2) the ways in which the Council and NMFS monitor State management measures that regulate salmon fishing in the East Area, (3) the process by which NMFS will review State management measures governing salmon fisheries in the East Area for consistency with the FMP, the MSA, and other applicable Federal law, (4) the process by which a member of the public can petition NMFS to review State management measures in the East Area for consistency with the FMP, the MSA, and other applicable Federal law, and (5) the process NMFS will follow if NMFS determines that State management measures in the East Area are inconsistent with the FMP, the MSA, or other applicable Federal laws.

2.3.10. Monitoring, Recordkeeping, and Reporting Requirements

The FMP currently places no monitoring, recordkeeping, or reporting requirements on the vessels commercial fishing for salmon in the EEZ of Cook Inlet.

The State does not place monitoring or recordkeeping requirements on fishery participants, but does require all processors (and fishermen selling to individual buyers “on the docks”) to provide a summary report of the number of fish purchased by species and statistical area no later than 12:00 noon of the day following a fishery. For example, if a fishing period ends at 11:00 p.m., these reports are required no longer than 13-hours later.

Monitoring during the fishery is accomplished by aerial and vessel based law enforcement patrols.

2.4. Alternative 2: Federal management with specific management measures delegated to the State.

Under Alternative 2, the Council would amend the Salmon FMP to include the Cook Inlet EEZ in the FMP’s fishery management unit in the West Area and establish a Federal management regime for the salmon fishery that delegates specific management measures to the State of Alaska, to use existing State salmon management infrastructure, in compliance with the MSA and Ninth Circuit ruling. Alternative 2 would identify the management measures that would be implemented by the Council and NMFS, the management measures that would be delegated to the State to manage with Federal oversight, and the process for delegation and oversight of management.

2.4.1. Management Policy and Objectives

Although the Council may want to consider the development of a new management policy and objectives specifically applicable to the Cook Inlet EEZ under this alternative, one option for Council consideration is to maintain the FMP's existing management policy and objectives and have them continue to apply to all areas managed by the FMP (the East Area and the West Area, which would include the Cook Inlet EEZ). This approach would require some modifications to the existing Management Objectives as follows:

New draft FMP language:

Management Policy

The Council's salmon management policy is to facilitate State of Alaska salmon management in accordance with the Magnuson-Stevens Act, Pacific Salmon Treaty, and applicable Federal law. This FMP represents the Council's contribution to a comprehensive management regime for the salmon fishery that will be achieved in concert with actions taken by the Pacific Salmon Commission and the State. This policy ensures the application of judicious and responsible fishery management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future, as well as current generations.

Under this policy, all management measures will be based on the best scientific information available. This management policy recognizes the need to balance many competing uses of marine resources and different social and economic objectives for sustainable fishery management, including protection of the long-term health of the resource and the optimization of yield. This policy uses and improves upon the Council's and State's existing open and transparent process of public involvement in decision-making.

Management Objectives

The Council has identified the following seven management objectives to guide salmon management under the FMP. The Council, NMFS, and the State of Alaska will consider the management policy and the following management objectives in developing amendments to this FMP and associated management measures. Because adaptive management requires regular and periodic review, the management objectives identified in this section will be reviewed periodically by the Council. The Council, NMFS, and the State of Alaska will also review, modify, eliminate, or consider new management measures, as appropriate, to best carry out the management objectives for the FMP.

Objective 1 – Prevent overfishing and achieve optimum yield

Manage the commercial and sport salmon fisheries in the East Area in concert with the Pacific Salmon Commission, and in accordance with the conservation and harvest sharing goals of the Pacific Salmon Treaty, to prevent overfishing and obtain the number and distribution of fish capable of producing the optimum yield on a sustained basis.

Manage the commercial salmon fishery in the Cook Inlet EEZ in concert with the State to prevent overfishing and obtain the number and distribution of spawning fish capable of producing the optimum yield on a sustained basis.

Prevent overfishing and achieve optimum yield in the West Area outside of the Cook Inlet EEZ by prohibiting the commercial harvest of salmon. Prohibiting commercial harvest in the West

Area outside of the Cook Inlet EEZ enables the Council, NMFS, and the State to manage salmon fisheries to achieve escapement goals and maximize economic and social benefits from the fishery.

Objective 2 – Manage salmon as a unit throughout their range

Manage salmon fisheries in the EEZ in a manner that reflects the salmon life history by utilizing the State’s existing salmon management infrastructure and expertise and enabling the State to manage salmon stocks seamlessly throughout their range. In the East Area, this objective is achieved by delegating specified aspects of management of the sport and commercial salmon fisheries to the State, to manage consistent with the FMP and with State and Federal laws, including the Pacific Salmon Treaty.

In the Cook Inlet EEZ, this objective is achieved by delegating specified aspects of management of the commercial salmon fishery to the State to manage consistent with the FMP and with State and Federal laws.

In the West Area outside of the Cook Inlet EEZ, this objective is achieved by prohibiting commercial fishing for salmon so that the Council, NMFS, and the State can manage Alaska salmon stocks as a unit.

Objective 3 – Minimize Bycatch and Bycatch Mortality

To the extent practicable, manage salmon fisheries to minimize bycatch and minimize the mortality of unavoidable bycatch. Decrease, where possible, the incidental mortalities of salmon hooked and released, consistent with allocation decisions and the objective of providing the greatest overall benefit to the people of the United States.

Objective 4 - Maximize economic and social benefits to the Nation over time.

Economic benefits are broadly defined to include, but are not limited to: profits, income, employment, benefits to consumers, and less tangible or less quantifiable benefits such as the economic stability of coastal communities, recreational value, non-consumptive use value, and non-use value. To ensure that economic and social benefits derived from fisheries covered by this FMP are maximized over time, the following will be examined in the selection of management measures:

- Control of fishing effort and salmon catches.
- Fair and equitable allocation of harvestable surpluses of salmon.
- Economic impacts on coastal communities and other identifiable dependent groups (e.g., subsistence users).

This examination will be accomplished by considering, to the extent that data allow, the impact of management measures on the size of the catch during the current and future seasons and their associated prices, harvesting costs, processing costs, employment, the distribution of benefits among members of the harvesting, processing and consumer communities, management costs, and other factors affecting the ability to maximize the economic and social benefits as defined in this section. Other benefits are tied to economic stability and impacts of commercial fishing, as well as, unguided and charter recreational fishing associated with coastal communities, subsistence fishing supporting traditional social and cultural ‘communities,’ and passive-use ‘communities’.

Objective 5 – Protect wild stocks and utilize hatchery production

Manage salmon fisheries to prioritize and ensure the sustainability of naturally spawning stocks, while providing access to hatchery production.

Objective 6 –Safety

Promote the safety of human life at sea in the development of fisheries management measures. Upon request, and from time to time as appropriate, the Council, NMFS, or the State may provide for temporary adjustments, after consultation with the U.S. Coast Guard and fishery participants, for vessels that are otherwise excluded because of weather or ocean conditions causing safety concerns while ensuring no adverse effect on conservation in other fisheries or discrimination among fishery participants.

Objective 7 - Identify and Protect Salmon Habitat.

Use the best available science to identify and describe essential fish habitat pursuant to the MSA, and mitigate fishery impacts in the EEZ as necessary and practicable to continue the sustainability of managed species.

2.4.2. Procedures for FMP Implementation

For the Cook Inlet EEZ, Alternative 2 would delegate certain management functions to the State and specify the requirements associated with each delegated authority. The FMP would need to include transparent procedures governing the State’s exercise of its delegated management authority of the commercial salmon fishery in the Cook Inlet EEZ. Under Alternative 2, the Council and NMFS would continue to directly manage the West Area outside of the Cook Inlet EEZ under the FMP.

Under § 306(a)(3)(B) of the MSA, a State may regulate a fishing vessel outside the boundaries of the State when the FMP for the fishery in which the fishing vessel is operating delegates management of the fishery to a State and the State's laws and regulations are consistent with such fishery management plan. Since the FMP was in place on August 1, 1996 and the FMP did not explicitly delegate management of the commercial salmon fishery in the Cook Inlet EEZ to the State on that date, the Council would need to approve a delegation of management of the Cook Inlet EEZ commercial salmon fishery to the State by a three-quarters majority vote of the voting members of the Council.

The proposed procedures to implement an FMP that delegates management of the Cook Inlet EEZ commercial salmon fishery to the State are based on the division of management roles and functions established in the Fishery Management Plan for the Scallop Fishery off Alaska and the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs. Under Alternative 2, the FMP would be amended to include the following procedures that would apply to the management of the commercial salmon fishery in the Cook Inlet EEZ.

New draft FMP language:

Procedures for FMP Implementation (Federal/State) in the Cook Inlet EEZ

To achieve the Management Policy and Management Objectives, the FMP delegates certain specified management measures to the State. To the extent practicable, NMFS will coordinate with ADF&G to develop management measures for the commercial salmon fishery in the Cook Inlet EEZ that are consistent with the FMP, the MSA, and other applicable Federal law.

The FMP establishes the following protocol which describes the roles of the Federal and State governments under a delegated management regime for the Cook Inlet EEZ:

1. The Council will develop and amend the FMP to govern management of the commercial salmon fishery in the Cook Inlet EEZ, prescribing objectives and any management measures found by the Council and NMFS to be necessary for effective conservation and management. Under the authority delegated to it by the FMP, the State will promulgate regulations that apply to all vessels commercially fishing for salmon in the Cook Inlet EEZ. State management measures must be consistent with the FMP, MSA, and other applicable Federal law.

The FMP contains two categories of management measures:²⁹

Category 1: Federal management measures that are fixed in the FMP, implemented by Federal regulation, and require an FMP amendment to change.

Category 2: General management measures delegated to the State for implementation consistent with the FMP, MSA, and other applicable law. The “Other” measure under Category 2 permits the State to implement management measures not specifically identified under Category 2.

Category 1 (Federal)	Category 2 (State)
<ul style="list-style-type: none"> • Status Determination Criteria (optimum yield, overfishing and overfished) • Annual Catch Limits and Accountability Measures • Essential Fish Habitat • Standardized Bycatch Reporting • Recordkeeping and Reporting • Legal gear 	<ul style="list-style-type: none"> • Escapement goals • Fishing Seasons • Closed Waters • Management Area, District, Subdistrict, Section, and Statistical Area Boundaries • Legal Gear • Inseason Management • Limited Entry Permits • Recordkeeping and Reporting • Other

2. Representatives from the Council, NMFS, and NOAA General Counsel will coordinate with the State in the development of regulations for commercial salmon fishery management in the Cook Inlet EEZ for the purpose of assisting the State in determining the extent to which proposed management measures are consistent with the FMP, MSA, and other applicable Federal law. NMFS will review measures adopted by the State in accordance with FMP Chapter 9.
3. Under FMP Chapter 9, the Secretary will consider only those requests for Federal review asserting that a State law is inconsistent with the FMP, MSA, or other applicable Federal law. If necessary, NMFS will issue Federal regulations in the Cook Inlet EEZ to supersede any State laws or regulations that are inconsistent with the FMP, the MSA, or other applicable Federal law.
4. ADF&G will provide the information on which to base State fishing regulations and will consult with NMFS (Alaska Region and AFSC), NOAA General Counsel, and

²⁹ The same type of management measure can occur in both categories to allow for State and Federal measures pertaining to the topic. For example, a Category 1 measure generally authorizing nets as legal gear, and a Category 2 measure precisely defining the allowable configurations of legal net gear.

other fishery management or research agencies to prevent duplication of effort and assure consistency with the FMP, MSA, and other applicable Federal law.

5. The FMP provides that the Commissioner of ADF&G, or his designee, may open or close seasons or areas by means of emergency orders (EO) authorized under State regulations. Consistent with Chapter 9, interested persons may request Federal review of these actions for a determination that the emergency orders are consistent with the FMP, MSA, and other applicable Federal law. If NMFS determines that the State action is inconsistent with the above, NMFS will issue a Federal regulation to supersede the State EO in the EEZ.
6. The State will provide written explanations of the reasons for its decisions concerning management of the commercial salmon fishery in the Cook Inlet EEZ. For EOs, the current EO written justification provided by the State meets this requirement.
7. ADF&G will participate in the Salmon Plan Team and assist in preparing the Stock Assessment and Fishery Evaluation Report for the Council which discusses the status of the stocks and economic status of the fishery. This report will be made available to the public and presented to the Council on an annual basis.
8. NOAA Office of Law Enforcement and the U.S. Coast Guard will work in cooperation with the State to enforce regulations for the commercial salmon fishery in the Cook Inlet EEZ.

2.4.3. Management Measures Delegated to the State of Alaska

The option presented in the previous section identifies types of management measures that could be delegated to the State in Category 2. As with other FMPs that delegate management to the State, criteria to guide the State for each type of management measure that is delegated would be needed. The following provides possible criteria for the Category 2 management measures identified above.

New draft FMP language:

Criteria for Category 2 management measures delegated to the State:

Escapement Goals – The FMP authorizes the State to set escapement goals under State regulations and policies. Escapement goals allow the State to make inseason management decisions based on current data. The State may close fishing periods or areas to ensure that escapement goals are met. The State sets the escapement goals for Cook Inlet salmon stocks using the best scientific information available to sustain salmon resources for future generations.

Fishing Seasons – The State adopts fishing seasons for salmon based on run timing of specific salmon species and stocks and to meet economic and social objectives, achieve stability, and ensure efficiency in fishing operations. The FMP authorizes the State to modify and adopt fishing seasons consistent with the FMP, the MSA, and other applicable Federal law.

Closed Waters – The FMP recognizes the State’s need to close certain waters to commercial salmon fishing for conservation purposes and authorizes the State to designate new closed water areas or expand or reduce existing State closed water areas to meet State subsistence requirements and to promote conservation and sustained yield management of a specific salmon species or stock.

Management Area, District, Subdistrict, Section, and Statistical Area Boundaries – The FMP authorizes the State to adjust management area, district, subdistrict, section, and statistical area boundaries to manage the salmon fishery in the Cook Inlet EEZ for sustained yield and to ensure accurate recordkeeping and reporting.

Legal Gear – Salmon in the Cook Inlet EEZ commercial salmon fishery are taken with drift gillnet gear. The FMP authorizes the State to change the configuration of legal gillnet gear that fishermen are permitted to use when harvesting salmon in the Cook Inlet EEZ and to modify gear specifications such as net length, marking, depth, and mesh size.

Inseason Management – The State manages commercial salmon fisheries in the Cook Inlet EEZ to meet escapement goals and management plan objectives established by the State and to achieve FMP Management Objectives. This is done primarily by inseason actions to adjust the time and area of commercial salmon fishing periods to either increase or decrease harvest of specific salmon species and stocks. The State establishes the time and area of openings in regulation or by EO.

Limited Entry Permits – The Limited Entry Act was passed in 1973 to promote conservation and sustained yield management and improve health and stability of Alaska’s commercial salmon fisheries by regulating the number of fishery participants. All commercial salmon fishing in the Cook Inlet EEZ occurs under auspices of the Limited Entry Act.

The FMP authorizes the State to continue to issue and transfer limited entry permits and to modify the terms of limited entry consistent with the FMP, the MSA, and other applicable Federal law. Any modifications by the State to the terms of limited entry in the Cook Inlet EEZ and decisions on limited entry permits will be subject to Council and NMFS oversight and the process described in Chapter 9 of the FMP.

Recordkeeping and Reporting – Recordkeeping and Reporting requirements for fishery participants are an important component in achieving Management Objectives described in the FMP. The FMP authorizes the State to establish recordkeeping and reporting requirements such as information required on fish tickets, methods of submitting fish tickets, and frequency of fish ticket submittal, as well as logbooks.

Other – The State is delegated authority to implement management measures not specifically described in Categories 1 or 2. However, any State management measures that fall under “Other” must be consistent with the FMP, the MSA, and other applicable Federal laws, and may be implemented by the State only after consultation with the Council. Other management measures the State may implement are subject to the review and appeals procedures described in Chapter 9 of the FMP.

2.4.4. Status Determination Criteria and Annual Catch Limits for the Cook Inlet EEZ

Status determination criteria and annual catch limits (ACLs) are under *Category 1: Federal management measures that are fixed in the FMP, implemented by Federal regulation, and require an FMP amendment to change*. This section provides status determination criteria and annual catch limits for specific salmon stocks harvested in the EEZ in Cook Inlet.

To address the requirements of the MSA, the proposed status determination criteria are based on the unique life history of salmon and the large variations in annual stock abundance due to numerous environmental variables. They also take into account the uncertainty and imprecision surrounding the estimates of MSY, fishery impacts, and spawning salmon escapements. In recognition of the unique

salmon life history, the criteria differ somewhat from the general guidance in the NS1 Guidelines (§600.310).

The FMP would establish a tier system for annually determining the status of the salmon stocks in Cook Inlet. Presently, sufficient data are not available to develop status determination criteria and annual catch limits for all salmon stocks within Cook Inlet. Each year, salmon stocks would be separated into three tiers based on the level of information available for each stock through the annual status determination process.

- Tier 1: salmon stocks with escapement goals and stock-specific catches
- Tier 2: salmon stocks managed as a complex, with specific salmon stocks as indicator stocks
- Tier 3: salmon stocks with no reliable estimates of escapement

The proposed status determination criteria for each tier are based on the State of Alaska’s escapement goal policies and are designed to prevent overfishing and provide for rebuilding of overfished stocks in the manner and timeframe required by the Magnuson-Stevens Act. As explained in more detail within each tier, a maximum sustainable yield (MSY) control rule, a maximum fishery mortality threshold (MFMT), a minimum stock size threshold (MSST), overfishing level (OFL), and acceptable biological catch (ABC), and an annual catch limit (ACL) would be established for Tiers 1 and 2. In Tier 3, the OFL and ABC would be specified in terms of maximum catch value over an historical time period, unless the Salmon Plan Team or SSC recommends an alternative value based on the best available scientific information. Changes to the tier system must be made through an FMP amendment. However, the tier system is designed to incorporate the best scientific information available each year through the annual status determination process.

Developing appropriate status determination criteria is highly scientific and requires time and analysis of available data and appropriate methods. The proposed criteria provided in this section provide a starting point for that ongoing scientific analysis through the annual status determination process. To inform the calculation of the MSY Control Rule, Overfishing, and ACLs, landings from EEZ waters would have to be accounted for separately from landings originating from State waters.

New draft FMP language for the Cook Inlet EEZ:

Tier 1: Salmon stocks with escapement goals and stock-specific catches

Each year, salmon stocks that have escapement goals and stock-specific catches would be placed in Tier 1. The Salmon Plan Team, in consultation with ADF&G, would identify the Tier 1 stocks each year during the annual status determination process. For the Tier 1 stocks, the following calculations would be conducted each year to determine the status of the managed salmon stocks and set the appropriate biological reference points:

MSY Control Rule

(1) The MSY control rule is of the “constant escapement” form. In other words, yield varies with run size each year to achieve a constant sustainable level of escapement, currently defined as the lower bound of the escapement goal range. If, in a particular year, run size falls below the escapement goal, then yield that year would be zero.

- MSY Control Rule: $Y_t = \max(0, R_t - G_t - C_{state,t})$, where t = return year, Y = potential yield within the EEZ, R = annual run size of a stock, and G = escapement goal or target. G = lower bound of the established escapement goal is the default used in this tier system, however, the Salmon Plan Team or SSC may recommend a different value

(such as the midpoint of the escapement goal range or S_{MSY}) for G during the annual stock status determination process if deemed appropriate.

Overfishing

(2) The fishing mortality rate in the EEZ for these stocks is expressed as an exploitation rate (catch/run), which is computed as a weighted average of run-specific exploitation rates observed for the stock over one generation (T):

- $F_t = \frac{\sum_{i=t-T+1}^t C_{EEZ,i}}{\sum_{i=t-T+1}^t R_i}$, where T = average generation time in years, and C_{EEZ} = annual EEZ catch of a stock in year i .

(3) The level of fishing mortality in the EEZ above which overfishing occurs (MFMT) for these stocks is also based on a multi-year exploitation rate, in this case, the exploitation rate that corresponds to harvest at the MSY control rule each year for one generation time:

- $MFMT_t = \frac{\sum_{i=t-T+1}^t Y_i}{\sum_{i=t-T+1}^t R_i}$, evaluated by comparing F with $MFMT$.

Should the fishing mortality rate exceed the MFMT in any year, it will be determined that the stock is subject to overfishing.

Overfished

(4) Should a stock's productive capacity fall below the MSST in any year, it will be determined that the stock is overfished. This would occur when the summed escapements for one generation (T) are less than one-half of G across T years:

- $MSST_t = \frac{\sum_{i=t-T+1}^t G_i}{2}$; evaluated by comparing $\sum_{i=t-T+1}^t S_i$ with $MSST$, where S is spawning escapement in year i .

(5) MFMT and MSST would be updated each year with the most current T years of G , R , C_{EEZ} , and S .

Annual Catch Limit

(6) The ACL in the EEZ would be calculated postseason each year as the cumulative yield in the EEZ under the MSY control rule for the most recent T years:

- $ACL_t = \sum_{i=t-T+1}^t Y_{EEZ,i}$,

(7) The ACL would need to be evaluated if the summed catches across those T years $\sum_{i=t-T+1}^t C_{EEZ,i}$ exceed the ACL even though escapement has been above G , i.e., $S_t \geq G_t$ during the same time span.

- Preseason, the ACL would be expressed as the sum of observed potential yields in the EEZ from the previous $T-1$ years and the preseason estimate of potential yield in the EEZ based on the preseason forecast of run size:
 - $ACL_{preseason} = \sum_{i=t-T+1}^{t-1} Y_{EEZ,i} + \hat{Y}_{EEZ,t}$, where $\hat{Y}_{EEZ,t}$ is the preseason estimate of potential yield in the EEZ for year t and is calculated as:
 - $\hat{Y}_{EEZ,t} = \hat{R}_t - G_t - \bar{F}_{state,t} \hat{R}_t$, where \hat{R}_t is the predicted run size in year t based on a vetted preseason forecast method and $\bar{F}_{state,t}$ is the recent average harvest rate in State waters over the average generation time (T) for the species and stock.

- Postseason, all T years of realized runs would be used to determine if the ACL was exceeded.

Overfishing Level and Acceptable Biological Catch

(8) An OFL and ABC are not explicitly specified for Tier 1 stocks such that ABC would be a reduction from OFL to account for scientific uncertainty. Escapement goals developed by ADF&G incorporate uncertainties in the data and model (e.g. escapement assessment, process error, etc.) and the lower bounds of escapement goals are set to provide long-term yields near MSY, if the fishery is managed to achieve the escapement goal. Therefore, uncertainty is already accounted for in the process of defining the escapement goal range and it is not necessary to establish an additional buffer for Max ABC.

- OFL = Max ABC = ACL, with a default buffer between OFL and Max ABC of 0%.
- An ABC at or below the Max ABC would be set each year during the annual stock status determination process based on the best available information.
- For consideration in setting the ABC below Max ABC, the Salmon Plan Team could consider starting with this equation:
 - $ABC_{EEZ,t} = \hat{R}_t - \bar{F}_{state,t}\hat{R}_t - G_t$, where \hat{R}_t is the predicted run size in year t based on a vetted preseason forecast methodology, $\bar{F}_{state,t}$ is the average harvest rate in State waters over the average generation time T for the species and stock.

Tier 2: Salmon stocks managed as a complex

Tier 2 stocks are salmon stocks managed as a complex, with specific salmon stocks designated as indicator stocks. An indicator stock is a stock for which sufficient data exist to allow for the development of measurable and objective status determination criteria and can be used as a proxy to manage and evaluate data poor stocks within the stock complex. Further, an indicator stock is representative of the typical vulnerabilities of stocks within the stock complex.

The Salmon Plan Team, in consultation with ADF&G, would identify the Tier 2 stocks each year during the annual status determination process.

In general, management of these stocks is based on aggregate abundance. Lack of a general stock identification technique (or logistical and economic constraints) for catches within Cook Inlet prevents assessment of run strength of individual stock groups contributing to this mixed stock fishery. Information on the individual indicator stock is used to inform management actions for the stock complex.

For the Tier 2 stocks, the following calculations would be conducted each year to determine the status of the salmon stocks and set the appropriate biological reference points.

MSY Control Rule

(1) The MSY control rule is of the “constant escapement” form, described above for Tier 1 stocks. The difference with respect to Tier 1 is not in the form of the control rule, but rather the level of aggregation at which it is applied.

Overfishing

(2) The Tier 1 formulas for F and MFMT would be used for Tier 2 indicator stocks. Whenever estimates of F or MFMT, as defined under Tier 1, are unavailable for each stock

in a stock complex managed under this FMP, a list of “indicator” salmon stocks for a given stock complex will be established.

(3) Using the same definitions and criteria described under Tier 1, a determination that one or more indicator salmon stocks is being subjected to overfishing will constitute a determination that the respective stock complex is being subjected to overfishing, except as provided in the paragraph below.

(4) Overfishing of one or more stocks in a stock complex may be permitted, and will not result in a determination that the entire stock complex is being subjected to overfishing, under the following conditions established under National Standard 1 (50 CFR §600.310(l)), specifically:

a) it is demonstrated by analysis that such action will result in long-term net benefits to the Nation;

b) it is demonstrated by analysis that mitigating measures have been considered and that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristics in a manner such that no overfishing would occur; and

c) the resulting rate or level of fishing mortality will not cause any stock or stock complex to fall below its MSST more than 50% of the time in the long term.

(5) The productive capacity of a stock complex is measured as the sum of the indicator stocks’ escapements from the most recent T years, where T is equal to the average generation time for the species and stocks being considered in terms of total age.

Overfished

(6) The MSST for a stock complex is equal to one-half the sum of the G s for the indicator salmon stocks from the most recent T years.

(7) Should a stock complex’s productive capacity fall below the MSST in any year, it will be determined that the stock complex is overfished.

(8) The MSY for the stock complex could be listed as unknown, while noting that the stock complex is managed on the basis of one or more indicator stocks that do have stock-specific MSYs or suitable proxies.

Overfishing Levels, Annual Catch Limits & Acceptable Biological Catch

(9) The OFL, ACL, and ABC will be set for the indicator stock using the Tier 1 methodology.

Tier 3: Salmon stocks with no reliable estimates of escapement

Tier 3 salmon stocks have no reliable estimates of escapement, and OFL/ABC are based on reliable catch history for each species, similar to Tier 6 for Federally managed groundfish species. Only an OFL and ABC would be set for these stocks and because it is not possible to set an MSST without an estimate of escapement.

The Salmon Plan Team, in consultation with ADF&G, would identify the Tier 3 stocks each year during the annual status determination process.

For the Tier 3 stocks, the following calculations would be conducted each year to determine the status of the salmon stocks and set the appropriate biological reference points.

Proposed OFL, ABC, and ACL:

- OFL = the maximum EEZ catch multiplied by T years, unless an alternative value is recommended on the basis of the best available scientific information.
- $\text{Max ABC} < \text{OFL} * 0.9$ to buffer for uncertainty. An ABC at or below the maximum ABC would be set each year during the annual stock status determination process based on the best available information.
- $\text{ABC} = \text{ACL}$

Decisions for the annual status determination process:

- Which stocks belong in Tier 3?
- What are the appropriate years to use for maximum catch?
- Does the best available scientific information indicate that an alternative value should be set for OFL?
- What is the appropriate buffer for uncertainty in setting the ABC?

Because the OFL is a limit on catch, using catch history for Tier 3 stocks is the most appropriate way to set the OFL when there are no reliable estimates of escapement. Overfishing would occur when harvest exceeds the OFL. For salmon, the summary of catches can be reliably used as an OFL due to the multiple year nature of how the catch data are accumulated (e.g., 4 years for chum information). Methods that use CPUE (e.g., catch per delivery) would likely not provide sufficient information to judge whether catches had exceeded a level thought to cause overfishing, whereas a long period of sustained catches is evidence that overfishing is not occurring.

Rebuilding

If a stock or stock complex is determined to be overfished, NMFS will immediately notify the Council under section 304(e) of the Magnuson-Stevens Act. The Council would have two years from this notification to end overfishing and prepare a rebuilding plan.

If a stock or stock complex is declared overfished or if overfishing is occurring, the Council will request that the State of Alaska and Salmon Plan Team conduct a formal assessment of the primary factors leading to the decline in abundance and recommend management measures to prevent overfishing and rebuild the fishery. The Council and NMFS will assess these rebuilding measures for compliance with the Magnuson-Stevens Act, including the national standard guidelines. If the Council and NMFS deem the State of Alaska's proposed rebuilding measures sufficient to comply with Magnuson-Stevens Act requirements, the State rebuilding program may be adopted without an FMP amendment to assure timely implementation.

A proposed rebuilding plan could include:

1. an evaluation of the roles of fishing, marine and freshwater survival in the overfished determination;
2. any modifications to the SDC for determining when the stock has rebuilt,
3. recommendations for actions to rebuild the stock to MSY, including modification of control rules if appropriate, and;
4. a specified rebuilding period.

Based on the results of the State of Alaska and Salmon Plan Team's recommended rebuilding plan, the Council would recommend the rebuilding plan to the Secretary. Adoption of a rebuilding plan would require implementation either through an FMP amendment, Federal notice and comment rule-making, or State action. Subject to Secretarial approval, the Council and the State would implement the rebuilding

plan with appropriate actions to ensure the stock is rebuilt in as short a time as possible based on the biology of the stock but not to exceed ten years, while taking into consideration the needs of the commercial, recreational, personal use, and subsistence fishing interests and coastal communities.

If a stock is overfished, a rebuilding plan could include control rules or management measures that target spawning escapement at or above the level expected to produce MSY, provided sufficient recruits are available, and targeting a rebuilding period of one generation. As Chinook and sockeye generation times often vary more substantially than those of other salmon species (with an average of 5 years), in the context of rebuilding times “one generation” should be viewed in the context of the particular stock or average generation time within a stock complex. For any of the species, if the particular stock of concern typically exhibits a different life history than those generalized above, the Salmon Plan Team could use stock-specific expertise to determine the most appropriate generation time for the rebuilding timeline.

Because salmon are exploited in multiple fisheries, and because multiple salmon stocks may be exploited within the Federal waters of Cook Inlet, it is necessary to determine fishery specific contribution to the total exploitation rate to determine the actions necessary to end and prevent future overfishing. As the Council and NMFS have no jurisdiction over river and State-waters fisheries, it also may be necessary for other responsible entities to take action to end ongoing and prevent future overfishing. Furthermore, the Board of Fisheries may proactively or reactively modify salmon harvests in State waters to account for removals in the EEZ.

The Salmon Plan Team would report postseason exploitation rates in the annual SAFE document and assess the mortality rates in fisheries impacting the stock of concern and report their findings.

In cases where no action within Council authority can be identified which has a reasonable expectation of contributing to the rebuilding of the stock in question, the Council will identify the actions required by other entities to recover the depressed stock, and these findings will be reported to the appropriate management entity. Due to a lack of data for some stocks, environmental variation, economic and social impacts, and habitat losses or problems beyond the control or management authority of the Council, it is possible that rebuilding of depressed stocks in some cases could take much longer than ten years. The Council may change analytical or procedural methodologies to improve the accuracy of estimates for abundance, harvest impacts, and/or reduce ocean harvest impacts when it may be effective in stock recovery. For those causes beyond Council control or expertise, the Council may make recommendations to those entities which have the authority and expertise to change preseason prediction methodology, improve habitat, modify enhancement activities, and re-evaluate management and conservation objectives for potential modification through the appropriate Council process.

2.4.5. Accountability Measures

The National Standard 1 guidelines, at 50 CFR 600.310(g), define accountability measures as management controls to prevent ACLs from being exceeded, and to correct or mitigate overages of the ACL if they occur. Overages occur catch exceeds the ACL.

Some accountability measures would be implemented by ADF&G during the preseason planning process and inseason. Others are implemented postseason through monitoring and reporting requirements. Additional accountability measures would be implemented, as required, if the postseason ACL is exceeded in multiple years.

Overfishing would be addressed by restricting the fishery in subsequent years. Under the FMP, accountability measures would only apply to the fishery that occurs in the EEZ. Nevertheless, NMFS and ADF&G would have to consider all sources of harvest and adjust the EEZ harvest accordingly to prevent overfishing.

Inseason

The following are the types of measures that could be implemented during the season to avoid overages of the ACL.

- Inseason authority to manage the fishery allows ADF&G to close the fishery on short notice when ACLs are projected to be met or exceeded.
- Monitoring during the season allows projection of when ACLs will be met.

Post-season

Postseason accountability measures could be implemented through the assessment and review phases of the annual stock assessment process:

- Under Tier 1 and Tier 2, ADF&G would use the postseason ACL, using all T years of realized runs to determine if the ACL was met or not. If the ACL was exceeded, the AMs would be an overage adjustment that reduces the ACLs in the next fishing year.
- Salmon Plan Team - provides a forum for re-evaluation of management objectives, reference points, and modification of models that relate mixed-stock impacts to stock-specific objectives and reference points.
- Annual SAFE document - allows postseason assessment of objectives and performance.

If total catch is determined to be above the postseason ACL, the Salmon Plan Team would report on the catch overages and accountability measures in the annual SAFE reports. If it is necessary to correct problems in the assessment or management methods, such changes can be considered during the annual Salmon Plan Team process.

Repeated overages of ACL could trigger evaluation of the ACL/accountability measure approach in order to address any systemic bases for the overages.

2.4.6. Optimum Yield and Maximum Sustainable Yield

OY and MSY could be described as follows for the commercial salmon fishery in Cook Inlet.

New draft FMP language:

For the Cook Inlet salmon fishery, several economic, social, and ecological factors are involved in the definition of OY. Of particular importance are the annual variations in the abundance, distribution, migration patterns, and timing of the salmon stocks; allocations by the BOF; traditional times, methods, and areas of salmon fishing; and inseason indices of stock strength. Further, because the fisheries take place in the EEZ and State waters, the OY should not and cannot be subdivided into separate parts for the EEZ and State waters.

MSY is established for salmon stocks with escapement goals based on the MSY control rules in the tier system. For these stocks, MSY is defined in terms of escapement. MSY escapement goals account for biological productivity and ecological factors, including the consumption of salmon by a variety of marine predators.

The OY for the commercial salmon fishery in the Cook Inlet EEZ is that fishery's annual catch which, when combined with the catch from all other salmon fisheries within Cook Inlet, results in a post-harvest run size equal to the MSY escapement goal for each indicator stock. The portion of the annual catch harvested by the commercial salmon fishery in the Cook Inlet EEZ reflects the biological, economic, and social factors considered by the BOF

and ADF&G, in accordance with MSA requirements, in determining when to open and close the salmon harvest by the salmon fishery.

The MSA requires Regional Councils to “review on a continuing basis, and revise as appropriate, the assessments and specifications made ... with respect to the optimum yield.” In particular, OY may need to be respecified in the future if major changes occur in the estimate of MSY. 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.

2.4.7. Annual Process for Determining the Status of the Stocks

Under Alternative 2, the Council will need to establish an annual process for determining the status of salmon stocks in the Cook Inlet EEZ in order to ensure that a scientifically based approach is used for controlling catch to maintain stock abundance at the level necessary to produce MSY and prevent overfishing from occurring in the fishery.

Salmon Plan Team

Under Alternative 2, the Council would establish a Salmon Plan Team that would function similar to the Crab Plan Team and the Scallop Plan Team. The Salmon Plan Team would produce a Stock Assessment and Fishery Evaluation (SAFE) Report and annually recommend OFL, ABC, ACL, and MSST as appropriate, using the Tier system in the Salmon FMP and the best available information. The SSC and Council would review the SAFE and set the OFL, ABC, ACL, and MSST, as appropriate.

The Council selects plan team members from agencies and organizations having a role in the research or management of the affected fisheries. Plan teams are designed to be small enough to work effectively but large enough to have expertise covering all the important aspects of a particular fishery. Individuals on the teams may be nominated by other members of the Plan Team, Council, SSC or Advisory Panel. Appointments to the team are approved by the Council.

Salmon SAFE

The annual SAFE report would provide the Council with a summary of the most recent biological condition of the salmon stocks and the social and economic condition of the fishing and processing industries. The SAFE report would summarize the best available scientific information concerning the past, present, and possible future condition of the salmon stocks and fisheries, along with ecosystem considerations/concerns. This would include recommendations of OFL, ABC, ACL, and MSST. All recommendations must be designed to prevent overfishing while achieving optimum yield (National Standard 1). All recommendations would also be scientifically based (National Standard 2), drawing upon the Plan Team’s expertise in the areas of regulatory management, natural and social science, mathematics, and statistics. Finally, uncertainty would be taken into account wherever possible (National Standard 6).

The Salmon SAFE report would be scientifically-based, citing data sources and interpretations, and would provide information to the Council for determining annual harvest specifications, documenting significant trends or changes in the stocks, marine ecosystem, and fisheries over time; and assessing the relative success of existing State and Federal fishery management programs. The review by the SSC would constitute the official, scientific review for purposes of the Information Quality Act. Upon review and acceptance by the SSC, the Salmon SAFE and any associated SSC comments would constitute the best scientific information available for purposes of the MSA.

The Salmon SAFE could be structured like other Council SAFEs such that stock assessments, economic analyses, and ecosystem considerations comprise the three major themes of the SAFE document. The stock assessment section of the SAFE could contain chapters for each salmon stock, and a summary or “intro” chapter prepared by the Salmon Plan Team. To the extent practicable, each chapter would include

estimates of all annual harvest specifications, all reference points needed to compute such estimates, and all information needed to make annual status determinations with respect to “overfishing” and “overfished.” In providing this information, the Salmon SAFE would use an official time series of historical catch for each salmon stock, which would be provided by the State of Alaska, including estimates of retained and discarded catch taken in the salmon fishery; bycatch taken in other fisheries; State commercial, recreational, personal use, and subsistence fisheries; and catches taken during scientific research.

The other two major SAFE sections would contain economic, social, community, essential fish habitat, and ecological information pertinent to the success of salmon management or the achievement of Salmon FMP objectives.

2.4.8. Monitoring, Recordkeeping, and Reporting

Currently, the salmon FMP does not contain management measures to monitor the Cook Inlet EEZ commercial salmon fishery or to measure total salmon catch or bycatch from EEZ waters. Under either action alternative, new monitoring, recordkeeping, and reporting would be required to comply with provisions of the MSA. MSA § 313(h) States that the North Pacific Council shall submit, and the Secretary may approve, consistent with the other provisions of this Act, conservation and management measures to ensure total catch measurement in each fishery under the Council’s jurisdiction and such measures shall ensure the accurate enumeration, at a minimum, of target species, economic discards, and regulatory discards. Monitoring, recordkeeping, and reporting also inform many of the required provisions under § 303(a)(5) and related sections of the MSA. NMFS and the Council monitor Federally managed fisheries with a number of approaches, including electronic submission of landing reports through eLandings, logbooks, certified scales to weigh catch at offload, vessel monitoring systems, observers, and electronic monitoring. Fishery monitoring may also be required to verify compliance with regulations and implementation of these measures requires participants to have a Federal Fisheries Permit.

Under Alternative 2, the following fishery monitoring, recordkeeping, and reporting objectives must be addressed for the Cook Inlet EEZ drift gillnet salmon fishery:

- Accurate accounting of catch and discards of salmon, groundfish, and other species in the EEZ. (NS1 & NS9)
- Accounting of marine mammal and seabird interactions. (MMPA & ESA)
- Monitoring to ensure compliance with fishery open times and areas, as well as accurate reporting of catch and discards.

Table 2-1 provides a summary of the monitoring, recordkeeping, and reporting tools available to the Council and NMFS. A comprehensive discussion of these tools can be found in Section 8.

Table 2-1 Monitoring, recordkeeping, and reporting tools available

Monitoring, Recordkeeping, and Reporting Measure	Objectives Addressed
eLandings	SBRM Catch and bycatch Inseason management data
Electronic logbook (data available inseason)	Approximate effort and catch/bycatch by area
Paper logbook (data available post season or for enforcement)	Approximate effort and catch/bycatch by area
Electronic monitoring	Vessel location Catch accounting Compliance monitoring
VMS	Vessel location
Onboard observers	Catch and bycatch Marine mammals and seabird interactions Regulatory compliance Location of catch and effort
Remote observers	Catch and bycatch Marine mammals and seabird interactions Regulatory compliance Location of catch and effort

Options:

Option 1. Require an FFP, fish tickets/eLandings use, and a logbook. This proposed set of measures are the minimum monitoring, recordkeeping, and reporting requirements recommended by NMFS to accurately account for catch and monitor the fishery. These measures are designed to balance agency data requirements with costs and impacts to vessel operations as well as administrative burden.

Under Alternative 2, inseason management of the Cook Inlet EEZ drift gillnet fishery is delegated to the State. The State has an existing process for timely entry of paper fish tickets into a catch reporting system that collects accurate catch information from the fishery. With the addition of reporting areas specific to the EEZ and a requirement to report all bycatch and discards, fish tickets/eLandings would satisfy MSA catch accounting requirements. If eLandings is not required, appropriate considerations must be made for timely paper fish ticket data availability to the Salmon Plan Team, NMFS, and the Council.

There has not previously been a requirement to report discards in the fishery. Therefore, the amount and type of bycatch/discards in the fishery are largely unknown. See Section 4.5.2.4 of the RIR for a discussion of non-salmon landings in the fishery. Requiring full retention of groundfish in the fishery may improve accounting of bycatch but would also result in potentially complex interactions with GOA groundfish regulations and could be logistically challenging to participants. Requiring discard of bycatch would address these concerns, but in order to obtain accurate self-reported data on discards at the time of landing, a simple logbook would be required. For example, without a logbook, it is unlikely that a minimal amount of bycatch encountered and discarded early in a fishing day would be accurately reported when a landing is made at the end of the day. If improved accounting demonstrates that there is an insignificant amount of bycatch in the fishery, monitoring and recordkeeping measures could be modified in the future. In addition to establishing accountability for self-reported discard data at landing, logbook data would inform improved estimates of catch in the EEZ.

For the purposes of inseason management, precisely determining which fish were harvested in the EEZ or State waters is not essential under Alternative 2. However, additional information about the approximate

distribution of catch between EEZ and State waters is needed to inform the Salmon Plan Team when calculating ACLs and provide the Council with a more accurate assessment of removals by the fishery under its jurisdiction. The logbook already required to collect fishery discard information would provide this by collecting set start/end times and positions.

Table 2-2 Suite of Required Monitoring, Recordkeeping, and Reporting Measures for Alternative 2

Requirement	Objective(s) Addressed
Federal Fisheries Permit	Allow implementation of monitoring, recordkeeping, and reporting requirements
Fish tickets/eLandings with EEZ and State specific stat areas	Reporting of catch, bycatch, and discards by area. (NS1, NS9, SBRM)
Logbook	Recordkeeping of catch, bycatch, discards, and effort by area. (verification of reported discards, improved effort by area to inform the plan team and SDC/ACL calculations)

Option 2. The Council could choose to recommend additional monitoring, recordkeeping, and reporting measures to obtain increased information from the fishery or improve the enforceability of fishery provisions. A detailed discussion of available tools is provided in Section 8.

Sub-option 1. Require full retention of catch and reporting at the time of landing through fish tickets/eLandings. Halibut and any groundfish species in the Central GOA on non-retention status must be recorded in the logbook, discarded, and reported at the time of landing. May be combined with Option 1 or Option 2.

Sub-option 2. No retention of bycatch, all discards must be recorded in the logbook and reported at the time of landing. May be combined with Option 1 or Option 2.

2.4.9. Standardized Bycatch Reporting Methodology

Under Alternative 2, NMFS would require the use of logbooks and either eLandings and/or ADF&G paper fish tickets. This combination would serve as the SBRM for the Cook Inlet EEZ salmon drift, gillnet fishery. Harvesters would be required to report any quantities of fish discarded at sea or retained for sale or personal use at the time of landing. There are already accommodations for discard information in both eLandings and fish tickets.

The SBRM would report information about the characteristics of bycatch in the fishery. Self-reporting would be feasible, in accordance with SBRM guidelines. The FMP would need to identify the data uncertainty resulting from the method and identify how the data would be used. In this instance, the data would be used to satisfy catch accounting requirements and provide improved information about an additional source of GOA groundfish removals. This information may also provide the data required to estimate bycatch quantities for the fishery in the future.

2.4.10. Legal Gear

Under Alternative 2, commercial fishing with drift gillnet gear would have to be authorized for the Cook Inlet EEZ in the West Area as a Category 1 management measure. Current Federal regulations at 50 CFR 679.7(h) prohibit commercial fishing for salmon in the EEZ using any gear except troll gear.

Salmon fisheries. (1) Engage in commercial fishing for salmon (1) using any gear except troll gear, defined at §679.2, in the East Area of the Salmon Management Area, defined at §679.2 and Figure 23 to this part.

(2) Engage in commercial fishing for salmon in the West Area of the Salmon Management Area, defined at §679.2 and Figure 23 to this part.

In addition, there are general provisions specified at 50 CFR §600.725 that only authorize hook and line gear for salmon fisheries covered under the FMP. Drift gillnet gear would have to be authorized for the Cook Inlet EEZ commercial salmon fishery covered under an FMP.

Legal gear could also be a Category 2 management measure delegated to the State. This would allow the State to determine the exact specifications of gillnet gear that would be legal in the fishery, within any criteria specified in the FMP.

2.4.11. Federal oversight and review process for all salmon fisheries in the EEZ

Under Alternative 2, the Council would need to revise the Federal oversight and review process in Chapter 9 of the FMP. First, Chapter 9 would need to be modified to also apply to the commercial salmon fishery in the Cook Inlet EEZ. The following shows how Chapter 9 is proposed to be revised to include the commercial salmon fishery in the Cook Inlet EEZ.

New draft FMP language:

CHAPTER 9 FEDERAL OVERSIGHT AND REVIEW OF STATE MANAGEMENT MEASURES APPLICABLE IN THE EEZ

Delegation of salmon fishery management authority to the State of Alaska requires the Council and NMFS to stay apprised of State management measures governing salmon fishing in the EEZ and, if necessary, to review those measures for consistency with the FMP, the Magnuson-Stevens Act, and other applicable Federal law. Under this FMP, NMFS delegates salmon fishery management authority in the EEZ to the State of Alaska for the entirety of the fishery management unit in the East Area, and for the commercial salmon fishery in the Cook Inlet EEZ in the West Area. State management measures include measures adopted by the Pacific Salmon Commission (for the East Area) and the Alaska Board of Fisheries, as well as other State laws, regulations, and inseason actions. This chapter describes how the Council and NMFS fulfill this oversight role. Section 9.1 describes the ways in which the Council and NMFS monitor State management measures that regulate salmon fishing in the EEZ. Section 9.2 describes the process by which NMFS will review State management measures governing salmon fisheries in the EEZ for consistency with the FMP, the Magnuson-Stevens Act, and other applicable Federal law. Section 9.3 describes the process by which a member of the public can petition NMFS to review State management measures applicable in the EEZ for consistency with the FMP, the Magnuson-Stevens Act, and other applicable Federal law. Finally, section 9.4 describes the process NMFS will follow if NMFS determines that State management measures in the EEZ are inconsistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal laws.

9.1 Council and NMFS Receipt of Information on State Management Measures

The Council and NMFS receive information on, and stay apprised of, State management measures that regulate salmon fisheries in the EEZ, the Council and NMFS will receive reports from the State of Alaska at regularly scheduled Council meetings regarding applicable State management measures that govern commercial and sport salmon fishing in the East Area and commercial salmon fishing in the Cook Inlet EEZ. Additionally, representatives of the Council, NMFS, and NOAA's Office of General Counsel have the opportunity to participate in the State's regulatory process the Board of Fisheries on proposed regulations applicable to East Area and Cook Inlet EEZ salmon fisheries. These Federal representatives also can advise the State or the Board, as needed or as requested by the State of the Board, about the extent to which proposed

measures for the East Area or Cook Inlet EEZ salmon fisheries are consistent with the FMP, the Magnuson-Stevens Act, and other applicable Federal law. None of these Federal representatives, however, will vote on any proposals submitted to the Board or the State. NMFS representatives are also members of a number of advisory panels and technical committees of the Pacific Salmon Commission.

The purpose of receiving this information is two-fold. First, it provides the Council and NMFS with opportunities to consider its salmon fishery management policies relative to the State of Alaska's exercise of its authority. Based on the information received, the Council can determine whether the FMP is functioning as intended from a fishery management policy perspective or whether changes to the fishery management policies contained in the FMP are warranted. Second, it provides the Council and NMFS with a means to ensure that the delegation of fishery management authority to the State is being carried out in a manner consistent with the policy and objectives established within the FMP.

9.2 NMFS Review of State Management Measures for Consistency with the FMP and Federal Laws

If NMFS has concerns regarding the consistency of State management measures with the FMP, the Magnuson-Stevens Act, or other applicable Federal law, NMFS may initiate a consistency review of those management measures. NMFS may initiate this consistency review independently or at the request of the Council. During this review, NMFS will provide the Council and the State of Alaska with an opportunity to submit comments to NMFS that address the consistency of the management measures in question. Because NMFS's review is limited to whether the measures are consistent with the FMP, the Magnuson-Stevens Act and other applicable Federal law, NMFS will only consider comments that address consistency. NMFS may hold an informal hearing to gather additional information concerning the consistency of the measures under review if time permits and NMFS determines that such a hearing would be beneficial.

If NMFS determines after its review that the State management measures are consistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal law, NMFS will issue a written Statement to that effect, explaining the reasons for its conclusion and identifying the information NMFS used to support its finding. If NMFS determines after its review that the State management measures are inconsistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal law, NMFS will follow the process set forth in section 9.4.

NMFS's review under section 9.2 is limited to consistency of State management measures applicable in the East Area and the Cook Inlet EEZ with existing provisions of the FMP, the Magnuson-Stevens Act, or other applicable law. NMFS will not initiate a consistency review under section 9.2 resulting from a divergence of fishery management policy perspectives.

9.3 Public Request for NMFS to Review a State Management Measure or Decision for Consistency with the FMP and Federal Laws

Any member of the public may petition NMFS to conduct a consistency review of any State management measure that applies to salmon fishing in the East Area or the Cook Inlet EEZ if that person believes the management measure is inconsistent with the provisions of the FMP, the Magnuson-Stevens Act, or other applicable Federal law. Additionally, a member of the public may request NMFS to review a decision by the State concerning a limited entry permit for a salmon fishery occurring in the East Area or the Cook Inlet EEZ. Such a petition must be in writing and comply with the requirements and process described in this section. As with section 9.2, NMFS's review under section 9.3 is limited to consistency of the State management measure

or limited entry permit decision with existing provisions of the FMP, the Magnuson-Stevens Act, or other applicable law. NMFS will not initiate a consistency review under section 9.3 from petitions that merely object to a State management measure or limited entry permit decision, or argue that an alternative measure would provide for better management of the salmon fishery. A person with these types of policy concerns should present them to the Board, the State, or the Council.

Although the FMP provides an administrative process by which a person may seek Federal review of a State management measure or limited entry permit decision for consistency with the FMP, the Magnuson-Stevens Act, or other applicable Federal law, the existence of the Federal process does not preclude or limit that person's opportunity to seek judicial review of State management measure or limited entry permit decision within the State of Alaska's judicial system as available under the provisions of the State's Administrative Procedure Act (Alaska Statute [AS] 44.62). Initiation of State judicial review of a challenge to a State management measure or limited entry permit decision is not required before a person may petition NMFS to conduct a consistency review.

What must a person do before submitting a petition to NMFS?

Prior to submitting a petition requesting a consistency review, a person must exhaust available administrative regulatory or adjudicatory procedures with the State of Alaska. For CFEC decisions on individual limited entry permits, NMFS will conclude that a person has exhausted available State administrative adjudicatory procedures if the person files a petition for reconsideration of a final adverse CFEC decision under 20 AAC 5.1850 and that petition for rehearing is denied. For State management measures that have broad applicability to the fishery, NMFS will conclude that a person has exhausted available State administrative regulatory procedures if the person can demonstrate that he or she: (1) submitted one or more proposals for regulatory changes to the Board of Fisheries during a Call of Proposals consistent with 5 AAC 96.610 and (2) received an adverse decision from the Board on the proposal(s). There are circumstances that may require regulatory changes outside the regular process set forth in 5 AAC 96.610, or when the process set forth in 5 AAC 96.610 is unavailable due to the timing of the action requested. Under these circumstances, NMFS also will conclude that a person has exhausted State administrative regulatory procedures if the person can demonstrate that he or she: (1) could not have followed the regular Call of Proposals requirements at 5 AAC 96.610, (2) submitted an emergency petition to the Board or ADF&G consistent with 5 AAC 96.625 or submitted an agenda change request to the Board consistent with 5 AAC 39.999, and (3) received an adverse decision from the Board or ADF&G on the emergency petition or agenda change request.

The FMP requires exhaustion of available State administrative procedures before petitioning NMFS for a consistency review for several reasons. Under this FMP, the Council and NMFS have delegated regulation of the salmon fisheries in the East Area and the Cook Inlet EEZ to the State of Alaska in recognition of its expertise and the State is in the best position to consider challenges, and make changes, to its management measures or limited entry permit decisions. The Council and NMFS also recognize the importance of public participation during the development of fishery management measures and exhaustion of State administrative procedures encourages the public to actively participate in and try to effectuate fishery management change through the State process. Finally, by requiring a person to exhaust the State's administrative regulatory procedures before petitioning NMFS, the State is presented with an opportunity to hear the challenge and take corrective action if the State finds merit in the challenge before Federal resources are expended.

What must be in a petition submitted to NMFS?

A petition must: (1) identify the State management measure or limited entry permit decision that the person believes is inconsistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal law; (2) identify the provisions in the FMP, the Magnuson-Stevens Act, or other applicable Federal law with which the person believes the State management measure or limited entry permit decision are inconsistent; (3) explain how the State management measure or limited entry permit decision is inconsistent with the identified provisions of the FMP or Federal law; and (4) demonstrate that the person exhausted available State administrative regulatory or adjudicatory procedures before submitting the petition to NMFS.

Petitions concerning the consistency of a State inseason action present some challenges for timely review given the short duration of inseason actions and the length of time it will take NMFS to review petitions. Although it is unlikely that NMFS will be able to issue a decision on a petition challenging an inseason action before the inseason action expires, NMFS recognizes that there may be an aspect of inseason actions that is capable of repetition. Therefore, persons may submit petitions to NMFS that challenge the consistency of a recurring aspect of a State inseason action. In addition to the four requirements listed above, a petition challenging a State inseason action must identify and explain the inconsistent aspect of the inseason action that is capable of repetition.

A petition with all supporting documentation must be submitted to the Regional Administrator, NMFS Alaska Region.

A person must submit a petition to NMFS no later than 30 days from (a) the last day of the Board of Fisheries meeting at which the measure in question was adopted by the Board, (b) the day a denial was issued on an emergency petition, (c) the day a denial was issued on an agenda change request, or (d) the day a petition for reconsideration is denied by the CFEC. Although NMFS will not initiate a consistency review under this section for petitions submitted after the 30-day deadline, NMFS may initiate a consistency review under section 9.2.

What will NMFS do following receipt of a petition from the public?

Upon receipt of a petition, NMFS will immediately commence a review of the petition to determine whether it contains the information required for a consistency review. If NMFS determines that the petition fails to meet all of the requirements, NMFS will return the petition to the petitioner with an explanation that identifies the deficiencies. If NMFS determines that the petition meets all of the requirements, NMFS will initiate a consistency review and notify the petitioner that such a review has been initiated. NMFS will immediately provide a copy of the petition to the Council and to the Commissioner of ADF&G or the Commissioner of the CFEC. During its consistency review, NMFS will provide the Council and the State of Alaska with an opportunity to submit comments to NMFS that address the consistency of the measure or decision being challenged. Because NMFS's review is limited to whether the measure or decision in question is consistent with the FMP, the Magnuson-Stevens Act and other applicable Federal law, NMFS will only consider comments that address consistency. NMFS may hold an informal hearing to gather additional information concerning the consistency of the measure or decision under review if time permits and NMFS determines that such a hearing would be beneficial. NMFS will review a petition as quickly as possible but will take the time necessary to complete a thorough review of the consistency of the State management measure or decision being challenged before issuing its decision.

If NMFS determines after its review that the State management measure or decision is consistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal law, NMFS will issue a written Statement to that effect, explaining the reasons for its conclusion and identifying the information NMFS used to support its finding. If NMFS determines after its review that the State management measure or decision is inconsistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal law, NMFS will follow the process set forth in section 9.4.

9.4 NMFS Process Following a Determination that a State Management Measure or Decision is Inconsistent with the FMP or Federal Laws

If NMFS determines that a State management measure or decision is inconsistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal law after conducting a consistency review under sections 9.2 or 9.3, NMFS will issue a written determination to that effect, explaining the reasons for its conclusion and identifying the information NMFS used to support its finding. NMFS will promptly notify the State of Alaska and the Council, and the petitioner if applicable, of its determination and provide the State with an opportunity to correct the inconsistencies identified in the notification. No specific amount of time is identified in this FMP in which corrective action must be taken because circumstances directly affecting what constitutes a reasonable opportunity for corrective action will likely vary. NMFS will evaluate the circumstances on a case-by-case basis to determine the amount of time that represents a reasonable opportunity for the State to take corrective action and will provide that information to the State in the notification of inconsistency.

While it is anticipated that the State of Alaska will expeditiously correct the inconsistencies identified by NMFS, it is possible that the State may disagree with NMFS's determination and choose not to correct the identified inconsistencies. In the case of State management measures, if the State does not correct the inconsistencies identified by NMFS in the time provided, NMFS will need to assess whether the State's overall management scheme is unaffected by removal of the inconsistent measure or whether the inconsistent measure is an integral part of the overall management scheme and that the overall management scheme would fail if the inconsistent measure is removed. NMFS also will need to determine whether Federal regulations are required in the EEZ given the absence of the State management measure. Once this assessment is completed, NMFS will issue a notice announcing the extent to which the authority delegated to the State to implement fishery management measures has been withdrawn and whether NMFS intends to issue Federal regulations that would govern salmon fishing in the East Area or the Cook Inlet EEZ. In the case of a limited entry permit decision, if the State does not correct the inconsistencies identified by NMFS in the time provided, NMFS may issue a permit that authorizes the activity in the Cook Inlet EEZ or the East Area that was denied by the State.

Any delegation of fishery management authority that is withdrawn under this section of the FMP will not be restored to the State until the Council and NMFS determine that the State has corrected the inconsistencies.

2.5. Alternative 3: Federal management

Under Alternative 3, the Council would amend the Salmon FMP to include the Cook Inlet EEZ in the FMP's fishery management unit in the West Area and apply Federal management to the commercial salmon fishery that occur in the EEZ. This entails creating a completely new Federal management regime for the commercial salmon fishery in the Cook Inlet EEZ.

2.5.1. Management Policy and Objectives

Under Alternative 3, the Council would develop a new management policy and new management objectives for the commercial salmon fishery in the Cook Inlet EEZ. Under this alternative, the Council's management policy and management objectives as Stated in sections 3.1 and 3.2 of the FMP would remain for the East Area and the portion of the West Area that would remain closed to commercial salmon fishing. However, the Council could choose to modify or adopt a new management policy and management objectives for the West Area outside of the Cook Inlet EEZ in conjunction with the changes within the Cook Inlet EEZ to ensure consistency.

The potential management policy and management objectives provided below are based on the policy and objectives in the Fishery Management Plan for the Groundfish of the Bering Sea and Aleutian Islands Management Area. These would apply only to the Cook Inlet EEZ and assume that the FMP's current policy and objectives for the East Area and the West Area outside of the Cook Inlet EEZ would continue unmodified.

Management Policy for the Cook Inlet EEZ

The Council's policy is to apply judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems. The productivity of the North Pacific ecosystem is acknowledged to be among the highest in the world. The Council's management approach incorporates forward looking and precautionary conservation measures that address differing levels of uncertainty. Recognizing that potential changes in productivity may be caused by fluctuations in natural oceanographic conditions, fisheries, and other, non-fishing activities, the Council intends to continue to take appropriate measures to insure the continued sustainability of the managed species. It will carry out this objective by considering reasonable, adaptive management measures, as described in the MSA and in conformance with the National Standards, the Endangered Species Act (ESA), the National Environmental Policy Act, and other applicable law.

As part of its policy, the Council intends to consider and adopt, as appropriate, measures that accelerate the Council's precautionary, adaptive management approach that protects managed species from overfishing, and where appropriate and practicable, and increases habitat protection and bycatch constraints. All management measures will be based on the best scientific information available. Given this intent, the fishery management goal is to provide sound conservation of the living marine resources; provide for sustainable participation in the commercial salmon fishery for the social and economic well-being of fishing communities; minimize human-caused threats to protected species; maintain a healthy marine resource habitat; and incorporate ecosystem-based considerations into management decisions.

This management policy recognizes the need to balance many competing uses of marine resources and different social and economic goals for sustainable fishery management, including protection of the long-term health of the resource and the optimization of yield. This policy will use and improve upon the Council's existing open and transparent process of public involvement in decision-making.

Management Objectives

- Prevent overfishing.
 - Promote sustainable fisheries and communities.
 - Consider ecosystem processes in all aspects of management.
 - Manage incidental catch and reduce bycatch and waste.
 - Avoid impacts to seabirds and marine mammals.
 - Reduce and avoid impacts to habitat.
 - Promote equitable and efficient use of fishery resources.
 - Include Alaska Native Consultation
 - Improve data quality, monitoring, and enforcement.
- **Prevent overfishing.**
 1. Adopt conservative harvest limits for salmon stocks and stock complexes in the Cook Inlet EEZ commercial salmon fishery and specify optimum yield.
 2. Provide for adaptive management by continuing to specify optimum yield.
 3. Manage the Cook Inlet EEZ commercial salmon fishery through tier-based status determination criteria.
 4. Provide for periodic reviews of stock tier assignments, as appropriate.
 - **Promote sustainable fisheries and communities.**
 5. Promote conservation while providing for optimum yield in terms of the greatest overall benefit to the nation with particular reference to food production, and sustainable opportunities for fishing participants and fishing communities.
 6. Promote management measures that, while meeting conservation objectives, are also designed to avoid significant disruption of existing social and economic structures.
 7. Promote increased safety at sea.
 - **Consider ecosystem processes in all aspects of management.**
 8. Develop indices of ecosystem health.
 9. Adjust harvest limits as necessary to account for uncertainty and ecosystem factors.
 - **Manage incidental catch and reduce bycatch and waste.**
 10. Encourage research to evaluate bycatch of non-target species with a view to setting appropriate bycatch limits, as information becomes available.
 11. Reduce discards by developing management measures that encourage the use of gear and fishing techniques that reduce bycatch which includes economic discards.
 - **Avoid impacts to seabirds and marine mammals.**
 12. Review status of endangered or threatened seabirds and marine mammal stocks and fishing interactions and develop fishery management measures as appropriate.
 13. Cooperate with NMFS and USFWS to protect ESA-listed species.
 - **Reduce and avoid impacts to habitat.**
 14. Review and evaluate efficacy of existing habitat protection measures for managed species.
 15. Identify and designate essential fish habitat and habitat areas of particular concern pursuant to MSA rules and mitigate fishery impacts in the EEZ as necessary and practicable to continue the sustainability of managed species.

- **Promote equitable and efficient use of fishery resources.**
 16. Develop management measures that, when practicable, consider the efficient use of fishery resources taking into account the interest of harvesters, processors, and communities.
- **Include Alaska Native Consultation**
 17. Incorporate local and traditional knowledge in fishery management.
 18. Consider ways to enhance collection of local and traditional knowledge from communities and incorporate such knowledge in fishery management where appropriate.
 19. Increase Alaska Native participation and consultation in fishery management.
- **Improve data quality, monitoring, and enforcement.**
 20. Incorporate available data for the conservation and management of living marine resources, as practicable.
 21. Develop funding mechanisms that achieve equitable costs to the industry for implementation of fishery monitoring.
 22. Improve community and regional economic impact costs and benefits through increased data reporting requirements.
 23. Increase the quality of monitoring and enforcement data through improved technology.
 24. Encourage a coordinated, long-term ecosystem monitoring program to collect baseline information and compile existing information from a variety of ongoing research initiatives, subject to funding and staff availability.
 25. Cooperate with research institutions such as the North Pacific Research Board in identifying research needs to address pressing fishery issues.
 26. Promote enhanced enforceability.
 27. Cooperate and coordinate management and enforcement programs with the Alaska Board of Fisheries, Alaska Department of Fish and Game, Commercial Fishery Entry Commission, and Alaska Fish and Wildlife Protection, the U.S. Coast Guard, NOAA Enforcement, Federal agencies, and other organizations to meeting conservations requirements, promote economically healthy and sustainable fisheries and fishing communities; and maximize efficiencies in management and enforcement programs through continued consultation, coordination, and cooperation.

2.5.2. Procedures for FMP Implementation

Because Alternative 3 would have the Council and NMFS directly managing all aspects of the Cook Inlet EEZ commercial salmon fishery and would not delegate any management authority to the State, an FMP section describing procedures for FMP implementation in the West Area would not be necessary. The Council and NMFS will follow applicable Federal law in implementing the FMP through Federal regulations.

2.5.3. Status Determination Criteria and Annual Catch Limits

Under Alternative 3, the status determination criteria would be established through the Federal process. Status determination criteria are assessed at the stock or stock complex level and take into consideration total catch of salmon from all fisheries. This section provides an initial set of status determination criteria for the salmon stocks harvested by the commercial salmon fishery in the Cook Inlet EEZ. Developing appropriate status determination criteria is highly scientific and requires time and analysis of available data and appropriate methods. The proposed criteria provided in this section provide a starting point for that ongoing scientific analysis. Landings from the Federal fishery occurring in the EEZ would have to be

precisely accounted for separately from landings originating from the directly adjacent State waters salmon fishery.

In addition to the possibility of an inseason closure, if an OFL or ACL was exceeded, then NMFS would apply accountability measures to prevent overfishing from occurring the next year. NMFS would be able to apply those measures to the fishery that occurs in the EEZ. So, preventing overfishing/exceeding the ACL would be addressed by restrictive measures on the part of the fishery the Council and NMFS have authority over. In setting the allowable harvest in the EEZ, NMFS must consider all sources of harvest and adjust the EEZ harvest accordingly to prevent overfishing. Under Alternative 3, the Council is considering two options for preventing overfishing:

Option 1 - Specify salmon status determination criteria and a harvest limit in Federal waters of Cook Inlet.

Under this option, the tier system in Alternative 2 would be used to set annual SDCs through the Council's review process that includes recommendations of OFL/ABC by a Salmon Plan Team, and subsequent approval by the SSC/Council. This option assumes NMFS is able to gather the necessary data to conduct the annual SDC process.

Option 2: Prohibit Salmon Harvest in Federal waters of Cook Inlet

This option would extend the existing prohibition on salmon harvest in the EEZ to Cook Inlet and would be responsive to one or more of the following conditions:

1. A Federal salmon data gathering process for Cook Inlet is not established.
2. Data inputs to support full Federal management of salmon resources in the Cook Inlet EEZ are not shared by the State or are not transmitted to Federal managers in a timely manner.
3. The State of Alaska manages Cook Inlet salmon resources such that those resources are fully allocated to State water fishing operations.
4. Salmon harvest reporting tools necessary to allow the Federal catch accounting system to adequately monitor harvest and bycatch such that overfishing can be prevented do not exist.

2.5.3.1. Challenges Associated with Data Needs Under Federal Management

The availability of sufficient data necessary for Federal management may be a driving factor in consideration of a Federal only management approach for the Cook Inlet EEZ.

Option 1 requires that one or more of the following conditions are met:

1. A fully Federal data gathering process for salmon stocks in Cook Inlet is established. It is highly unlikely that this condition would be met, however, Option 1 could still be implemented if it is not.
2. In the absence of a fully Federal data gathering process, data inputs to support Federal management of salmon resources in the Cook Inlet EEZ would need to be provided to NMFS by the State. NMFS would need to replicate the data streams used by ADF&G to manage salmon harvests, monitor escapement, and set escapement goals. This information would need to be electronically available for Federal inseason management and the types of information needed could be described in the FMP. Annual escapement and catch data by stock would be necessary for the Salmon Plan Team to utilize these data in making its status determination criteria recommendations. Access to the data would need to be as early in the process as possible.
3. The State of Alaska manages Cook Inlet salmon resources in State waters such that there is adequate surplus for a fishery in Federal waters. Although the Cook Inlet EEZ commercial salmon fishery may be the first fishery to encounter returning salmon, NMFS must manage the EEZ fishery to ensure that sufficient numbers of salmon return to meet escapement goals. Sub-options could be

identified that would establish control rules or other arrangements for shared allocations between State and Federal fisheries. In order to identify the full salmon harvest available to the Federal fisheries, the Council would need to pre-emptively subtract expected harvest in State waters from the Total Allowable Catch (TAC), which would require either: (a) assuming a fixed proportion of annual Cook Inlet salmon harvest occurs in Federal waters, or (b) separate accounting of State and Federal harvest in the future and using the average ratio of harvest rates among the two areas (Federal and State waters) for preseason planning purposes.

4. Salmon harvest reporting tools necessary to allow the Federal catch accounting system to adequately monitor harvest and bycatch, including the proportion of total harvest occurring in Federal waters, such that overfishing can be prevented exist and are in place.

Timely and accurate reporting of salmon catches in the Cook Inlet EEZ would be critical for ensuring that the Federal portion of OFL is not exceeded. eLandings (and tLandings) is an interagency electronic reporting system for reporting commercial fishery landings in Alaska (see Section 2.6.5). eLandings is used to report landings and/or production data and includes landings for data salmon.

A landing report documents the offload or delivery of fish that were harvested in State or Federal waters off Alaska. Shoreside processing plants, tender vessels, and motherships can receive deliveries from properly licensed and registered catcher vessels. The landing report information is captured in a fish ticket that complies with ADF&G reporting requirements. Information such as the vessel ADF&G number, number of crew onboard, fishing trip dates, State statistical areas, Federal areas, State and Federal fishing permits (as applicable) and species weights and dispositions are captured in this form. It should be noted that current catch reporting for Cook Inlet does not separate landings between Federal and State waters. This must be modified to allow for proper accounting relative to the Federal harvest limit.

The landings and production data are transmitted electronically many times a day to the NMFS Alaska Region. This information is made available to inseason managers in near-real time and is made available to stock assessment authors through the Alaska Fisheries Information Network (AKFIN). The Alaska Region would need to modify its catch accounting system to monitor the inseason catch of salmon, but given its connectivity to eLandings, this modification would not be difficult. Of course, landings of salmon not reported through eLandings would be unavailable for inseason managers; however, this amount of salmon is believed to be comparatively small to the overall harvest (see Section 4.7.2.2.7). However, even with processors submitting reports in near-real time, eLandings information does not include the most recent catch necessary to make closure decisions for fast paced fisheries. Often inseason managers would need to call each processor or receive daily reports to obtain the latest information.

2.5.4. Accountability Measures

Accountability measures are required for all stocks and stock complexes in the Salmon FMP that are required to have ACLs. Accountability measures are intended to prevent catch exceeding ACLs correct or mitigate overages if they occur. Some accountability measures are implemented during the preseason planning process and inseason. Others are implemented postseason through monitoring and reporting requirements. Additional accountability measures will be implemented, as required, if the ACL performance standard is not met as indicated by the catch being below ACL in more than one in T years.

In addition to inseason closures of the fishery, overfishing would be addressed by restricting the fishery in subsequent years. NMFS would only be able to apply accountability measures only to the fishery that occurs in the EEZ. Nevertheless, NMFS would have to consider all sources of harvest and adjust the EEZ harvest accordingly to prevent overfishing.

The following are the types of measures that could be implemented during the preseason planning process or inseason to meet the intent of preseason management objectives and to help ensure compliance with ACLs.

- Inseason authority to manage fisheries allows NMFS to close fisheries on short notice when mixed stock ACLs or harvest limits are projected to be met. Any closures require publication in the *Federal Register* to become effective, which requires 1-3 days from the time a decision is made.
- Mixed stock monitoring during the season allows projection of when ACLs or harvest limits will be met.
- Partitioning harvest among fishery sectors and port areas and time periods may allow finer scale management, thereby reducing the chance that overall ACL or harvest limits will be exceeded.
- Other provisions as needed.

Harvest limits may be adopted in any fishing year in which there is uncertainty in the ability to maintain compliance with the ACL or the applicable control rule for a given stock. A harvest limit would be specified at a level that is expected to produce spawning abundances sufficiently above the ACL to address uncertainty in the ability to constrain catch to the ACL (management uncertainty).

The following are the types of postseason accountability measures that could be implemented through the assessment and review phases of the salmon management process:

- Salmon Plan Team - provides a forum for re-evaluation of management objectives, reference points, and modification of models that relate mixed-stock impacts to stock-specific objectives and reference points.
- Annual SAFE document - allows postseason assessment of objectives and performance.

If total catch is determined to be above the postseason ACL, the Salmon Plan Team would report on the catch overages and accountability measures in the annual SAFE reports. If it is necessary to correct problems in the assessment or management methods, such changes can be considered during the annual Salmon Plan Team process.

Repeated overages of ACL could trigger evaluation of the ACL/accountability approach in order to address any systemic bases for the overages. Possible outcomes could include increased buffers in the ACL to account for scientific or management uncertainty.

2.5.5. Optimum Yield and Maximum Sustainable Yield

The OY for the Cook Inlet EEZ commercial salmon fishery would be the fishery's ACL which, when combined with the catch from all other salmon fisheries, results in a post-harvest run size equal to the MSY escapement goal for each indicator stock.

The MSA requires Regional Councils to "review on a continuing basis, and revise as appropriate, the assessments and specifications made ... with respect to the optimum yield." OY may need to be re-specified in the future if major changes occur in the estimate of MSY. Likewise, OY may need to be re-specified if major changes occur in the ecological, social, or economic factors governing the relationship between OY and MSY.

2.5.6. Annual Process for Determining the Status of the Stocks

Under Alternative 3, the annual process for the West Area would be similar to the annual process established for the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) groundfish FMPs. This is because specifying harvest limits for Federally managed fisheries involves the Federal rulemaking process.

The Council would establish a Salmon Plan Team that would annually produce a SAFE Report, as described in Section 2.4.7 under Alternative 2. The SSC would review the SAFE and set the OFL, ABC, and MSST, the Council would set the TACs for the Cook Inlet EEZ commercial salmon fishery, and NMFS would initiate rulemaking. As the Federal ACL and TAC would need to account for removals in State waters, a preseason agreement with the State regarding its removals would also have to be established at this time.

NMFS would publish proposed and final salmon harvest specifications in the *Federal Register*. Under the Federal rulemaking process, the public is informed through the *Federal Register* of proposed rules and can comment on them and provide additional information to the agency. A final rule is then issued with modifications, as needed, and includes the agency responses to issues raised by public comments. This process takes time, and for the Council's groundfish fisheries, the Council recommends the proposed harvest specifications in October, based on the previous year's data, and NMFS publishes the proposed harvest specifications in November. Then, there is a separation of three months between the Council's final harvest recommendations (December) and publication and effective date of the final harvest specifications (March). As a result, the groundfish fisheries open on January 1 under the TAC established the previous year, and that TAC is then superseded when the final harvest specifications are published and effective for the current year. The length of this process is a result of the time it takes to conduct the stock assessments, review them through the Plan Team, SSC, and Council, establish the SDCs and set the TAC, and then conduct notice and comment rulemaking under the Administrative Procedure Act.

Process and Timeline of Council Recommendations, Public Review, and Secretarial Decision

In consultation with the Council, the Secretary would establish salmon harvest specifications, including TACs, effective June 1 of each year through publication in the *Federal Register*. Final harvest specifications would replace those in effect for that year based on information contained in the latest approved SAFE report. If the fishing season begins prior to the effective date of the final rule, salmon harvest would be restricted to levels designed to achieve a default Tier 3 level of harvest for each salmon stock until the final rule effective date. Possible definitions for Tier 3 harvest for each salmon stock are provided in Section 2.4.4.

The exact sequence of events within the existing Council meeting schedule would depend on the timing of data from ADF&G to the Salmon Plan Team. Two scenarios are envisioned for the availability of those data: (1) postseason data are immediately shared by ADF&G with the Salmon Plan Team when they become available in November, or (2) postseason data are not available to the Plan Team until February.³⁰ For either of the data timing scenarios, the Salmon Plan Team would need to complete the Salmon SAFE so that it is available for SSC review at least two weeks before the SSC meeting.

Scenario 1

Under scenario 1, the Salmon Plan Team would have access to run-specific forecasts in November prior to development of the ADF&G Annual Management Report. Additionally, the Plan Team would be able to complete the Salmon SAFE such that the information contained therein can be used by the SSC and Council at the Council's February meeting for recommending proposed OFL and ABC, and April for recommending final OFL and ABC for the upcoming fishing season. Following the February Council meeting, a proposed harvest specification would be published in March. Like the groundfish process, which involves two Plan Team meetings and two Council meetings, salmon OFL and ABC would be

³⁰ Commercial fishery data are available by November (Marston 2020), but sport and personal-use estimates are not available until much later. According to Hasbrouck (2020), preliminary personal-use and sport harvest data are typically not available until March and May of the following year.

considered at the February and April meetings. Unlike groundfish, where new assessment information becomes available before the second of those meetings (December), no new information on salmon run size is expected between February and April, and final harvest specifications would not be expected to change compared to proposed harvest specifications. Because of this, publication and the effective date of the final harvest specifications may be accelerated and could be effective in time for the new fishing season by June 1. Tier 3 harvest specifications would remain in place if the effective date is after June 1.

As soon as practicable after the February Council meeting, the Council would recommend harvest specifications to NMFS. The Council's recommendation would include the basis for each stock and stock complex's harvest specification. After considering the Council's recommended harvest specifications, NMFS would publish in the *Federal Register* a notice of proposed harvest specifications and make available for public review and comment all information regarding the basis for the harvest specifications. The notice of proposed harvest specifications would identify whether and how harvest specifications are likely to be affected by developing information unavailable at the time the notice is published. The public review and comment period on the notice of proposed harvest specifications would be a minimum of 15 days. After the April Council meeting, the Council would confirm final harvest specification recommendations to NMFS. As soon as practicable thereafter and after considering the Council's recommendation, NMFS would publish final harvest specifications.

If NMFS were to determine that the notice of final specifications would not be "a logical outgrowth" of the notice of proposed harvest specifications (i.e., the notice of proposed harvest specifications was inadequate to afford the public opportunity to comment meaningfully on the issues involved), NMFS would either: (1) publish a revised notice of proposed harvest specifications in the *Federal Register*, solicit public comment thereon, and publish a notice of final harvest specifications, as soon as is practicable; or (2) if "good cause" pursuant to the Administrative Procedure Act exists, waive the requirements for notice and comment and 30-day delayed effectiveness and directly publish a notice of final harvest specifications with a post-effectiveness public comment period of 15 to 30 days.

Scenario 2

Under scenario 2, the Plan Team would not have advance access to the salmon forecast data and would instead have to wait until February of the affected fishing year when the Annual Management Report becomes publicly available. Because of the effect a delay until February would have on the sequence of Plan Team, SSC, and Council meetings, proposed and final harvest specifications could not occur in time for the new fishing year. Availability of the information in February would delay initial availability of the SAFE to the SSC until the April Council meeting, at the earliest. Under the most optimistic schedule, the Council's final harvest specification recommendations would be made at the June meeting, which would delay publication and the effective date of the final harvest specifications until September, which is after the salmon driftnet season has ended. **Under scenario 2, therefore, harvest specifications would be maintained at Tier 3 indefinitely. This scenario renders moot the entire exercise in which OFL and ABC for an upcoming fishing season are estimated, and so Plan Team development of the SAFE and subsequent SSC review would be conducted at a level of analysis consistent with Tier 3 harvest.**

2.5.7. Monitoring, Recordkeeping, and Reporting

See section 2.4.8 for a summary of required monitoring elements. In addition to these universal catch and bycatch accounting requirements, Alternative 3 would require monitoring and recordkeeping measures to provide data for Federal inseason managers to precisely deduct catches from the EEZ catch limit and ensure compliance with EEZ fishery regulations. The following set of tools would provide the required information:

Options:

Option 1. Require an FFP, eLandings use, a logbook, and VMS. This proposed set of measures is designed to balance agency information requirements with costs and impacts to vessel operations as well as administrative burden.

Table 2-3 Suite of Required Monitoring, Recordkeeping, and Reporting for Alternative 3

Monitoring Measure	Needs Addressed
Federal Fisheries Permit	Allow implementation of monitoring, recordkeeping, and reporting requirements
eLandings	Data stream for inseason management and the annual process.
VMS	Monitoring of compliance with the EEZ boundary to ensure catch is appropriately deducted from the EEZ catch limit.
Logbook	Corroboration of catch, discards, and VMS spatial data.

Under Alternative 3, the Cook Inlet EEZ drift gillnet fishery would be managed separately from the adjacent State waters salmon drift gillnet fishery. Federal managers would require highly accurate, spatially explicit, rapidly reported, and complete catch accounting to accurately deduct salmon catches from the EEZ specific catch limit. This would require prompt reporting through eLandings with corresponding EEZ only stat areas. In order to ensure accurate accounting without additional monitoring measures, a vessel could not operate in the EEZ and State waters drift gillnet fishery within a single trip. Vessel operators would have to monitor their position and stay within the EEZ during a single trip. This would allow for the accurate accounting of catch against the EEZ harvest limit. There may be an incentive to maximize attributions of catches to State waters in order to maintain fishing opportunity in the EEZ for longer.

Furthermore, spatially explicit monitoring through VMS would be required to ensure compliance with Federal fishery boundaries. Appropriate VMS ping rates would need to be determined as well as regulations requiring a vessel to remain within a certain proximity of their drift gillnet. To allow for the use of VMS as an enforcement tool, a corresponding logbook would be required. This would also allow for the development of VMS algorithms to monitor the salmon fishery.

Ensuring that vessels only participating in the State waters fishery do not enter EEZ waters is another important consideration. FMP requirements could not be imposed on vessels only registered and operating in the State waters drift gillnet salmon fishery. However, there is a concern about monitoring these vessels to ensure that they do not intentionally or inadvertently harvest fish in the EEZ. This could be most simply addressed by opening the EEZ drift gillnet fishery off-cycle with the State salmon drift gillnet fishery. If the EEZ fishery does occur concurrently with the State salmon drift gillnet fishery in Cook Inlet, more intensive monitoring will be required to ensure that catch is accurately attributed to the EEZ so it can be appropriately deducted from the EEZ catch limit. This would be expected to include a VMS for vessels operating in State waters.

Option 2. The Council could choose to recommend additional monitoring, recordkeeping, and reporting measures to obtain increased information from the fishery or improve the enforceability of fishery provisions. A detailed discussion of available tools is provided in Section 8.

Sub-option 1. Require full retention of all catch and reporting at the time of landing through fish tickets/eLandings. Halibut and any groundfish species in the Central GOA on non-retention status must be recorded in the logbook and discarded. May be combined with Option 1 or Option 2.

Sub-option 2. No retention of non-salmon bycatch, all discards must be recorded in the logbook and reported at the time of landing. May be combined with Option 1 or Option 2.

2.5.8. Standardized Bycatch Reporting Methodology

Under Alternative 3, eLandings and logbooks would serve as the SBRM for salmon fishery in the Cook Inlet EEZ. Harvesters would be required to report any quantities of groundfish discarded at sea or retained at the time of landing. There are already accommodations for reporting of discards in eLandings.

The SBRM would report information about the characteristics of bycatch in the fishery. Self-reporting would be feasible, in accordance with SBRM guidelines. The FMP would also need to identify the data uncertainty resulting from the method and identify how the collected data would be used. In this instance, the information would be used to characterize bycatch in the fishery and potentially develop a methodology to estimate bycatch quantities for the fishery in the future.

2.5.9. Federal Oversight and Review Process

Under Alternative 3, no substantive changes to Chapter 9 would be necessary. Under Alternative 3, no management authority for the Cook Inlet EEZ would be delegated to the State. Federal oversight and review is needed when an FMP delegates management to a State. Because the East Area would remain the only portion of the EEZ in which management authority is delegated to the State under Alternative 3, and Chapter 9 already covers the East Area, no changes are necessary.

2.5.10. Additional Management Measures

To manage the commercial salmon fishery in the Cook Inlet EEZ, the Council would need to develop additional management measures besides those described in the sections above. NMFS would implement these measures through Federal regulations. All Federal management measures would be changed following the MSA FMP Amendment and rulemaking process.

Total Allowable Catch (TAC) setting – The Council could decide to control harvest by annually setting a TAC for the Cook Inlet drift gillnet fishery. The TAC would be based on the ACL and set through the annual process for determining the status of the stocks (harvest specifications). A TAC would be set below the ACL and thus provide an additional buffer from the ACL to account for management uncertainty. As NMFS has not previously managed the Cook Inlet salmon drift gillnet fishery or similar fisheries in Alaska, there would be a high degree of management uncertainty in the initial seasons under Federal management. Given this, NMFS inseason management would have to initially assume that the maximum historical catch would occur during each open period when evaluating whether the TAC could support additional openings of the fishery.

There are a number of challenges associated with implementing a TAC in the Cook Inlet drift gillnet fishery. First, salmon from separate stocks are often visually indistinguishable. In the absence of near real-time genetic stock identification data from landings, a methodology to estimate the proportional contribution of stocks from EEZ landings would have to be developed. Additionally, due to the mixed stock nature of the fishery, if the TAC is reached for an individual stock, the entirety of the fishery may have to be closed to avoid overharvest of that stock, even if other stocks have unharvested TAC remaining.

The following procedure could be used to specify TACs:

1. Determine the ABC for each managed stock or stock complex. ABCs are recommended by the SSC based on information presented by the Plan Team.
2. Determine a TAC for each managed stock or stock complex. The TAC must be less than or equal to the ABC. The TAC may be less than the ABC if warranted on the basis of bycatch considerations (primarily concerns about the catch of weak salmon stocks), management uncertainty, ecosystem requirements, or socioeconomic considerations.

Fishing Seasons – The Council could adopt the State’s fishing seasons for the Cook Inlet drift gillnet fishery or establish a Federal fishing season for the EEZ. In State regulations, the fishing season is bounded by the availability of target salmon species in Cook Inlet.

- *Option 1.* Consistent with existing State of Alaska regulations for the Central District drift gillnet fishery (5 AAC 21.310), salmon may be taken in the Cook Inlet EEZ only from the third Monday in June or June 19 whichever is later, until closed by the Regional Administrator (RA).
- *Option 2.* Define a distinct Federal fishing season.

Fishing Periods – Within the fishing season, the State has used scheduled fishing periods to allow for an orderly, predictable fishery and meet allocation and conservation goals. This benefits participants by allowing them to plan their fishing as well as processors who can plan their operations to maximize efficiency.

Under Alternative 3, choosing to open the EEZ salmon fishery off-cycle with the State salmon fishery would greatly simplify monitoring and catch accounting for both the EEZ drift gillnet fishery and the State waters drift gillnet fishery. However, due to the State’s additional flexibility in opening and closing the drift gillnet fishery in their waters, precise coordination may not always be feasible. The Council could choose to coordinate the occurrence of the EEZ drift gillnet salmon fishery with the State’s drift gillnet salmon fishery, define independent Federal fishing periods, or allow fishing to occur at any time until the fishery is closed by the RA.

Options:

- *Option 1.* Establish Federal fishing periods concurrent with existing State of Alaska fishing periods set forth in regulations for the Central District drift gillnet fishery (5 AAC 21.320), such that salmon may be taken in the Cook Inlet EEZ only from 7:00 a.m. Monday until 7:00 p.m. Monday and from 7:00 a.m. Thursday until 7:00 p.m. Thursday. Additional monitoring would have to be identified under this option to ensure accurate catch accounting and enforceability.
- *Option 2.* Establish independent Federal fishing periods and specify that the Cook Inlet EEZ salmon drift gillnet fishery could not be open concurrently with the adjacent State waters salmon drift gillnet fishery.

Closed Areas – The State permanently closes areas to meet fishery allocation and conservation objectives. The Council could establish a new system of closed areas, however this could be disruptive to the State salmon fishery management plan for Cook Inlet. A change in the areas available to fish in the EEZ could significantly impact the fishery harvest rate and harvest composition (i.e. which salmon stocks are caught) which could further increase uncertainty for both State and Federal fishery managers.

The Council could establish closed areas in the EEZ that are the same as the State’s closed areas for the Cook Inlet drift gillnet fishery, establish a separate set of closed areas in the EEZ, or have no areas in the EEZ closed to commercial salmon fishing.

Options:

- *Option 1.* Establish the same closed areas as the State’s permanently closed areas for the Cook Inlet EEZ drift gillnet fishery.
- *Option 2.* Establish different Federal closed areas in the Cook Inlet EEZ.
- *Option 3.* Open the entire Cook Inlet EEZ area to commercial salmon fishing.

Management Area, District, Subdistrict, Section, and Statistical Area Boundaries – The Council could adopt the State’s management area, district, subdistrict, section, and statistical area boundaries to

manage the salmon fishery in the Cook Inlet EEZ or establish different Federal management areas in the EEZ. At a minimum, a new statistical area or sub-statistical area that only includes EEZ waters will need to be created for accurate catch accounting of EEZ harvests.

Due to the mobile nature of drift gillnet gear and the strong tides in Cook Inlet, fishing can occur over multiple areas in a single set. At certain times fishery effort can be concentrated on or around the EEZ boundary. Historically, this has been addressed by the State's management of the fishery without reference to the EEZ as a fishery boundary or explicit reporting area. However, fishery participants have still had to fish within the bounds of specific open areas at any given time. These are typically defined with straight boundaries with coordinates in regulation. The EEZ boundary is irregular in shape which stakeholders have indicated could be problematic for compliance. Under Alternative 3, the open area(s) could be defined within EEZ waters using straight boundaries that would allow for easier compliance. These boundary coordinates would need to be defined in the FMP or Federal regulations. Furthermore, the buffer zone created through this approach between State waters and fishery open areas in the EEZ may allow for more effective enforcement of the respective fisheries.

Options:

- *Option 1.* Adopt, for reporting purposes, existing State management area, district, subdistrict, section, and statistical area boundaries used by the State at 5 AAC 21.200 wherein the EEZ waters of Cook Inlet are limited to the Central District. Create a sub-statistical area to allow for accurate catch accounting of fish harvested in the Cook Inlet EEZ.
- *Option 2.* Adopt separate Federal management areas, districts, subdistrict, section, and statistical area boundaries.
- *Option 3.* Require driftnet vessels operating in the Cook Inlet EEZ to maintain technology necessary to accurately determine vessel position relative to the boundaries of the EEZ (this option may be combined with Option 1 or Option 2).

Legal Gear – Current Federal regulations at 50 CFR 679.7(h) prohibit commercial fishing for salmon in the EEZ using any gear except troll gear and do not authorize commercial fishing with any gear in the West Area.

Salmon fisheries. (1) Engage in commercial fishing for salmon using any gear except troll gear, defined at §679.2, in the East Area of the Salmon Management Area, defined at §679.2 and Figure 23 to this part.

(2) Engage in commercial fishing for salmon in the West Area of the Salmon Management Area, defined at §679.2 and Figure 23 to this part.

In addition, there are general provisions specified at 50 CFR §600.725 that authorize only hook and line gear for salmon fisheries covered under the FMP. Gillnet gear would have to be authorized for used in the EEZ portion of Cook Inlet and legal gear configurations would have to be defined. Adopting legal gear configurations that are different from the State could make it challenging for participants to move between the fisheries.

Current legal gear in the Cook Inlet drift gillnet salmon fishery is described in the following State of Alaska regulations:

- a. [5 AAC 21.331. Gillnet specifications and operations](#)
- b. [5 AAC 21.333. Requirements and specifications for use of 200 fathoms of drift gillnet in the Cook Inlet Area](#)

- c. [5 AAC 21.334. Identification of gear](#)
- d. [5 AAC 21.335. Minimum distance between units of gear](#)

Inseason Management –The Council would establish the process for NMFS to close the fishery in Federal regulations. A series of open days or periods within the fishing season could be defined in regulation. Once the TAC is reached, or there is insufficient TAC to support another fishery opening, NMFS inseason management would close the fishery. Having multiple closed days between each fishery opening, which is consistent with current State practice, would allow time for catch data to reach managers and a Federal closure to be published in the *Federal Register* if needed. Closing the fishery would be the primary practicable tool available to inseason managers.

The RA may become aware of new information and data relating to stock status during the course of a fishing year which warrant inseason adjustments to a fishery. **However, due to the relatively short duration of the fishery, and the length of noticing requirements for an inseason adjustment (15-30 days), it is unlikely that inseason adjustments would be an effective or useful tool for inseason management of the Cook Inlet EEZ drift gillnet fishery. This is a significant limitation of Federal management as information about salmon stock abundance develops significantly over the course of the season as escapement data becomes available.** The other requirements for an inseason adjustment are laid out below.

Inseason adjustments are for changes in stock status that might not have been anticipated or were not sufficiently understood at the time harvest levels were being set. Such changes may become known from events within the fishery as it proceeds, or they may become known from analysis of scientific survey data. Certain changes warrant swift action by the RA to protect the resource from biological harm by instituting gear modifications or adjustments through closures or restrictions.

The need for inseason action may be related to several circumstances. For instance, run size may be much less than originally forecast. When new information indicates a run is well below previous expectations, allowing a fishery to continue under a pre-season harvest level could increase the risk of overfishing. Conservation measures that would reduce harvest in season may be warranted.

Inseason adjustments are accomplished most effectively by management personnel who are monitoring the fishery and communicating with those in the fishing industry who would be directly affected by such adjustments. Therefore, under Alternative 3, the Council could authorize the RA to make inseason adjustments to conserve fishery resources on the basis of all relevant information. Using all available information, the RA may close the fishery in the Cook Inlet EEZ. The RA could change any previously specified TAC if it is proven to be incorrectly specified on the basis of the best scientific information available or stock status. Such inseason adjustments must be necessary to address one of the following:

1. preventing overfishing
2. TAC specified on the basis of information that is found to be incorrect.

The possible types of information that the RA could consider in determining whether conditions exist that require an inseason adjustment or action are described as follows. The Council could provide that the RA is not precluded from using information not described but determined to be relevant to the issue:

- a. the effect of overall fishing effort;
- b. CPUE and rate of harvest;
- c. relative abundance of salmon stocks;
- d. changes in the condition of a stock; and
- e. any other factor relevant to the conservation and management of salmon in Cook Inlet.

The RA would be constrained, however, in his or her choice of management responses to prevent potential overfishing by having to first consider the least restrictive adjustments to conserve the resource. The order in which the RA would consider inseason adjustments to prevent overfishing could be specified as: 1) a time and/or area closure; and 2) total closure of the management area and season.

Any inseason adjustments made by the RA would be carried out within the authority set forth in the FMP. Such action would not be considered to constitute an emergency that would warrant a plan amendment within the scope of section 305(e) of the MSA. Any adjustments would be made by the RA by such procedures provided under existing law. Any inseason adjustments that are beyond the scope of the above authority would be accomplished by emergency regulations as provided for under section 305(e) of the MSA. The Council would establish the process for NMFS to close the fishery in Federal regulations.

Use of the Joint Protocol Committee – Under Alternative 3, the State salmon fisheries that occur exclusively in State waters of Cook Inlet would be separately managed by ADF&G. As Stated above, the Council and the BOF would need to work closely through the Joint Protocol Committee to minimize conflicts between State and Federal salmon management actions. Preseason coordination would need to occur so Federal catch limits would account for expected removals from State waters fisheries. Established preseason agreements or arrangements between State and Federal managers of Cook Inlet salmon fisheries would be a requirement to open the EEZ for commercial salmon fishing.

Limited Entry – Under Federal management, commercial salmon fishing permits issued by the Alaska Commercial Fisheries Entry Commission (CFEC) State Limited Entry Program would not be directly applicable to commercial salmon fishing in the EEZ. However, the CFEC limited entry permitting requirements and other State regulations would still be in effect for vessels registered with the State and/or entering into State waters, including State regulations that prohibit unregistered vessels from entering State waters with salmon harvested in the EEZ.³¹ In the long run, the Council would still need to determine who could access the Cook Inlet EEZ fishery. The Council could decide to develop a License Limitation Program, institute a moratorium, or even a catch share program for vessels fishing in the Cook Inlet EEZ. However, developing a Federal limited entry program is complex and would likely take 2–3 years and could not be developed and approved in a timely manner consistent with the court order. Within the current action, the Council could notify the public of its intent to develop a limited program in the future. Absent a Federal program to allocate access based on historical participation, the Cook Inlet EEZ commercial salmon fishery would be managed as an open access fishery. With the management measures contained under Alternative 3, in combination with applicable State regulations, open access management is expected to be viable solution at this time.

Options:

- *Option 1: Open Access.* This option would allow anyone to obtain a Federal Fisheries Permit with the proper gear and species endorsements (to be developed) and participate in the Cook Inlet EEZ drift gillnet fishery.
- *Option 2: Open Access and Notification of Intent to Develop a Limited Entry Program.* This option would allow anyone to obtain a Federal Fisheries Permit with the proper gear and species endorsements (to be developed) and participate in the Cook Inlet EEZ drift gillnet fishery; in addition, the Council would officially notify the public of its intent to establish a limited entry program for the Cook Inlet EEZ drift gillnet fishery.

³¹ It is conceivable that a vessel operator could decide to cut all ties with the State and only fish in the Cook Inlet EEZ. However, if the vessel involved entered State waters for fuel, supplies, or a mechanical or medical emergency, the vessel would be subject to State enforcement. Therefore, this is not considered a scenario that is at all likely.

2.6. Alternatives Considered but not Moved Forward for Analysis

The Cook Inlet Salmon Committee (Committee) developed Alternative 2B: Expanded Scope to fundamentally change how the Federal government manages salmon in Cook Inlet and throughout the West Area. Alternative 2B: Expanded Scope is summarized in section 1.4 and provided in full in the May 2020 Committee Report available on the Council’s web page.³²

The Council reviewed the Committee’s alternative at their June 2020 Council meeting and decided not to add that alternative to the suite of alternatives to be analyzed in the EA/RIR for Council initial review in October 2020. The Council Stated that:

“The Council is not moving the Cook Inlet Salmon Committee’s (Committee’s) recommended alternative forward for analysis, but staff will include it in the section on alternatives considered but not analyzed further. The Council has been clear on its intent to manage the commercial salmon fishery in the EEZ, and not in State waters outside its jurisdiction. The Council requests staff evaluate the recommended management measures that may be applicable to the Council’s alternatives, and analyze the implications of incorporating these recommendations in the current suite of alternatives.”

This section summarizes the major provisions of the Committee’s Alternative 2B: expanded scope recommendation, and explains either why the major provision is not carried forward for further analysis or whether it will be analyzed as an option for Alternative 2. The Committee based Alternative 2B on Alternative 2 and expanded or modified the provisions of Alternative 2 to apply in State waters and to all salmon fisheries.

Expand Federal management to State and internal waters of Cook Inlet and the expanded Salmon Management Area

This provision of Alternative 2B: expanded scope would have the FMP include all of the EEZ off Alaska, and west of Cape Suckling including all State waters (0-3 nm from the coastline), and all State internal waters (such as rivers, streams and lakes) and have the FMP manage all fisheries for salmon, such as commercial, sport, personal use, and subsistence. Similar to Alternative 2, the FMP under the Committee’s Alternative 2B: expanded scope would delegate certain management measures to the State. Because of the scope of the FMP, State and Federal management of all salmon fisheries in all waters west of Cape Suckling, including the Cook Inlet area, would have to be consistent with the FMP, the MSA, and other applicable Federal law.

This provision of the Committee’s Alternative 2B: expanded scope recommendation has been considered and is not carried forward for further analysis. This provision of the Committee’s recommendation is not a reasonable alternative to addressing the purpose and need for action.

First, expanding Federal management to the Prince William Sound EEZ and the South Alaska Peninsula EEZ is not a reasonable alternative because it is outside the scope of the purpose and need for this action. The Council decided to address incorporating the Cook Inlet EEZ into the FMP first, and will develop an FMP amendment to incorporate the Prince William Sound EEZ and the South Alaska Peninsula EEZ subsequent to its work on the Cook Inlet EEZ. Therefore, it is outside the scope of this action to include these other two areas into the FMP at this time.

Second, expanding Federal management to State waters and State internal waters of Cook Inlet is not a reasonable alternative because it is outside the scope of the purpose and need for action. As accurately

³² <https://www.npfmc.org/committees/cook-inlet-salmon-committee/>

Stated by the Council, the need for action is to bring the Salmon FMP into compliance with the MSA consistent with the Ninth Circuit's decision and the judgment of the district court in *UCIDA v. NMFS*.³³ In *UCIDA v. NMFS*, UCIDA and CIFF challenged the consistency of Amendment 12 to the FMP with the MSA. As explained in Section 1 of this analysis, Amendment 12, among other things, removed the Cook Inlet EEZ and the commercial salmon fisheries occurring within it from the FMP and Federal management. The Ninth Circuit held that Amendment 12's removal of the Cook Inlet EEZ from the FMP, and the commercial salmon fisheries within from Federal management, was contrary to section 302(h)(1) of the MSA³⁴, and therefore violated the MSA. The court explained that under section 302(h)(1), a council must prepare an FMP for a fishery that is under its authority and that requires conservation and management. Because the Cook Inlet EEZ is under the authority of the Council and NMFS, the Council and NMFS determined that the commercial salmon fishery occurring within the Cook Inlet EEZ required conservation and management by some entity, and that "the exempted area of Cook Inlet is a salmon fishery"³⁵, the court held that it was impermissible for Amendment 12 to remove that area and the commercial salmon fishery occurring within that area from Federal management under the FMP.

Immediately prior to Amendment 12, the FMP included all of the EEZ off Alaska and managed salmon fisheries occurring in the EEZ. At no point in its history has the FMP included State waters, or managed salmon fisheries occurring within State waters. Amendment 12 modified the scope of the FMP to exclude three areas of EEZ waters from Federal management under the FMP, including the Cook Inlet EEZ. In doing so, Amendment 12 slightly shrank the EEZ area managed under the FMP. The result of Amendment 12 was that the FMP continued to manage most of the EEZ off Alaska and the salmon fisheries within that area, but excluded three small pocket areas of the EEZ and the salmon fisheries within those small pockets of EEZ waters from the FMP and Federal management. The controversy with Amendment 12 was its removal of EEZ waters adjacent to Cook Inlet and the termination of Federal management of the commercial salmon fishery within that removed EEZ area. The Ninth Circuit decision creates a need for the Council and NMFS to undo the inconsistencies created by Amendment 12's removal of the Cook Inlet EEZ area. Therefore, the purpose of the action is to add the Cook Inlet EEZ area back into the FMP and manage the commercial salmon fishery within the Cook Inlet EEZ area under the FMP.

During the court challenge to Amendment 12, the parties never argued, and the court's decision never suggests, that the MSA requires the FMP to include State waters and salmon fisheries within State waters. The court's decision correctly characterizes the "fishery" in question as the salmon fishery within the exempted area of Cook Inlet -- the salmon fishery within the Cook Inlet EEZ area exempted from the FMP and Federal management by Amendment 12. And it was this area -- the exempted Cook Inlet EEZ -- to which the court was referring when it said that NMFS could not "wriggle out" of managing relative to the remainder of the EEZ that continued under Federal management. The Council's Stated purpose for action -- to manage the traditional net fishing area that occurs in Federal waters of Cook Inlet -- is consistent with addressing the need identified by the Ninth Circuit's decision and the district court's judgment order and is reasonable in its scope. Finally, the court's decision acknowledges several times that MSA section 302(h)(1) applies to fisheries "under a Council's authority." As explained further in the following paragraphs, fisheries occurring within State waters are not under a Council's authority and may only be regulated by NMFS after a preemption hearing has occurred in accordance with MSA section 306(b).³⁶

³³ *United Cook Inlet Drift Association v. NMFS*, 837 F.3d 1055 (9th Cir. 2016). The decision is included in Appendix 7.6.

³⁴ Section 302(h)(1) of the MSA (16 U.S.C. § 1852(h)(1)) States, "Each council shall . . . for each fishery under its authority that requires conservation and management, prepare and submit to the Secretary" an FMP and any necessary amendments to the FMP.

³⁵ *UCIDA v. NMFS*, 837 F.3d, at 1061 and 1064.

³⁶ 16 U.S.C. § 1856(b).

The Ninth Circuit determined that Amendment 12's removal of the Cook Inlet EEZ and the salmon fishery within it from the FMP and Federal management violated section 302(h)(1) of the MSA. The court's decision does not require the Council to consider an alternative that extends the FMP and Federal management to State waters and salmon fisheries within State waters. The Council's Stated purpose and need for action is consistent with the court's decision and the Council has not impermissibly narrowed the scope of the action relative to the court's decision. Because this provision of the Committee's recommendation is outside the scope of the action, it is not a reasonable alternative and is not carried forward for analysis.

Third, expanding Federal management to State waters and State internal waters of Cook Inlet through FMP amendment is not a reasonable alternative because it is not authorized under the MSA. The MSA authorizes NMFS to manage State fisheries in State waters through preemption in accordance with MSA section 306(b). And as explained above, Federal preemption of State management authority over State salmon fisheries occurring within State waters is not the purpose of, or need for, this action.

MSA sections 101(a) and (b)(1), 302(a)(1)(G), and 306(a) establish geographic boundaries on the Council's and NMFS's authority to conserve and manage fisheries, including fisheries for anadromous species like salmon.³⁷ MSA section 302(h)(1) requires councils to prepare an FMP for (1) a fishery (2) under its authority that (3) requires conservation and management.

The MSA defines "fishery" at section 3(13)³⁸ as "(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and (B) any fishing for such stocks." This is a broad definition, and it can be used to reference all different kinds of stocks of fish on various characteristics. Some have argued that salmon's unique life history and the MSA definition of "fishery" require the Council and NMFS to manage the salmon fishery in Cook Inlet as a single fishery that includes all waters (EEZ, State marine, and State internal waters) and all types of fishing for salmon (i.e., commercial, recreational, subsistence). These stakeholders have argued that there are not two separate salmon fisheries (a Federal fishery and a State fishery) but only one salmon fishery and that the MSA requires the Council to develop an FMP for that fishery. While the statutory definition of "fishery" is broad, nothing within the definition supports an interpretation that it overrides several other provisions of the MSA that clearly State the Council and NMFS have authority to manage fishery resources within the EEZ and cannot manage fisheries within State waters or State internal waters unless NMFS successfully preempts State management in accordance with MSA section 306(b). The term "fishery" is descriptive and does not bestow or restrict authority. The Council and NMFS have used it to refer to fisheries occurring within State waters, such as the State Pacific cod Guideline Harvest Level fisheries or the State's parallel groundfish fisheries. The Council and NMFS have also used it too broadly, or precisely, describe Federal fisheries. For example, the "GOA groundfish fishery" refers to commercial fishing for any and all groundfish species in the Gulf of Alaska EEZ that are managed by the GOA Groundfish FMP, whereas the "GOA Pacific cod fishery" refers to all commercial fishing for a specific groundfish species in the EEZ. And to get even more precise, the "GOA Pacific cod hook-and-line fishery" refers to commercial fishing for GOA Pacific cod with hook-and-line gear in the EEZ. While the term "fishery" may be used to refer to any fishing for a stock or stocks of fish on the basis of geographical, scientific, technical, recreational, and economic characteristics, nothing within the definition extends or diminishes the Council's and NMFS's authority as established in other provisions of the MSA. Most, and possibly all, species of fish managed by the Council and NMFS in the EEZ off Alaska can be found in both Federal and State waters and a Federal fishery/State fishery distinction is made routinely. Except for preemption, nothing in the MSA permits the Council and NMFS to erase the 3-nm boundary between

³⁷ For more explanation, see the legal memorandum dated March 29, 2018, from the NOAA Office of General Counsel, Alaska Section, to the Council at Appendix 7.7.

³⁸ 16 U.S.C. § 1802(13).

State waters and the EEZ just because a species of fish exists in both and there are fisheries for that species of fish in both the EEZ and State waters.

As this analysis demonstrates, the Council and NMFS must consider and analyze the effects of State management of salmon fisheries within State waters in order to develop status determination criteria, annual catch limits, delegation of management of salmon fishery within the EEZ to the State. This examination and analysis is necessary in order to sustainably manage salmon fishery within the EEZ under the FMP (under either delegated or direct Federal management). The Council and NMFS are not ignoring the impacts and effects of the State's management of salmon fisheries on the stocks of salmon managed by the FMP. While the MSA requires the Council and NMFS to consider the impacts of State fisheries and to account for those impacts when establishing status determination criteria and harvest limits for the EEZ fishery, it does not authorize the Council and NMFS to manage those State fisheries simply because there are State and Federal fisheries for the same stock of fish.

Furthermore, the MSA does not authorize a Council or NMFS to manage fisheries occurring in the waters of a State simply by amending the scope of an FMP to include State waters and the fisheries occurring within them. In Alaska, NMFS can manage fisheries occurring from zero to 3 nautical miles from the coastline of Alaska if NMFS successfully preempts State management in accordance with section 306(b). Section 306(b) does not authorize NMFS to preempt State management of fisheries occurring within the State's internal waters.

Finally, there is no analytical or administrative benefit that would come from examining this provision of Alternative 2B: expanded scope. This analysis is examining many aspects of State management of salmon fisheries and the impacts of that management on salmon fisheries, which will help inform the Council in its choice of a preferred alternative. At times, the Council has examined alternatives that were not authorized by the MSA when there was a request by Congress to do so or an indication that changes might be made to the MSA to accommodate the currently unauthorized alternative.³⁹ There is no indication at this time that the MSA will be amended to allow the Council and NMFS to extend Federal management authority into State waters and to manage State water salmon fisheries absent preemption.

Management Policy and Objectives

The Alternative 2B: expanded scope proposes changes to the five FMP objectives in Alternative 2. The overall effect of these changes would be to extend the Federal jurisdiction to manage fisheries that occur in State waters, including other commercial salmon fishing, recreational fishing, subsistence fishing, and personal use fishing. Also, the recommended changes would adversely impact the salmon fishery in the East area by either removing or modifying objectives for the East Area. The proposed changes to Objective 3 - minimize bycatch and bycatch mortality, would greatly constrain the recreational fishing, subsistence fishing, and personal use fishing beyond the current State management of these fisheries.

The Alternative 2B: expanded scope would also add Objective 7 - Identify and Protect Salmon Habitat. The objective as recommended by the committee would put requirements on the Council that are outside of the Council's scope of authority under the MSA. Specifically, the Council does not have the authority to assume an aggressive role in the protection and enhancement of EFH. The Council has designated EFH in State waters and streams designated in the Anadromous Waters Catalog. And, under the MSA, the Council is involved in consultations on Federal actions that may adversely impact EFH and can make EFH conservation recommendations. The MSA does not extend the Council or NMFS's

³⁹ The Crab Rationalization Program is an example of this. At the time the Council was developing alternatives, it also examined an alternative that would provide for processor quota share and arbitration, both of which were not authorized by the MSA but were aspects Congress asked the Council to consider.

authority to require EFH conservation recommendation or stop development projects to ensure no net loss of habitat.

Objective 7 would also require the Council to form a salmon habitat workgroup. There are a number of Federal and State working groups that address fish habitat in Cook Inlet, including the Kenai Peninsula Fish Habitat Partnership (see <https://www.kenafishpartnership.org/>) and the Matanuska Susitna Basin Salmon Habitat Partnership (see <http://www.matsusalmon.org/>). The Committee did not provide additional information on why an additional habitat workgroup was necessary under the FMP or what unique role a Council workgroup would fulfil at this time.

Other Council FMP's have a habitat objective and so NMFS added a new habitat objective to the objectives in Alternative 2 for Council consideration at initial review. This habitat objective is similar to the habitat objectives in other Council FMPs and appropriate to the Council's jurisdiction and consistent with the EFH requirements in the MSA.

Procedures for FMP Implementation

The Alternative 2B: expanded scope recommendations for these sections include expanding the FMP into State waters and expanding FMP management to all salmon fisheries. However, this Alternative did not provide any recommended management measures for these other fisheries. Since State waters and the salmon fisheries that occur there are outside the jurisdiction of the Council, these recommendations are not carried forward in the analysis.

The Alternative 2B: expanded scope would add escapement goals as a Category 1 Federal management measure and have a Salmon Technical Team set escapement goals. This is outside the scope for a number of reasons. The State has established escapement goals for Cook Inlet salmon and has the expertise, experience, and the data to set escapement goals. There is no reason to create a new Federal escapement goal setting body that would lack the expertise, experience, and data to effectively and efficiently set escapement goals. This Federal body would not have access to the best available scientific information for the management of FMP salmon stocks, resulting in increased uncertainty and therefore more constrained catch limits compared to the status quo. Further, Alternative 2B: expanded scope States that the Salmon Technical Team would include a large group of people without experience in the science of setting escapement goals, including stakeholders from fishing groups. This is very different from the PFMC's salmon technical team which is comprised of Federal, State, and tribal scientist and managers. In reality, the Pacific Fishery Management Council's salmon technical team is similar to the proposed Salmon Plan Team under Alternative 2.

The Alternative 2B: expanded scope would make legal gear only a Category 1 Federal management measure which would mean that any changes to the gear used would be in Federal regulations and require Federal rulemaking to change. This would be contrary to the aim of Alternative 2 which is to delegate appropriate management measures to the State because they have the expertise and experience to make these management decisions. The Committee did not identify why legal gear should only be a Category 1 management measure. Under Alternative 2, legal gear is both a Category 1 and Category 2 management measure because Federal regulations are necessary to authorize the use of drift gillnets in Federal waters, however, the detailed regulations on gear specification would remain in State regulations. Additionally, legal gear is a Federal management measure under Alternative 3.

Annual Process for Determining the Status of the Stocks

The Alternative 2B: expanded scope would add that the Salmon Plan Team would make recommendations on State water fisheries. This is outside of the scope of Federal management under the FMP. Additionally, the Committee recommended a Salmon Technical Team to set escapement goals, as

discussed above, and review requests for Federal review of State salmon management decisions in Cook Inlet. It is not clear that there is a need for an additional layer of new decision making body for either escapement goals or to resolve if State management actions are in conflict with the Magnuson-Stevens Act, FMP, or other applicable Federal law. And, since the proposed Salmon Technical Team would be a large body, it would not be an efficient way to make timely decisions.

Federal Oversight and Review Process for State management of all salmon fisheries

Chapter 9 of the FMP currently sets forth a process for Council and NMFS oversight and review of State management measures implemented by the State under its delegated authority and applicable to the EEZ. This process is intended to ensure that the State's exercise of its delegated authority is consistent with the provisions of the FMP, the Magnuson-Stevens Act, and other applicable law.

For the most part, the Alternative 2B: expanded scope would continue the process set forth in Chapter 9. However, it would make three major modifications to the current process.⁴⁰ The first modification would expand the State management measures that would be subject to Federal review and oversight under Chapter 9. This modification would be consistent with the intent of Alternative 2B: expanded scope to have the FMP manage all salmon fisheries in both Federal and State waters of Cook Inlet and delegate most of the day-to-day management of those salmon fisheries to the State of Alaska. Under this modification, all State management measures implemented by the State under its delegated authority and applicable to all commercial and non-commercial salmon fisheries that occur in both Federal and State waters of Cook Inlet would be subject to Federal oversight and review under Chapter 9 of the FMP.

The second modification would allow the submission of petitions that challenge the State's salmon management policy choices. Chapter 9 currently States that petitions for Federal review must claim that the State management measure to be reviewed is inconsistent with some provision of the FMP, the MSA, or other applicable Federal law. Alternative 2B: expanded scope would continue this type of consistency review, but would also permit the submission of petitions that object to the policy choice made by the Board of Fisheries (BOF) or the State of Alaska, or that claim an alternative management measure would be more acceptable to the petitioner than the measure adopted by the BOF or the State.⁴¹ Under this modification, the Federal review process could have NMFS deciding between two or more State fishery management policy choices, all of which may be consistent with the FMP, the MSA, and other applicable law.

The third modification would remove the requirement that a person exhaust available administrative procedures with the State of Alaska prior to submitting a petition to NMFS for Federal review. Removal

⁴⁰ According to section 2.4.9 of the Alternative 2B: expanded scope recommendation attached to the May 26, 2020, Committee Report, the Committee's recommendation would also remove existing FMP language that States that the Federal review process does not prevent a person from seeking judicial review of a State management measure and that initiation of State judicial review is not required before petitioning NMFS to conduct a consistency review. It is not clear why this language is recommended to be removed, but since the stricken language is acknowledging that a person may seek State judicial review in addition to Federal review and does not need to initiate State judicial review prior to filing a petition, its removal does not change the availability of State judicial review or modify the current process.

⁴¹ This seems to be the best reading of the Alternative 2B: expanded scope recommendation. According to section 2.4.9 of the Alternative 2B: expanded scope recommendation attached to the May 26, 2020, Committee Report, the Committee's recommendation would remove existing FMP language that prohibits petitions that "merely object to a State management measure or argue that an alternative measure would provide for better management of the salmon fishery." However, the Committee recommendation did not modify other existing language that requires a petition to identify and describe the inconsistency of the challenged State management measure with the FMP, the MSA, or other applicable Federal law. It is reasonable to conclude that the Committee recommendation is to continue petitions that challenge the consistency of a State management measure with the FMP, the MSA, or other applicable Federal law and to add the ability to petition NMFS to review State management policy choices.

of this requirement would allow petitioners to submit a petition for Federal review directly to NMFS without first attempting to get the State to change the challenged management measure.

The proposed action is to reincorporate into the FMP the geographic portion of the EEZ adjacent to Cook Inlet that was removed from the FMP by Amendment 12 and to Federally manage the commercial salmon fishery that occurs within that portion of the EEZ under the FMP. Both Alternative 2 and Alternative 3 would assert Federal management over the Cook Inlet EEZ and the commercial salmon fishery that occurs within it (e.g., the drift gillnet fishery). Because Alternative 2 would delegate to the State of Alaska the authority to manage certain aspects of the drift gillnet commercial salmon fishery occurring in the EEZ, Alternative 2 requires Federal review and oversight of the State's management measures to ensure the State is managing the commercial salmon fisheries occurring in the EEZ consistent with the provisions of the FMP, the MSA and other applicable Federal law. As explained above, the provision of Alternative 2B: expanded scope that would have the FMP managing all salmon fisheries in all waters of Cook Inlet is not a reasonable alternative and is not carried forward for additional analysis. Because the first modification is derived from, and directly tied to, the scope of the Committee's Alternative 2B: expanded scope, it is also unreasonable and is not carried forward for additional analysis.

The second modification that would allow the submission of petitions that challenge the State's salmon management policy choices is not carried forward for additional analysis because it is in tension with, and undermines, the concept of delegation and an alternative that delegates management authority to the State of Alaska. Alternatives 2 and 3 capture the Council's broad range of management choices -- Federally manage the commercial salmon fishery occurring within the Cook Inlet EEZ through direct Federal management and no delegation of any management authority to the State of Alaska (Alternative 3) or Federally manage the commercial salmon fishery within the Cook Inlet EEZ through a mix of direct Federal management for some management measures and delegation of management authority to the State of Alaska for other management measures (Alternative 2). Inherent within the concept of delegation under the MSA is the ability of the State to make management policy choices under its delegated authority. The MSA requires management decisions by the State to be consistent with the provisions of the FMP, the MSA, and other applicable Federal law, but allows the State to exercise its delegated authority and choose among those policy options that are consistent with the FMP, the MSA, and other applicable Federal law. If the Council wants to retain its ability to choose among various salmon management policy choices, then it could: 1) select Alternative 3 (full Federal management with no delegation); 2) retain Federal control over those management measures for which the Council wants to set management policy and not delegate those to the State; or 3) develop criteria for a delegated management measure that control the State's exercise of its authority for that management measure. If the Council selects Alternative 2 as its preferred alternative, the Council will be authorizing the State to implement its management policy choices for the commercial salmon fishery in the EEZ as long as those choices are consistent with the FMP, the MSA, and other applicable Federal law. Allowing the Council and NMFS to review and possibly overturn the State's Federally-consistent policy decisions contradicts and undermines the concept of delegation. If the Council becomes concerned with the State's policy choices, even when those choices are consistent with the FMP, the MSA, and other applicable law, the Council has the authority to amend the FMP to narrow the delegated authority or to withdraw the delegation.

Finally, the Council may wish to consider adding an option to remove the requirement that a person exhaust available administrative procedures with the State of Alaska prior to submitting a petition for Federal review. The MSA does not require a person to exhaust their remedies with a State, however, this is a provision in all Council FMPs that delegate management to the State. Staff did not create an option because the exhaustion provision is in the best interest of the fishery participants because it allows for quick resolution and changes to measures that are inconsistent with the FMP, MSA, or applicable Federal law. Submitting a petition to NMFS for review is a lengthy process and any potential resolution through Federal rulemaking may take years.

Habitat and Ecosystem Issues

Aggressively pursuing Northern pike eradication in lakes is outside the Council's scope, however, this analysis provides information on the State and Federal actions being taken to control Northern pike in the Cook Inlet region. Additionally, this analysis also provides consideration of threats to salmon habitat in Cook Inlet. These sections are in the cumulative impacts analysis in Section 3.6.

3. Environmental Assessment

This draft environmental assessment (EA) analyzes the impacts of the proposed action to revise the Salmon FMP and the alternative management approaches considered.

The environmental impacts of the *Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska* (FMP) were first analyzed in an Environmental Impact Statement (NPFMC 1978). The Environmental Impact Statement (EIS) analyzed the impacts of alternatives to allow an unrestricted fishery, greatly restrict the fishery, or hold the fishery at its present level. The 1978 FMP maintained the fisheries in the EEZ at their then present level (i.e., no change in fishing with the introduction of the Federal FMP). The EIS concluded:

A primary objective of the action is to prevent overfishing and conserve the resource, the overall impact of the fishery management plan on the environment will generally be beneficial. Monitoring the plan will allow adjustments in applying the management concepts outlined in the plan. These concepts are designed to help minimize fluctuations in fish stock numbers due to catch efforts and to integrate management of ocean salmon with those of other salmon fisheries. This will exert a stabilizing influence in the ecosystem by preventing biological depletion of fish populations.

The environmental impacts of the 1990 version of the FMP were first analyzed in an EA (NPFMC 1990a). The EA concluded:

The proposed amendment will have no significant impacts on the human environment. The proposed changes are primarily of style and structure of the fishery management plan, rather than with the way the fisheries are actually managed. The parts of the draft amendment that deal with management of the fisheries (e.g. deferring⁴² regulatory authority to the State of Alaska, for vessels registered under Alaska law) will, by themselves, have little, if any effect of the human environment.

In 1997, NMFS and ADF&G prepared an EA for the salmon fisheries in the EEZ and State waters off Alaska that evaluated the deferral of regulation and management to the State (NMFS 1997). The EA concluded that the impacts on the target species by the current salmon fishery in southeast Alaska, due to a fishery policy of optimal sustainable yield, are such that produce optimum production of the stocks and healthy escapement levels. Moreover, management over the past several decades (since Statehood) has resulted in healthy salmon stocks for all species.

In 2003, NMFS prepared the Final Programmatic Environmental Impact Statement for the Pacific Salmon Fisheries Management off the Coasts of Southeast Alaska, Washington, Oregon, and California, and in the Columbia River Basin (FPEIS, NMFS 2003). The primary Federal action considered in the FPEIS for the Southeast Alaska salmon fishery was the annual decision regarding continued deferral of management to the State and the issuance of an incidental take Statement through the Endangered Species Act Section 7 consultation process. The FPEIS details the short-term, long-term, and cumulative effects of the Federal action on salmon fisheries and harvests, ESA-listed salmon, non-salmon fish species, ESA-listed and unlisted marine mammals, ESA-listed and unlisted seabirds. The FPEIS also evaluates effects on the

⁴² The 1990 version of the FMP delegated management of the East Area salmon fisheries to the State of Alaska with Federal oversight, but used the term “defer,” rather than “delegate,” when referencing the delegation. Amendment 12 updated the FMP to be more precise in its description so that the current version of the FMP uses the term “delegate” when referencing the delegation of management authority of the East Area salmon fisheries to the State. At the time of Amendment 12, a new meaning for the term “defer” developed. The Council and NMFS currently use the term “defer” when there is no Federal management of a fishery occurring in the EEZ but the State has regulations that manage State-registered vessels that may be fishing in the EEZ. In such a case, the Council and NMFS have deferred management of the fishery to the State.

human environment, including angler benefits (i.e., net willingness to pay for ocean salmon fishing), net income (profit) to businesses that are directly affected by angler activity, net income to commercial fishers, and social effects on the coastal and riverine communities of commercial and sport fisheries affected by the Federal action.

In 2012, NMFS prepared an EA for the salmon fisheries in the EEZ off Alaska that evaluated alternatives for defining the scope of the FMP and determining where Federal conservation and management is required, and options for the specific management provisions in the FMP that apply to the fisheries managed under the FMP. The proposed action was not found to substantially change salmon management under the FMP in a way that would change the prosecution of the fisheries. Therefore, the analysis concluded that Alternatives 1, 2, and 3 would have an insignificant impact on Alaska salmon stocks, Pacific salmon stocks listed under the Endangered Species Act, marine mammals, seabirds, and essential fish habitat. The analysis concluded that Alternative 4, which would remove the majority of EEZ waters from the FMP, could impact salmon abundance and other resources, such as marine mammals, if unregulated fishing occurred in EEZ waters. However, since it was not possible to estimate the potential for or extent of unregulated fishing, or the nature of the impacts of that fishing, the impacts of Alternative 4 were considered unknown.

The proposed action analyzed in this EA concerns the application of Federal management in addition to, or in place of, the existing State management for the commercial salmon fishery that occurs in the Cook Inlet EEZ. Alternative 1, the no action alternative, would not include the Cook Inlet EEZ in the Salmon FMP and would therefore maintain all existing conditions in the fishery. Alternative 2 would include the Cook Inlet EEZ in the FMP and delegate management of the commercial salmon fishery occurring within the Cook Inlet EEZ to the State of Alaska. This is not expected to significantly change the State's management of the commercial salmon fishery in a way that would result in impacts to the environment that are significantly different from the status quo/no action. Alternative 3 would institute Federal management of Cook Inlet EEZ waters in the FMP, which could result in changes to the spatial and temporal distribution of commercial salmon harvest in Cook Inlet. However, it is expected that the total amount of commercial salmon fishing effort and removals would remain consistent with existing conditions. The proposed actions are not expected to change salmon management in a way that would result in significant environmental impacts. Including the Cook Inlet EEZ in the FMP would require NMFS to conduct ESA § 7 consultations on salmon fishing activities in the EEZ. These potential impacts are discussed in this chapter.

The best available information on the status of the salmon stocks in Cook Inlet, and interactions between the EEZ and State waters salmon fisheries and ESA-listed Pacific salmon, marine mammals, seabirds, and habitat are provided in the following sections. This EA analyzes the impacts of the alternatives on these resource components.

3.1. Alaska Salmon Stocks

Alaska salmon fisheries are complex and target mixed stocks of five Pacific salmon species (Chinook, pink, sockeye, chum, and coho), with many divergent users. It is difficult to achieve MSY for each salmon stock and species present in these mixed stock, mixed species fisheries because the composition, abundance, and productivity of salmon stocks and species in these fisheries varies substantially on an annual basis, and the need to conserve weaker stocks by reducing fishing effort sometimes results in foregone yield from more productive stocks. One of the primary tools used by the State to conserve and maximize yield of Alaska salmon stocks is the escapement goal, where escapement is defined as the annual estimated spawning stock. A comprehensive description of the scientific methods and principles underlying State of Alaska salmon management in Section 9.

Abundance data

The State establishes salmon stock escapement goals, which provide benchmarks for assessing stock performance (Munro and Volk 2017, Munro 2018, Munro 2019). In 2018, the State had 287 established and monitored escapement goals (Munro 2019). The State of Alaska publishes an annual report of all current escapement goals for salmon stocks in Alaska.⁴³ Table 3-2 and Table 3-3 provide an overview of salmon stocks in Upper Cook Inlet for which escapement goals exist. This includes a numerical description of the goal, type of goal, year the goal was first implemented, and recent years' escapement data for each stock. In addition, summary statistics documenting performance in achieving goals are presented in Table 3-3. Escapement data are collected by aerial and on-the-ground surveys, and through weir and sonar counts. Depending on the method of observation, the annual escapement estimate may represent an absolute or relative index of spawning abundance. For sockeye and Chinook, run-specific escapement estimates are available for many rivers, providing data for estimating stock-specific reference points. Coho and chum escapement estimates are available for only four and one rivers, respectively, and are not all suitable to be used as indicator stocks.

Stock-specific exploitation data

Stock, or even stock complex-based, exploitation rates require the ability to partition catches to the stock or stock complex to which they belong. Genetic analysis is one of the most prevalent methods for stock identification, and genetic stock identification (GSI) baselines exist for Chinook and sockeye in Cook Inlet. Commercial catches of Chinook and sockeye are sampled throughout the season by ADF&G and GSI data are available for specific locations and gear types, enabling the post-season allocation of harvests and harvest impacts to specific stocks. GSI data are not yet available for coho, chum, or pink salmon stocks in Cook Inlet, preventing run or stock specific harvest allocations of these species.

GSI data are a key source of information for reconstruction of stock-specific annual run sizes, informing the correct apportionment of mixed-stock catches and allocation to stock of origin. While age-only reconstruction methods are available (see Bernard 1983 and Branch and Hilborn 2010), using both age and genetic composition data to inform run reconstruction is preferred (Cunningham et al. 2017). In the absence of accurately reconstructed annual run sizes for stocks or stock complexes, observed fishing mortality rates (F_i) and necessary reference points (F_{MSY} , F_{ABC} , F_{OFL}) cannot be calculated for the UCI system and species level proxies would be necessary.

Sufficiency of Sustainable Escapement Goals as Proxies for S_{MSY}

State management of salmon fisheries within the Cook Inlet region by ADF&G is based on inseason adjustment of fishing effort by emergency order and time-area closures to achieve fixed escapement goals or abundance levels on the spawning grounds. Both the type of escapement target and method used to estimate abundance vary by species and location. Three types of escapement goals are currently implemented for UCI stocks, biological escapement goals (BEG), sustainable escapement goals (SEG), and optimal escapement goals (OEG).

A BEG is defined in policy as the escapement level that provides the greatest potential for maximum sustained yield, and usually requires a complete stock-recruitment analysis be conducted to identify the range of escapements that are likely to produce MSY, and therefore requires stock-specific spawning abundance (escapement), catch, and age composition information. ADF&G seeks to maintain evenly distributed salmon escapements within the bounds of a BEG.

An SEG is a level of escapement, as indicated by an absolute level of spawning abundance or alternative index, that has been observed to provide sustained yield over a 5- to 10-year period and is used when data are insufficient to reliably estimate S_{MSY} and a BEG can therefore not be established or managed for

⁴³ <http://www.adfg.alaska.gov/FedAidPDFs/FMS18-04.pdf>

effectively. SEGs may be established by the ADF&G as either an “SEG range” or “lower bound SEG” and may be defined based on a Percentile Approach (Clark et al. 2014, 2017), stock-recruitment analysis, habitat capacity, risk analysis or other methods. In the case of the Percentile Approach, the range of observed escapements to a system are ranked, and percentiles of the observed range ascribed to each observation. SEGs are subsequently defined as a function of the distribution of observed escapements, the contrast in past escapement observations, exploitation rate, and the level of relative measurement error.

Both BEGs and SEGs are based on the best available biological information and are scientifically defensible, with escapement ranges intended to account for variation in stock productivity and data uncertainty.

OEGs are management targets established by the BOF that consider other biological or allocative factors and may differ from the SEG or BEG specified for a given stock.

The majority of management targets for UCI salmon stocks are SEGs, evaluated annually based on weir or sonar counts, single aerial surveys or single foot surveys (Table 3-1). Exceptions are BEGs for Kasilof River and Russian River (Early Run) sockeye salmon, and an OEG for Kenai River (Early Run) Chinook salmon and an OEG for Kasilof River sockeye salmon that is implemented under certain circumstances.

Table 3-1 Percentile ranges recommended by Clark et al. (2014, 2017) for defining Sustainable Escapement Goals using the Percentile Approach. Contrast in the escapement data is defined as the maximum observed escapement divided by the minimum observed escapement.

Tier	Contrast	Measurement Error	Exploitation	SEG Range
1	High (>8)	High (aerial and foot surveys)	Low to moderate (<0.40)	20 th to 60 th Percentile
2	High (>8)	Low (weirs, towers)	Low to moderate (<0.40)	15 th to 65 th Percentile
3	Low (<=8)		Low to moderate (<0.40)	5 th to 65 th Percentile

The State does not have the necessary resources to monitor returns of salmon to each drainage in Upper Cook Inlet. Therefore, the State does not have the information necessary to set escapement goals for many of the salmon runs, nor is there a need for an escapement goal for each tributary or drainage for purposes of sustainable salmon management. The State has identified the most important species and stocks in each area and directs resources to monitoring returns to these key drainages. Even though the State does not directly monitor some stocks of sockeye, Chinook, pink, chum, and coho salmon; aerial surveys, test fisheries, and commercial harvest provide indicators of relative abundance. In the absence of specific stock information, the State manages these stocks conservatively following the precautionary principle and based on information collected from adjacent indicator stocks (stocks that can be assessed that are assumed to represent nearby stocks) and the performance of salmon fisheries (Section 9).

3.1.1. Impacts of Alternative 1 on Salmon Stocks

Under Alternative 1, the EEZ waters of Cook Inlet would continue to be excluded from the FMP, which would result in a continued deferment of management to the State of Alaska. No changes to the management of salmon or levels of salmon removals would be expected as a result.

The majority of escapement goals in Upper Cook Inlet are sustainable escapement goals (SEG), including lower-bound SEGs. Optimal escapement goals (OEG) and Biological Escapement Goals (BEGs) collectively represent a small proportion of escapement goals in Cook Inlet. SEGs and BEGs are set by ADF&G to maximize return per spawner, while OEGs are set by the BOF and may not represent a spawning escapement that maximizes return per spawner. Escapement goals are typically evaluated on a triennial basis.

Between 2009 and 2018, approximately 60% of lower bound escapement goals for Upper Cook Inlet were met.

Where escapements for a given stock are chronically below established goal ranges or lower bounds, a stock of concern designation may be recommended to the BOF by ADF&G at one of three levels of increasing concern; yield, management, and conservation. Stocks of concern and the conditions which may trigger their adoption by the BOF are narrowly defined in the Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222). Three categories of concern exist:

- yield concern – stocks that fail to produce expected yields or harvestable surpluses;
- management concern – stocks that fail to meet established escapement goals; or
- conservation concern – stocks with chronic inability to maintain escapements above a threshold level such that the ability of the stock to sustain itself is jeopardized.

Stocks may be designated as a management concern if the stock fails to meet the escapement goal over a period of 4 to 5 years despite appropriate management taken to address the concern.

When stocks of concern are identified, ADF&G works with the BOF and public to develop action plans describing potential management actions and research programs to achieve stock re-building goals. Action plans for management may involve time and area restrictions for commercial fisheries judged to have significant impacts on the stock of concern, as well as sport fishery restrictions including bag limit changes, prohibiting use of bait or retention of a species, or closures of the fisheries. Subsistence fishing restrictions may also be considered in action plans.

Currently, stocks of concern in Cook Inlet are as follows:

- Chuitna and Theodore rivers – Chinook stocks of management concern, designation adopted 2010/11
- Alexander Creek – Chinook stock of management concern, designation adopted 2010/11
- Susitna (Yentna) River – sockeye stock of yield concern, designation adopted 2008/09
- Eastside Susitna River – Chinook stock of management concern, designation adopted 2019/20.

In addition to measures affecting commercial and sport fishery management, stock of concern action plans also identify key research objectives designed to provide information necessary to make informed decisions. For Westside Cook Inlet Chinook stocks of management concern in the Lewis, Chuitna and Theodore Rivers, the department will continue to build appropriate genetic baselines in Cook Inlet which will assist in specifically identifying these stocks in mixed fisheries. The current baseline has sufficient discriminatory power to allow genetic mixed stock analysis of at least five Chinook salmon stock groups within Cook Inlet (Barclay et al. 2015) and sampling and analysis of marine Chinook salmon harvests were instituted in 2013. Aerial survey programs will continue monitoring escapements for these stocks, and installation of weirs from 2012–2014 on the Theodore River improved assessment of escapements and provided a platform for collection of reliable age, sex and size information. Continued monitoring of salmon escapements against established goals allows ADF&G, the BOF, and the public to gauge the success of these actions and modify action plans accordingly.

The impacts of Alternative 1 are shown in Table 3-3, which provides an overview of salmon stocks in Upper Cook Inlet for which escapement goals exist, a numerical description of the goal, type of goal, year the current goal was first implemented, and recent years' escapement data for each stock. In Table 3-3, escapements from 2009 through 2018 were compared against escapement goals in place at the time of enumeration to assess outcomes in achieving goals. Escapements for a particular stock were classified as “below” if escapement for a given year was less than the lower bound of the escapement goal range. If escapement fell within the escapement goal range or was greater than a lower-bound goal, escapements were classified as “met”. Where escapements exceeded the upper bound of an escapement goal range (if an upper bound was defined), they were classified as “above”. Where escapement goals or enumeration methods changed for a stock between 2009 and 2018, outcomes were assessed by comparing escapement estimates with the goal and methods in place at the time of the fishery. In addition, summary statistics

documenting performance in achieving goals are presented in Table 3-3. These conditions would be maintained under Alternative 1 and do not result in a significant impact on Cook Inlet salmon stocks.

Table 3-2 Upper Cook Inlet Chinook, chum, coho, pink, and sockeye salmon escapement goals and escapements, 2009–2018. SEG is Sustainable Escapement Goal, BEG is Biological Escapement Goal, and OEG is Optimal Escapement Goal.

System	2018 Goal Range		Type	Initial Year	Escapement									
	Lower	Upper			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CHINOOK SALMON														
Alexander Creek	2,100	6,000	SEG	2002	275	177	343	181	588	911	1,117	754	170	296
Campbell Creek	380		LB SEG	2011	554	290	260	NS	NS	274	654	544	475	287
Chuitna River	1,200	2,900	SEG	2002	1,040	735	719	502	1,690	1,398	1,965	1,372	235	939
Chulitna River	1,800	5,100	SEG	2002	2,093	1,052	1,875	667	1,262	1,011	3,137	1,151	NC	1,125
Clear (Chunilna) Creek	950	3,400	SEG	2002	1,205	903	512	1,177	1,471	1,390	1,205	NS	780	940
Crooked Creek	650	1,700	SEG	2002	617	1,088	654	631	1,103	1,411	1,459	1,747	911	714
Deshka River	13,000	28,000	SEG	2011	11,967	18,594	19,026	14,010	18,531	16,335	24,316	22,874	11,383	8,548
Goose Creek	250	650	SEG	2002	65	76	80	57	62	232	NC	NC	148	90
Kenai River - Early Run (all fish)	eliminated ^a			2017	6,163	6,393	8,448	5,044	2,148	5,311	6,190	9,177		
Kenai River - Early Run (large fish)	3,900	6,600	OEG	2017									6,553	2,909
	2,800	5,600	SEG	2017										
Kenai River - Late Run (all fish)	eliminated			2017	21,390	16,210	19,680	27,710	15,395	16,263	22,626	18,790		
Kenai River - Late Run (large fish)	13,500	27,000	SEG	2017									20,731	16,813
Lake Creek	2,500	7,100	SEG	2002	1,394	1,617	2,563	2,366	3,655	3,506	4,686	3,588	1,601	1,767
Lewis River	250	800	SEG	2002	111	56	92	107	61	61	5 ^b	0	0 ^b	0
Little Susitna River (Aerial) ^c	900	1,800	SEG	2002	1,028	589	887	1,154	1,651	1,759	1,507	1,622	1,192	530
Little Susitna River (Weir)	2,300	3,900	SEG	2017									2,531	549
Little Willow Creek	450	1,800	SEG	2002	776	468	713	494	858	684	788	675	840	280
Montana Creek	1,100	3,100	SEG	2002	1,460	755	494	416	1,304	953	1,416	692	603	473
Peters Creek	1,000	2,600	SEG	2002	1,283	NC	1,103	459	1,643	1,443	1,514	1,122	307	1,674
Prairie Creek	3,100	9,200	SEG	2002	3,500	3,022	2,038	1,185	3,304	2,812	3,290	1,853	1,930	1,194
Sheep Creek	600	1,200	SEG	2002	500	NC	350	363	NC	262	NC	NC	NC	334
Talachulitna River	2,200	5,000	SEG	2002	2,608	1,499	1,368	847	2,285	2,256	2,582	4,295	1,087	1,483
Theodore River	500	1,700	SEG	2002	352	202	327	179	476	312	426	68	21	18
Willow Creek	1,600	2,800	SEG	2002	1,133	1,173	1,061	756	1,752	1,335	2,046	1,814	1,329	411
CHUM SALMON														
Clearwater Creek	3,500	8,000	SEG	2017	8,300	13,700	11,630	5,300	9,010	3,110	10,790	5,056	7,040	1,800
COHO SALMON														
Deshka River	10,200	24,100	SEG	2017									36,869	13,072
Fish Creek (Knik)	1,200	4,400	SEG	2011	8,214	6,977	1,428 ^d	1,237	7,593 ^d	10,283	7,912	2,484	8,966	5,022
Jim Creek	450	1,400	SEG	2014	1,331	242	229	213	663	122	571	106	5,646	758
Little Susitna River	10,100	17,700	SEG	2002	9,523	9,214	4,826 ^e	6,779	13,583	24,211 ^e	12,756	10,049	17,781	7,583 ^e
PINK SALMON														
There are no pink salmon stocks with escapement goals in Upper Cook Inlet.														

System	2018 Goal Range		Type	Initial Year	Escapement									
	Lower	Upper			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SOCKEYE SALMON														
Crescent River	eliminated			2014	NS	86,333	81,952	58,838	NS					
Fish Creek (Knik)	15,000	45,000	SEG	2017	83,480	126,836	66,678	18,813	18,912	43,915	102,309	46,202	61,469	71,556
Kasilof River	160,000	390,000	OEG	2011	324,783	293,765	243,767	372,523	487,700	438,238	470,677	239,981	358,724	388,009
	160,000	340,000	BEG	2011										
Kenai River ^f	OEG eliminated			2017	843,255	1,015,106	1,275,369	1,197,518	964,224	1,151,629	1,325,673	1,042,668	1,056,773	
	700,000	1,200,000	SEG	2011									NA	831,096
Packers Creek	15,000	30,000	SEG	2008	16,473	NS	NS	NS	NA	19,242	28,072	NA	17,164	16,247
Russian River - Early Run	22,000	42,000	BEG	2011	52,178	27,074	29,129	24,115	35,776	44,920	50,226	38,739	37,123	44,110
Russian River - Late Run	30,000	110,000	SEG	2005	80,088	38,848	41,529	54,911	31,364	52,277	46,223	37,837	45,012	71,052
Chelatna Lake	20,000	45,000	SEG	2017	17,721	37,784	70,353	36,577	70,555	26,212	69,750	60,792	26,986	20,434
Judd Lake	15,000	40,000	SEG	2017	44,616	18,361	39,997	18,303	14,088	22,416	47,684	NA	35,731	30,844
Larson Lake	15,000	35,000	SEG	2017	40,933	20,324	12,413	16,708	21,821	12,040	23,214	14,333	31,866	23,632

Source: Munro 2018, Munro 2019

Note: NA = data not available; NC = no count; NS = no survey; LB SEG = lower-bound SEG.

a Kenai River early-run Chinook salmon (all fish) SEG was eliminated and OEG was revised by BOF.

b Lewis River mouth naturally obstructed.

c Little Susitna River Chinook salmon aerial survey goal is only used to assess escapement if weir count is not available.

d Incomplete counts for Fish Creek (Knik) coho salmon in 2011 and 2013 because weir was pulled before end of run.

e Incomplete counts for Little Susitna River coho salmon in 2011 due to breach of weir and 2014 because weir was pulled before end of run.

f Kenai River sockeye salmon uses the best estimate of sport harvest upstream of sonar.

Table 3-3 Summary of Upper Cook Inlet salmon escapements compared against escapement goals for the years 2009–2018.

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Stocks with Escapement Data		33	29	32	31	31	34	31	27	31	35
Below Lower Goal	Number	14	16	16	18	8	14	2	9	12	20
	Percent	42%	55%	50%	58%	26%	41%	6%	33%	39%	57%
Goal Met	Number	14	10	13	13	18	16	23	17	14	12
	Percent	42%	34%	41%	42%	58%	47%	74%	63%	45%	34%
Above Upper Goal	Number	5	3	3	0	5	4	6	1	5	3
	Percent	15%	10%	9%	0%	16%	12%	19%	4%	16%	9%

Source: Munro 2018, Munro 2019

3.1.2. Impacts of Alternatives 2 on Salmon Stocks

Alternative 2 would establish Federal management of the Cook Inlet EEZ and the commercial salmon fishery with delegation of management to the State. The additional Federal management measures and processes are not likely to result in significant changes relative to current State management of salmon stocks under the status quo. However, over time the additional review and Federal resources implemented through the FMP may lead to incremental improvement and refinement of the information available to managers.

The annual SDC process and ACLs are the aspects of Alternative 2 that would most impact salmon stocks in Cook Inlet. For this analysis, we apply the proposed SDCs to the salmon stocks in Cook Inlet. The FMP would establish a tier system for annually determining the status of the salmon stocks in Cook Inlet.

- Tier 1: salmon stocks with escapement goals and stock-specific catches
- Tier 2: salmon stocks managed as a complex, with specific salmon stocks as indicator stocks
- Tier 3: salmon stocks with no reliable estimates of escapement

The following analysis provides a retrospective analysis of how the proposed status determination criteria under Alternative 2 would have been applied to each stock in each tier, to determine the status of that stock from 2003 to 2018. This provides an assessment of whether the addition of required Federal management measures would be expected to constrain, or otherwise modify the previously experienced levels of salmon removals in the Cook Inlet EEZ salmon drift gillnet fishery. If implemented, these criteria would be applied annually using the best available scientific information during the stock status determination process.

Each year, the best available information would be used to assign stocks to each tier through the annual Salmon Plan Team process. It is recognized that at present, sufficient data are not available to develop status determination criteria and annual catch limits for all salmon stocks within Cook Inlet. Table 3-4 provides an illustration of the stocks that would fit in each tier given the current level of information for each stock. ADF&G reviews and updates (if necessary) salmon escapement goals regularly on a three-year cycle. ADF&G is continuously developing and improving the genetic tools used for stock identification, particularly for stocks with direct management needs. For some Tier 2 stocks (e.g. sockeye and coho salmon), the ability to do genetic stock identification exists but might not be practical for several other reasons, such as logistics and costs of obtaining catch samples or costs of analysis. For some species, genetic stock identification at the fine scale is more challenging (e.g. pink salmon), but ADF&G is continually developing and improving genetic baselines and applying the latest genetic techniques to be able to support salmon management needs. The Salmon Plan Team and ADF&G managers would incorporate this information as it becomes available to improve stock-specific management.

Table 3-4 Tier levels and proposed Upper Cook Inlet salmon stocks in each Tier, based on the current information available for each stock, under Alternative 2.

Tier	Stock	Description
1	Kenai River sockeye salmon	Stock-specific catches and escapements are annually calculated for this stock and the sustainable escapement goal is currently 750,000 to 1,300,000 fish. Average generation time is 5 years.
	Kasilof River sockeye salmon	Stock-specific catches and escapements are annually calculated for this stock and the biological escapement goal is currently 140,000 to 320,000 fish. Average generation time is 5 years.
	Kenai River late run Chinook salmon	Stock-specific catches and escapements are annually calculated for this stock and the sustainable escapement goal is currently 13,500 to 27,000 large fish. Average generation time is 6 years.
2	Upper Cook Inlet coho salmon	There are no stock-specific catches of coho salmon calculated, but there are sustainable escapement goals for the Deshka and Little Susitna rivers, and Jim and Fish creeks. Stocks regularly assessed with weirs, such as the Deshka and Little Susitna rivers, can be used as stock status indicators. Average generation time is 4 years.
	Other sockeye salmon	Some stock-specific catch information is calculated, but complete escapement enumeration is not available. Stocks with sustainable escapement goals based on weir counts, such as Chelatna, Judd, and Larson lakes; and Fish Creek can be used as stock status indicators. Average generation time is 5 years.
3	Upper Cook Inlet chum salmon	There are no stock-specific catches of chum salmon calculated. While there is one sustainable escapement goal for chum salmon, it cannot be used as a stock status indicator. Average generation time is 4 years.
	Upper Cook Inlet pink salmon	There are no stock-specific catches of pink salmon calculated. There are no escapement goals for pink salmon. Generation time is two years to address odd and even brood lines in a single stock.

Note: For quick reference—

- Biological escapement goal is the number of salmon in a particular stock that ADF&G has determined should be allowed to escape the fishery to spawn to achieve the maximum yield. This determination is based on biological information about the fish stock in question. See 5 AAC 39.222(f)(3) for formal definition.
- Sustainable escapement goal is defined as a level of escapement, indicated by an index or a range of escapement estimates, that is known to have provided for sustained yield over a 5- to 10-year period. A sustainable escapement goal is used in situations where a biological escapement goal cannot be estimated due to the absence of a stock-specific catch estimate. See 5 AAC 39.222(f)(36) for formal definition.

Tier 1: salmon stocks with escapement goals and stock-specific catches

Three salmon stocks would be placed in Tier 1 with the current information available: Kenai River sockeye salmon, Kasilof River sockeye salmon, and Kenai River late run Chinook salmon (see **Table 3-4**).

Total catches in Upper Cook Inlet, catches in the EEZ portion of Upper Cook Inlet, and escapements of salmon for each stock were used to develop examples of status determination criteria and ACLs for 1999 through 2018. EEZ catch of each salmon stock was estimated based on annual approximations of the percentage of the sockeye and Chinook salmon harvest in the Central District drift gillnet fishery (see Section 4.5.2.3 for description of methods). It was assumed for these examples that sport fishery catches of sockeye and Chinook salmon in the EEZ waters of UCI are minimal and not included in the estimate of EEZ catches, although they may be included once SDCs are implemented.

For all Tier 1 stocks, the MFMTs and MSSTs are based on the estimated stock-specific exploitation rates in the EEZ and spawning escapements of salmon for the specific stock. The lower bound of the escapement goal, total catches, catches in the EEZ, and run size accumulated over the average generation time were used to calculate the MFMT relevant to the EEZ.

The preseason ACL would be estimated as the expression of the observed potential yields from the previous *T*-1 years and the preseason estimate of potential yield in the EEZ based on the preseason forecast of run size.

If implemented, these criteria would be applied annually to each stock using the best available scientific information during the stock status determination process.

Kenai River sockeye salmon

The following provides a retrospective analysis of how the proposed Tier 1 status determination criteria under Alternative 2 would have been applied to Kenai River sockeye salmon, to determine the status of that stock from 2003 to 2018.

Total catches in Upper Cook Inlet, catches in the EEZ portion of Upper Cook Inlet, and escapements of sockeye salmon in the Kenai River were used to develop status determination criteria and ACLs for 1999 through 2018 (**Table 3-5**). The MSST for Kenai River sockeye salmon is calculated from one-half of the lower bound of the escapement goal (700,000 sockeye salmon) accumulated over $T=5$ years. Based on the example, overfishing and overfished status were not observed between 2003 and 2018 although the escapement goal was not met in 2000.

The preseason ACL would be estimated as the expression of the observed potential yields from the previous $T-1$ years and the preseason estimate of potential yield in the EEZ based on the preseason forecast of run size. For example, the 2018 preseason run forecast for Kenai River sockeye salmon was 2.485 million fish. The preseason potential yield in the EEZ (\hat{Y}_t) would have been estimated by applying the recent (2013-2017) average harvest rate in State waters ($\bar{F}_{state} = 0.54$) to the preseason forecast to estimate State water harvest; then subtracting that value (1.342 million) and the lower bound of the escapement goal (700,000) from the preseason forecast (i.e. $\hat{Y}_{EEZ,t} = 2.485 - 0.700 - 2.485 \times 0.54 = 0.443$). The 2018 potential yield in the EEZ (443,000 fish) added to the sum of potential EEZ yields for the previous $T-1$ years (3.337 million fish; sum of EEZ Yield 2014-2017) results in a preseason ACL of 3.799 million fish. Postseason, the EEZ ACL would be recalculated using the realized run and catch in State waters and result in an ACL of 3.642 million fish for 2018 (**Table 3-5**).

Table 3-5 Tier 1, Kenai River sockeye salmon catch, estimated catch in the EEZ, escapements, run size, lower bound of escapement goal from 1999-2018 (in thousands) and retrospective estimates of the Status Determination Criteria and Annual Catch Limits from 2003 to 2018 (in thousands).

Year	Total Kenai R. Catch (C_{Total})	Kenai R. EEZ Catch (C_{EEZ})	Escapement (S)	Run (R)	Lower Bound of Goal (G)	Potential Yield (Y_{EEZ})	F_{EEZ}	$MFMT_{EEZ}$	MSST	Cumulative Escapement ($\sum S_t$)	ACL ($\sum Y_{EEZ,t}$)	Cumulative Catch ($\sum C_{EEZ}$)	Overfishing	Overfished	ACL Exceeded
1999	2,035	341	949	2,985	700	590									
2000	1,118	181	697	1,815	700	178									
2001	1,451	221	738	2,190	700	259									
2002	2,340	360	1127	3,467	700	786									
2003	3,037	431	1402	4,440	700	1,134	0.103	0.198	1,750	4,913	2,947	1,534	No	No	No
2004	4,015	716	1691	5,705	700	1,707	0.108	0.231	1,750	5,655	4,064	1,909	No	No	No
2005	4,455	859	1654	6,109	700	1,813	0.118	0.260	1,750	6,612	5,699	2,587	No	No	No
2006	957	107	1892	2,849	700	1,299	0.110	0.299	1,750	7,766	6,739	2,473	No	No	No
2007	2,638	775	964	3,602	700	1,039	0.127	0.308	1,750	7,603	6,991	2,888	No	No	No
2008	1,374	220	709	2,082	700	228	0.132	0.299	1,750	6,910	6,086	2,676	No	No	No
2009	1,582	328	848	2,430	700	476	0.134	0.284	1,750	6,067	4,855	2,287	No	No	No
2010	2,558	672	1038	3,596	700	1,011	0.144	0.278	1,750	5,452	4,053	2,101	No	No	No
2011	4,982	1,140	1281	6,263	700	1,721	0.174	0.249	1,750	4,840	4,475	3,134	No	No	No
2012	3,557	1,214	1213	4,770	700	1,726	0.187	0.270	1,750	5,089	5,162	3,574	No	No	No
2013	2,648	682	980	3,628	700	963	0.195	0.285	1,750	5,360	5,897	4,036	No	No	No
2014	2,186	503	1218	3,404	700	1,022	0.194	0.297	1,750	5,730	6,443	4,212	No	No	No
2015	2,419	238	1400	3,819	700	938	0.173	0.291	1,750	6,092	6,370	3,778	No	No	No
2016	2,591	400	1121	3,712	700	820	0.157	0.283	1,750	5,932	5,470	3,037	No	No	No
2017	1,522	202	1073	2,596	700	575	0.118	0.252	1,750	5,793	4,319	2,026	No	No	No
2018	678	98	888	1,566	700	286	0.095	0.241	1,750	5,701	3,642	1,441	No	No	No

Escapements in bold did not meet the lower bound of the escapement goal.

NOTE: Prior to 2011, escapement and escapement goal were based on Bendix sonar assessment; 2011 to present they are based on DIDSON. Escapements and escapement goal in this table are all in DIDSON or DIDSON equivalents.

NOTE: Kenai River sockeye salmon sustainable escapement goal range was revised from 700,000–1,200,000 fish to 750,000–1,300,000 fish starting with the 2020 fishing season.

NOTE: Average generation time (T) is assumed to be 5 years.

Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G.

Kasilof River sockeye salmon

The following provides a retrospective analysis of how the proposed Tier 1 status determination criteria under Alternative 2 would have been applied to Kasilof River sockeye salmon, to determine the status of that stock from 2003 to 2018.

Total catches in Upper Cook Inlet, catches in the EEZ portion of Upper Cook Inlet, and escapements of sockeye salmon in the Kasilof River were used to develop status determination criteria and ACLs for 1999 through 2018 (Table 3-6). The MSST is calculated from one-half of the lower bound of the escapement goal (160,000 sockeye salmon) accumulated over $T=5$ years. Based on the example, overfishing and overfished status were not observed between 2003 and 2018 and the escapement goal was met every year.

Table 3-6 Tier 1, Kasilof River sockeye salmon catch, estimated catch in the EEZ, escapements, run size, and lower bound of escapement goal from 1999-2018 (in thousands) and retrospective estimates of the Status Determination Criteria and Annual Catch Limits from 2003 to 2018 (in thousands).

Year	Total Kasilof R. Catch (C_{Total})	Kasilof R. EEZ Catch (C_{EEZ})	Escapement (S)	Run (R)	Lower Bound of Goal (G)	Potential Yield (Y_{EEZ})	F_{EEZ}	MFMT	MSST	Cumulative Escapement ($\sum S_i$)	ACL ($\sum Y_{EEZ,t}$)	Cumulative Catch ($\sum C_{EEZ}$)	Overfishing	Overfished	ACL Exceeded
1999	514	110	312	826	160	263									
2000	267	60	264	531	160	163									
2001	432	81	319	751	160	239									
2002	432	76	236	667	160	152									
2003	509	78	354	862	160	271	0.111	0.299	400	1,484	1,088	404	No	No	No
2004	897	160	524	1,421	160	524	0.107	0.319	400	1,695	1,349	454	No	No	No
2005	867	71	360	1,227	160	271	0.094	0.296	400	1,792	1,457	466	No	No	No
2006	1,490	61	390	1,880	160	291	0.074	0.249	400	1,863	1,509	446	No	No	No
2007	792	193	365	1,157	160	398	0.086	0.268	400	1,992	1,755	563	No	No	No
2008	1,248	160	327	1,575	160	327	0.089	0.250	400	1,966	1,812	646	No	No	No
2009	779	87	326	1,105	160	253	0.082	0.222	400	1,768	1,541	573	No	No	No
2010	523	73	295	819	160	208	0.088	0.226	400	1,703	1,478	574	No	No	No
2011	564	75	246	810	160	161	0.108	0.247	400	1,559	1,348	588	No	No	No
2012	258	65	375	632	160	280	0.093	0.249	400	1,569	1,229	460	No	No	No
2013	513	51	490	1,003	160	381	0.080	0.293	400	1,731	1,282	351	No	No	No
2014	663	74	440	1,103	160	354	0.077	0.317	400	1,845	1,383	338	No	No	No
2015	704	18	471	1,175	160	328	0.060	0.318	400	2,021	1,504	283	No	No	No
2016	241	1	240	481	160	81	0.047	0.324	400	2,015	1,424	209	No	No	No
2017	443	39	359	802	160	238	0.040	0.303	400	1,999	1,382	183	No	No	No
2018	315	30	388	703	160	258	0.038	0.296	400	1,898	1,260	162	No	No	No

NOTE: Prior to 2011, escapement and escapement goal were based on Bendix sonar assessment; 2011 to present they are based on DIDSON. Escapements and escapement goal in this table are all in DIDSON or DIDSON equivalents.

NOTE: Average generation time (T) is assumed to be 5 years.

Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G.

Kenai River late-run Chinook salmon

The following provides a retrospective analysis of how the proposed Tier 1 status determination criteria under Alternative 2 would have been applied to Kenai River late-run Chinook salmon, to determine the status of that stock from 2004 to 2018.

Total catches in Upper Cook Inlet, catches in the EEZ portion of Upper Cook Inlet, and escapements of Kenai River late-run Chinook salmon were used to develop status determination criteria and ACLs for 1999 through 2018 (Table 3-7). The MSST is calculated from one-half of the lower bound of the escapement goal (13,500 Chinook salmon) accumulated over $T=6$ years. Based on the example, overfishing and overfished status were not observed between 2004 and 2018 although the escapement goal was not met in 2010, 2013, and 2014.

Table 3-7 Tier 1, Kenai River late-run Chinook salmon catch, estimated catch in the EEZ, escapements, run size, and lower bound of escapement goal from 1999-2018 and retrospective estimates of the Status Determination Criteria and Annual Catch

Year	Total Kenai late-run Catch (C_{Total})	Kenai late-run EEZ Catch (C_{EEZ})	Escapement (S)	Run (R)	Lower Bound of Goal (G)	Potential Yield (Y_{EEZ})	F_{EEZ}	MFMT	MSST	Cumulative Escapement ($\sum S_i$)	ACL ($\sum Y_{EEZ,i}$)	Cumulative Catch ($\sum C_{EEZ}$)	Overfishing	Overfished	ACL Exceeded
1999	16,557	62	29,100	45,657	13,500	15,662									
2000	16,217	49	25,502	41,719	13,500	12,051									
2001	16,223	58	29,531	45,754	13,500	16,089									
2002	15,396	39	40,514	55,910	13,500	27,053									
2003	19,523	109	48,461	67,984	13,500	35,070									
2004	26,200	121	65,112	91,312	13,500	51,733	0.001	0.453	40,500	238,220	157,658	438	No	No	No
2005	28,501	195	55,688	84,189	13,500	42,383	0.001	0.477	40,500	264,808	184,379	571	No	No	No
2006	17,817	109	39,305	57,122	13,500	25,914	0.002	0.493	40,500	278,611	198,242	631	No	No	No
2007	14,757	115	29,664	44,421	13,500	16,279	0.002	0.495	40,500	278,744	198,432	688	No	No	No
2008	14,586	50	28,094	42,680	13,500	14,644	0.002	0.480	40,500	266,324	186,023	699	No	No	No
2009	9,793	105	18,251	28,044	13,500	4,856	0.002	0.448	40,500	236,114	155,809	695	No	No	No
2010	9,143	65	13,037	22,180	13,500	0	0.002	0.374	40,500	184,039	104,076	639	No	No	No
2011	10,650	72	15,731	26,381	13,500	2,303	0.002	0.290	40,500	144,082	63,996	516	No	No	No
2012	753	38	22,453	23,206	13,500	8,991	0.002	0.252	40,500	127,230	47,073	445	No	No	No
2013	2,077	32	12,305	14,382	13,500	0	0.002	0.196	40,500	109,871	30,794	362	No	No	No
2014	1,423	32	11,980	13,403	13,500	0	0.003	0.127	40,500	93,757	16,150	344	No	No	No
2015	5,971	40	16,825	22,796	13,500	3,365	0.002	0.120	40,500	92,331	14,659	279	No	No	No
2016	9,866	102	14,676	24,542	13,500	1,278	0.003	0.128	40,500	93,970	15,937	316	No	No	No
2017	9,774	41	20,634	30,408	13,500	7,175	0.002	0.162	40,500	98,873	20,809	285	No	No	No
2018	513	103	17,285	17,798	13,500	3,888	0.003	0.127	40,500	93,705	15,706	350	No	No	No

Escapements in bold did not meet the lower bound of the escapement goal.

NOTE: The escapement goal was in terms of all fish prior to 2017. In 2017 the escapement goal was revised to a large fish goal (≥ 75 cm). All fish numbers in this table are in terms of large Chinook salmon.

NOTE: Average generation time (T) is assumed to be 6 years in this example.

Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G

Tier 2: salmon stocks managed as a complex, with specific salmon stocks as indicator stocks

Two salmon stocks complexes would be placed in Tier 2 with the current information available: Upper Cook Inlet coho salmon and other sockeye salmon (see **Table 3-4**). If Alternative 2 is implemented, these criteria would be applied annually using the best available scientific information during the stock status determination process.

The EEZ catch of each indicator salmon stock was estimated based on annual approximations of the percentages of the coho and sockeye salmon harvest in the Central District drift gillnet fishery (see Section 4.5.2.3 for description of methods). It was assumed for this example that sport fishery catches of coho and sockeye salmon in the EEZ waters of UCI are minimal and not included in the estimate of EEZ catch, although they may be included once SDCs are implemented.

For all Tier 2 stocks, the MFMTs and MSSTs are proxies for the true but unknown exploitation rates in the EEZ and spawning escapements of coho salmon or other sockeye salmon in Upper Cook Inlet. The lower bound of the aggregated escapement goals, total catches, catches in the EEZ, and indexed run size accumulated over the average generation time ($T=4$ years for coho, $T=5$ years for sockeye) were used to calculate the MFMT relevant to the EEZ.

Upper Cook Inlet coho salmon

The following provides a retrospective analysis of how the Tier 2 status determination criteria would have been applied to the Upper Cook Inlet coho salmon stock complex, using Deshka River and Little Susitna River coho stocks as indicator stocks from 2002 to 2018. If Alternative 2 is implemented, these criteria would be applied annually using the best available scientific information during the stock status determination process.

Catches of coho salmon in all of Upper Cook Inlet and in the EEZ portion of Upper Cook Inlet, and escapements of coho salmon based on weir counts in the Deshka and Little Susitna rivers were used to develop examples of status determination criteria and ACLs during 1999-2018 (**Table 3-8**).

The MSST is calculated from one-half of the lower bound of the aggregated escapement goals (10,200 fish in Deshka River and 10,100 fish in Little Susitna River) accumulated over $T=4$ years. In retrospect, overfishing would have been observed only in 2013 ($F = 0.1877$, MFMT = 0.1876), but overfished status would not have been observed between 2002 and 2018 although individual river escapement goals were not met in some years. The cumulative ACL was exceeded in 2013 by 113 fish.

Table 3-8 Tier 2 example using Upper Cook Inlet coho salmon total catch, estimated catch in the EEZ, indexed escapements, proxy run size, and sum of lower bounds of escapement goals from 1999-2018 and retrospective estimates of the Status Determination Criteria and Annual Catch Limits, 2002-2018.

Year	Escapements (S)								EEZ									Overfishing	Overfished	ACL Exceeded
	Total Catch C_{Total}	EEZ Catch C_{EEZ}	Deshka R.	Little Susitna R.	Total	Run (R)	LB Goal Index (G)	Potential Yield (Y)	F	MFMT	MSST	Cum. Escape. ($\sum S_i$)	ACL ($\sum Y_{EEZ,t}$)	Cum. Catch ($\sum C_{EEZ}$)						
1999	257,704	29,177	4,566	3,017	7,583	265,287	20,300	16,460												
2000	444,258	68,810	26,387	15,436	41,823	486,081	20,300	90,333												
2001	320,985	19,384	29,927	30,587	60,514	381,499	20,300	59,598												
2002	465,327	66,185	24,612	47,938	72,550	537,877	20,300	118,435	0.110	0.170	40,600	182,470	284,826	183,556	No	No	No			
2003	261,952	26,096	17,305	10,877	28,182	290,134	20,300	33,978	0.106	0.178	40,600	203,069	302,344	180,475	No	No	No			
2004	509,533	92,888	62,940	40,199	103,139	612,672	20,300	175,727	0.112	0.213	40,600	264,385	387,738	204,553	No	No	No			
2005	391,817	67,466	47,887	16,839	64,726	456,543	20,300	111,892	0.133	0.232	40,600	268,597	440,032	252,635	No	No	No			
2006	359,893	47,311	59,419	8,786	68,205	428,098	20,300	95,216	0.131	0.233	40,600	264,252	416,813	233,761	No	No	No			
2007	316,900	67,818	10,575	17,573	28,148	345,048	20,300	75,666	0.150	0.249	40,600	264,218	458,501	275,483	No	No	No			
2008	357,443	41,346	12,724	18,485	31,209	388,652	20,300	52,255	0.138	0.207	40,600	192,288	335,029	223,941	No	No	No			
2009	315,690	39,164	27,348	9,523	36,871	352,561	20,300	55,735	0.129	0.184	40,600	164,433	278,872	195,639	No	No	No			
2010	353,653	61,165	10,393	9,214	19,607	373,260	20,300	60,472	0.144	0.167	40,600	115,835	244,128	209,493	No	No	No			
2011	203,893	19,173	7,326	4,826	12,152	216,045	20,300	11,025	0.121	0.135	40,600	99,839	179,487	160,848	No	No	No			
2012	197,966	36,844	6,825	6,779	13,604	211,570	20,300	30,148	0.136	0.136	40,600	82,234	157,380	156,346	No	No	No			
2013	382,699	110,875	22,141	13,583	35,724	418,423	20,300	126,299	0.187	0.187	40,600	81,087	227,944	228,057	Yes	No	Yes			
2014	280,218	35,622	11,578	24,211	35,789	316,007	20,300	51,111	0.174	0.188	40,600	97,269	218,583	202,514	No	No	No			
2015	377,887	56,635	10,775	12,756	23,531	401,418	20,300	59,866	0.178	0.198	40,600	108,648	267,424	239,976	No	No	No			
2016	231,482	36,202	6,820	10,049	16,869	248,351	20,300	32,771	0.173	0.195	40,600	111,913	270,047	239,334	No	No	No			
2017	416,258	83,343	36,869	17,781	54,650	470,908	20,300	117,693	0.147	0.182	40,600	130,839	261,441	211,802	No	No	No			
2018	362,708	63,450	13,072	7,583	20,655	383,363	20,300	63,805	0.159	0.182	40,600	115,705	274,135	239,630	No	No	No			

Escapements in bold did not meet the lower bound of the escapement goal.
 NOTE: Average generation time (T) is assumed to be 4 years in this example.
 Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G.

Other sockeye salmon

The following provides a retrospective analysis of how the Tier 2 status determination criteria would have been applied to the other sockeye salmon stock complex in the Upper Cook Inlet.

Catches of other sockeye salmon in all of Upper Cook Inlet and in the EEZ portion of Upper Cook Inlet, and escapements of sockeye salmon based on escapement to the Yentna Rivers, Chelanta Lake, Judd Lake, Larson Lake, and Fish Creek were used to develop examples of status determination criteria and ACLs during 1999-2018 (Table 3-9).

The MSST is calculated from one-half of the lower bound of the aggregated escapement goals accumulated over $T=4$ years. In this example, MSST changes over time as assessment projects change and escapement goals are updated. In retrospect, overfishing would have been observed only in 2008 ($F = 0.195$, $MFMT = 0.175$), and overfished status would not have been observed between 2003 and 2018 although individual river escapement goals were not met in some years. The cumulative ACL was exceeded in 2008 by 63,479 fish.

Table 3-9 Tier 2 example using Upper Cook Inlet other sockeye salmon total catch, estimated catch in the EEZ, indexed escapements, proxy run size, and sum of lower bounds of escapement goals from 1999-2018 and retrospective estimates of the Status Determination Criteria and Annual Catch Limits, 1999-2018.

Year	Total Catch (C_{Total})	EEZ Catch (C_{EEZ})	Yentna R.	Chelatna Lk.	Judd Lk.	Larson Lk.	Fish Ck.	Total (S)	Run (R)	LB Goal Index (G)	Potential Yield (Y_{EEZ})	F_{EEZ}	MFMT	MSST	Cumulative Escapement ($\sum S_i$)	ACL ($\sum Y_{EEZ,i}$)	Cumulative Catch ($\sum C_{EEZ}$)	Overfishing	Overfished	ACL Exceeded
1999	648,577	156,824	99,029				26,746	125,775	774,352	150,000	132,599									
2000	434,853	119,113	133,094				19,533	152,627	587,480	150,000	121,740									
2001	456,081	109,011	83,532				43,469	127,001	583,082	150,000	86,012									
2002	634,197	143,699	78,591				90,483	169,074	803,271	110,000	202,773									
2003	620,332	233,954	180,813				92,298	273,111	893,443	110,000	397,065	0.209	0.258	335,000	847,588	940,189	762,601	No	No	No
2004	759,438	217,801	71,281				22,157	93,438	852,876	110,000	201,239	0.221	0.271	315,000	815,251	1,008,829	823,578	No	No	No
2005	676,380	61,486	36,921				14,215	51,136	727,516	110,000	2,622	0.198	0.230	295,000	713,760	889,711	765,951	No	No	No
2006	255,953	38,685	92,051				32,562	124,613	380,566	110,000	53,298	0.190	0.234	275,000	711,372	856,997	695,625	No	No	No
2007	650,878	229,839	79,901				27,948	107,849	758,727	110,000	227,688	0.216	0.244	275,000	650,147	881,912	781,765	No	No	No
2008	424,068	85,112	90,146				19,339	109,485	533,553	110,000	84,597	0.195	0.175	275,000	486,521	569,444	632,923	Yes	No	Yes
2009	539,842	136,023		17,721	44,616	40,930	83,480	186,747	726,589	80,000	242,770	0.176	0.195	260,000	579,830	610,975	551,145	No	No	No
2010	636,906	201,719		37,734	18,466	20,324	126,836	203,360	840,266	80,000	325,079	0.213	0.288	245,000	732,054	933,432	691,378	No	No	No
2011	834,648	254,230		70,353	39,909	12,225	66,678	189,165	1,023,813	80,000	363,395	0.234	0.320	230,000	796,606	1,243,529	906,923	No	No	No
2012	472,681	166,149		36,736	18,715	16,557	18,813	90,821	563,502	80,000	176,970	0.229	0.323	215,000	779,578	1,192,811	843,233	No	No	No
2013	506,729	143,826		70,555	14,088	21,821	18,912	125,376	632,105	80,000	189,202	0.238	0.343	200,000	795,469	1,297,416	901,947	No	No	No
2014	469,175	136,401		26,374	22,229	12,430	43,915	104,948	574,123	80,000	161,349	0.248	0.335	200,000	713,670	1,215,995	902,325	No	No	No
2015	504,962	70,539		69,897	47,934	23,185	102,309	243,325	748,287	80,000	233,864	0.218	0.318	200,000	753,635	1,124,780	771,145	No	No	No
2016	308,924	48,997		60,792	NA	14,333	46,202	121,327	430,251	80,000	90,324	0.192	0.289	200,000	685,797	851,709	565,912	No	No	No
2017	658,306	132,305		26,986	35,731	31,866	63,882	158,465	816,771	65,000	225,770	0.166	0.281	192,500	753,441	900,509	532,068	No	No	No
2018	377,527	79,493		20,434	30,844	23,632	72,157	147,067	524,594	65,000	161,560	0.151	0.282	185,000	775,132	872,867	467,735	No	No	No

Escapements in bold did not meet the lower bound of the escapement goal.

NOTE: Average generation time (T) is assumed to be 5 years in this example.

Note: Yentna River sockeye salmon escapement goal was replaced by escapement goals for Chelatna, Judd, and Larson lakes in 2009.

Note: Fish Creek escapement goal from 1982-2001 was a point goal and not a lower-bound goal, but in this retrospective example it is treated as a lower bound.

Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G.

Tier 3: salmon stocks with no reliable estimates of escapement

Two salmon stocks would be placed in Tier 3 with the current information available: Upper Cook Inlet chum salmon and Upper Cook Inlet pink salmon (see **Table 3-4**).

EEZ catch of chum salmon and pink salmon were estimated based on annual approximations of the percentages of the chum salmon harvest in the Central District drift gillnet fishery (see Section 4.5.2.3 for description of methods). It was assumed for this example that there was minimal sport fishery catch of chum salmon or pink salmon in the EEZ waters of UCI, although estimates of harvest may be included once SDCs are implemented.

Upper Cook Inlet chum salmon

The following provides a retrospective analysis of how the Tier 3 status determination criteria would have been applied to Upper Cook Inlet chum salmon from 2002 to 2018. If implemented, these criteria would be applied annually using the best available scientific information during the stock status determination process.

Total catches of chum salmon in Upper Cook Inlet and catches in the EEZ portion of Upper Cook Inlet for 1999 through 2018 were used to develop the example OFLs and ABCs (**Table 3-10**).

The maximum return year catch in the EEZ between 1999 and 2018 was used to develop the OFL and ABC. Under Tier 3, other time periods (prior to 1999 or shorter period within 1999-2018) and methods of summarizing the catch data could be used (e.g., average or percentile) based on best available scientific information and analysis during the stock status determination process.

The 1999 through 2018 period was chosen due to the advent of the current abundance-based approach to management of sockeye salmon in Upper Cook Inlet that likely limits chum catches independent of stock status. The maximum return year catch of chum salmon was chosen as a reference point because chum catches are incidental in Upper Cook Inlet (i.e., no fishing time directed at chum is provided beyond regular fishing periods). Based on the example, the proposed ABC was not exceeded between 2002 and 2018.

Table 3-10 Tier 3 example using Upper Cook Inlet chum salmon total catch, estimated catch in the EEZ, and retrospective estimates of the OFL and ABC, 1999-2018.

Year	Total Catch (<i>CTotal</i>)	EEZ Catch (<i>CEEZ</i>)	EEZ			
			OFL	Max ABC	Cumulative Catch (Σ <i>CEEZ</i>)	Max ABC Exceeded?
1999	179,720	80,551				
2000	133,335	62,061				
2001	90,953	36,633				
2002	245,784	116,282	561,124	505,012	295,527	No
2003	126,146	53,224	561,124	505,012	268,200	No
2004	151,246	64,510	561,124	505,012	270,649	No
2005	73,992	33,879	561,124	505,012	267,895	No
2006	67,753	33,400	561,124	505,012	185,013	No
2007	79,871	46,350	561,124	505,012	178,139	No
2008	53,862	23,551	561,124	505,012	137,180	No
2009	86,817	41,289	561,124	505,012	144,590	No
2010	233,038	122,770	561,124	505,012	233,960	No
2011	134,114	49,098	561,124	505,012	236,708	No
2012	274,157	140,281	561,124	505,012	353,438	No
2013	145,038	76,575	561,124	505,012	388,724	No
2014	122,739	57,306	561,124	505,012	323,260	No
2015	281,694	116,466	561,124	505,012	390,628	No
2016	127,623	40,207	561,124	505,012	290,554	No
2017	249,251	104,175	561,124	505,012	318,154	No
2018	118,603	64,749	561,124	505,012	325,597	No

Note: OFL in this example is the product of the maximum return year catch during this time period and the average generation time of the species (i.e. 4 years for chum salmon). ABC is calculated by applying a default buffer of 10% to the OFL.
Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G.

Upper Cook pink salmon

The following provides a retrospective analysis of how the Tier 3 status determination criteria would have been applied to Upper Cook Inlet pink salmon from 1999 to 2018. If implemented, these criteria would be applied annually using the best available scientific information during the stock status determination process.

Total catches of pink salmon in Upper Cook Inlet and catches in the EEZ portion of Upper Cook Inlet for 1999 through 2018 for even and odd years, were used to develop the OFLs and ABCs (Table 3-11 and Table 3-12).

The maximum return year catch in the EEZ between 1999 and 2018 for each brood-line was used to develop the OFL and ABC. Under Tier 3, other time periods (prior to 1999 or shorter period within 1999-2018) and methods of summarizing the catch data could be used (e.g., average or percentile) based on best available scientific information and analysis during the stock status determination process.

The 1999-2018 time period was chosen due to the advent of the current abundance-based approach to management of sockeye salmon in Upper Cook Inlet that likely limits pink catches independent of stock

status. The proposed ABC would have been exceeded in 2009 and 2014 (i.e. the maximum harvest years that OFL is based on).

Table 3-11 Tier 3, Upper Cook Inlet odd-year pink salmon total catch, estimated catch in the EEZ, and retrospective estimates of the OFL and ABC, 1999-2018.

Year	Total Catch (<i>C_{Total}</i>)	EEZ Catch (<i>C_{EEZ}</i>)	EEZ		
			OFL	Max ABC	Max ABC Exceeded?
1999	26,144	1,257	74,777	67,299	No
2001	84,759	14,518	74,777	67,299	No
2003	60,415	13,424	74,777	67,299	No
2005	62,780	16,026	74,777	67,299	No
2007	163,094	41,604	74,777	67,299	No
2009	244,571	74,777	74,777	67,299	Yes
2011	47,718	6,322	74,777	67,299	No
2013	63,904	12,682	74,777	67,299	No
2015	70,815	9,581	74,777	67,299	No
2017	196,211	23,323	74,777	67,299	No

Note: OFL is maximum return year catch during this time period. ABC is calculated by applying a default buffer of 10% to the OFL. Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G.

Table 3-12 Tier 3, Upper Cook Inlet even-year pink salmon total catch, estimated catch in the EEZ, and retrospective estimates of the OFL and ABC, 1999-2018.

Year	Total Catch (<i>C_{Total}</i>)	EEZ Catch (<i>C_{EEZ}</i>)	EEZ		
			OFL	Max ABC	Max ABC Exceeded?
2000	189,728	42,595	149,727	134,754	No
2002	490,034	114,737	149,727	134,754	No
2004	393,589	103,094	149,727	134,754	No
2006	442,423	91,706	149,727	134,754	No
2008	208,092	49,540	149,727	134,754	No
2010	320,840	89,955	149,727	134,754	No
2012	498,572	132,804	149,727	134,754	No
2014	703,285	149,727	149,727	134,754	Yes
2016	425,497	109,495	149,727	134,754	No
2018	172,974	39,056	149,727	134,754	No

Note: OFL is maximum return year catch during this time period. ABC is calculated by applying a default buffer of 10% to the OFL. Source: Developed by ADF&G fisheries scientists using harvest and escapement data from ADF&G.

In summary, the proposed status determination criteria and annual catch limits indicate that between 2002 and 2018, overfishing occurred during one year for two stocks of Cook Inlet salmon, and ABC was exceeded once for odd-year pink salmon and once for even-year pink salmon. No stocks of salmon in Cook Inlet were found to be overfished during this period. This suggests that existing levels of removals are appropriate for the conservation of Cook Inlet salmon stocks. As the State would continue to manage inseason using escapement goals based on realized salmon run strength that are largely consistent with

existing conditions, no significant changes in salmon removals are expected under Alternative 2. Management measures implemented by the State under its delegated authority would have to be consistent with the MSA and other applicable Federal law, but these are not expected to be significantly different from the status quo because the State management would remain in place. As a result, the level of salmon removals, including their spatial and temporal distribution, are not expected to change. Therefore, the impacts of Alternative 2 on salmon stocks are not expected to be significant.

3.1.3. Impacts of Alternative 3 on Salmon Stocks

Alternative 3 would establish Federal management of the Cook Inlet EEZ and the commercial salmon fishery with no delegation of management to the State. There are two potential outcomes under Alternative 3. The first outcome would specify salmon status determination criteria and a harvest limit in Federal waters of Cook Inlet. Under this option, the tier system described in Alternative 2 (see Section 3.1.2) would be used to set annual SDCs through the Council's review process that includes recommendations of OFL/ABC by a Salmon Plan Team, and subsequent approval by the SSC/Council, with the addition of a TAC. This option assumes NMFS is able to gather the necessary data to conduct the annual SDC process. The specific impacts of Alternative 3 are dependent on the management measures selected, and the response of the State to modified salmon management in the EEZ. Generally, it is expected that Federal management would result in more conservative salmon harvests in the EEZ due to reduced data availability, increased management uncertainty, and reduced inseason management flexibility. Given the uncertain interaction between run size and State/EEZ waters harvest proportion, potential BOF action, and Federal TAC setting considerations, it is not possible to precisely estimate expected salmon harvests in the Cook Inlet EEZ under Alternative 3. EEZ salmon harvests under this option could range from a partial reduction (to account for increased management uncertainty) in the event existing harvest levels are maintained in State waters, to a complete elimination of EEZ salmon harvests in the event of a conservation concern. The EEZ TAC would be necessarily reduced if the State increased salmon harvests in State waters.

The second outcome under Alternative 3 would prohibit salmon harvest in Federal waters of Cook Inlet. This outcome would be responsive to a lack of a Federal salmon data gathering process for Cook Inlet, insufficient data inputs from the State, full allocation of Cook Inlet salmon stocks to State water fisheries, or Federal fishery management measures that are inadequate to avoid overfishing. This option would result in no commercial salmon harvest in the Cook Inlet EEZ.

However, regardless of the outcome under Alternative 3, any salmon surplus to escapement needs are expected to be harvested in State waters salmon fisheries, including the State waters drift gillnet fishery. This may increase the amount of salmon harvested in State waters, but would likely maintain overall harvest levels on Cook Inlet salmon stocks at or slightly below existing levels. Therefore, the impacts of Alternative 3 on salmon stocks are not likely to be significant.

3.2. ESA-listed Pacific Salmon

No species of Pacific salmon originating from freshwater habitats in Alaska are listed under the ESA. West Coast salmon species currently listed under the ESA originate in freshwater habitat in Washington, Oregon, Idaho, and California. Table 3-13 lists the ESA-listed salmon and steelhead stocks that are known to range into marine waters off Alaska during the ocean migration and growth to maturity phases of their anadromous life history. None of these ESA listed stocks have critical habitat in Alaska. During ocean migration to the Pacific marine waters, a small (undetermined) portion of the stock go into the GOA as far east as the Aleutian Islands (Weitkamp 2010). In that habitat they are mixed with hundreds to thousands of other stocks originating from the Columbia River, British Columbia, Alaska, and Asia. The listed fish are not visually distinguishable from unlisted stocks. Incidental take of ESA-listed salmon occurs in the Alaska groundfish fishery, primarily by pelagic trawl gear, and the salmon fisheries. While

the commercial salmon fisheries occur primarily in nearshore waters, they may also have the potential to incidentally take ESA-listed salmon. No ESA-listed salmon have been detected in the catch of the region-wide Cook Inlet drift gillnet fishery. As the Cook Inlet salmon drift gillnet fishery targets maturing salmon that are returning to their natal streams, it is unlikely that the fishery would encounter a stock from the West Coast during its ocean life history. Furthermore, 80% of the Cook Inlet drift gillnet fishery's catch is sockeye salmon on average, of which, over 99% of the catch is typically attributed to Cook Inlet stocks (Barclay 2020).

Table 3-13 ESA listed salmon stocks potentially encountered in Alaskan waters⁴⁴

ESA listed stock	Status
Hood Canal Summer-run Chum Salmon	Threatened
Columbia River Chum Salmon	Threatened
Lower Columbia River Coho Salmon	Threatened
Oregon Coast Coho Salmon	Threatened
Lower Columbia River Steelhead	Threatened
Middle Columbia River Steelhead	Threatened
Snake River Basin Steelhead	Threatened
Upper Columbia River Steelhead	Threatened
Upper Willamette River Steelhead	Threatened
Puget Sound Steelhead	Threatened
Snake River Sockeye Salmon	Endangered
Lake Ozette Sockeye Salmon	Threatened
Lower Columbia River Chinook Salmon	Threatened
Puget Sound Chinook Salmon	Threatened
Snake River Fall Chinook Salmon	Threatened
Snake River Spring/Summer-run Chinook Salmon	Threatened
Upper Columbia River Spring Chinook Salmon	Endangered
Upper Willamette River Chinook Salmon	Threatened

In 2020, coded-wire tag (CWT) information was queried for ESA-listed Chinook, coho, sockeye, and steelhead recovered in the region-wide Cook Inlet drift gillnet fishery. No CWTs have been recovered from ESA-listed salmon or steelhead in the sampling for the Cook Inlet drift gillnet fishery. Of the non-Alaska origin salmon species that may be encountered by the Cook Inlet Drift gillnet fishery, Chinook would be the most likely to be encountered due to their relatively nearshore distribution during ocean residency. There has been limited sampling of Chinook salmon from the drift gillnet fishery in Districts 244, 245, and 249. ADF&G sampled this fishery in Areas 244 and 245 from 1997–2004 (excluding 2000–2003). During this time period, a total of 43 Chinook salmon were sampled, and only one CWT was recovered from an Alaska hatchery fish. It should be noted that this limited sampling is due to the fact that the Cook Inlet drift gillnet fishery has a very limited catch of Chinook salmon, typically less than 500 fish per year for the entire fishery. For context, the total annual average commercial harvest of Chinook salmon in upper Cook Inlet commercial fisheries is 8,430 fish (Marston and Frothingham 2019). ADF&G is establishing a genetic baseline for possible future studies of stock composition of salmon in Cook Inlet commercial and subsistence fisheries.

3.2.1. Impacts of the Alternatives

For Cook Inlet, the best available information on the interactions between the region-wide Cook Inlet salmon drift gillnet fishery and ESA-listed salmon is presented in section 3.2. This information indicates that the Cook Inlet salmon drift gillnet fishery has no impact on ESA-listed salmon.

Neither Alternative 1 nor Alternative 2 is likely to significantly impact the gear used, or the spatial and temporal distribution of the Cook Inlet drift gillnet fishery. As harvest levels are also expected to remain

⁴⁴ <https://www.fisheries.noaa.gov/alaska/endangered-species-conservation/endangered-threatened-and-candidate-species-alaska>

within previously observed ranges, there is expected to be no additional probability of encountering ESA listed salmon stocks. Therefore, neither of these actions are expected to impact ESA listed Pacific salmon stocks.

Alternative 3 would result in Federal management of the Cook Inlet EEZ salmon drift gillnet fishery without delegation to the State. However, the fishery would remain constrained to the Cook Inlet EEZ north of the Anchor Point line using gillnet gear. As a result, Alternative 3 would not be expected to result in any impacts to ESA listed Pacific salmon stocks.

3.3. Marine Mammals

The GOA supports one of the richest assemblages of marine mammals in the world. Twenty-two species are present from the orders Pinnipedia (seals and sea lions), Carnivora (sea otters), and Cetacea (whales, dolphins, and porpoises). Some marine mammal species are resident throughout the year, while others migrate into or out of Alaska fisheries management areas. Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf (Lowry et al. 1982). Table 3-15 provides a summary of the status of the marine mammals potentially affected by the region-wide Cook Inlet drift gillnet salmon fishery. The 2019 marine mammal stock assessment report⁴⁵ provides background information, population estimates, population trends, and estimates of the potential biological removal levels for each stock.

Interactions between marine mammal species and salmon drift gillnet fisheries occur when fishing vessels disturb marine mammals, marine mammals prey on captured salmon, or marine mammals become snagged or entangled in fishing gear. The term incidental take in regards to commercial fishing refers to the catch or entanglement of animals that were not the intended target of the fishing activity. Reports of marine mammal injuries or mortalities incidental to commercial fishing operations have been obtained from fisheries reporting programs (self-reporting or logbooks), observer programs, and reports in the literature. The known interactions between marine mammals and the Cook Inlet drift gillnet fishery are detailed in Table 3-16.

Salmon fisheries may also compete with marine mammals that prey on salmon. Salmon is primarily a summer prey species for Steller sea lions, resident killer whales, spotted seals, beluga whales, and northern fur seals (NPFMC 2011). Table 3-14 lists the marine mammal species that may prey on salmon in Cook Inlet. Salmon harvested in the commercial salmon fisheries may otherwise be available as prey for marine mammals.

⁴⁵The 2019 Marine Mammal Stock Assessment Report (Muto et al. 2020) is available at <https://www.fisheries.noaa.gov/webdam/download/109188361>.

Table 3-14 Marine Mammals that prey on salmon

Species	Prey
Humpback whale	Zooplankton, schooling fish (pollock, herring, capelin, saffron cod, sand lance, Arctic cod, and salmon species)
Beluga whale	Wide variety invertebrates and fish including salmon and pollock
Killer whale	Marine mammals and (resident) fish (including herring, halibut, salmon, and cod)
Seals	Primarily pelagic and nearshore fish (pollock and salmon), occasionally cephalopods and crustaceans
Northern fur seal	Pollock, squid, and bathylagid fish (northern smoothtongue), herring, salmon, and capelin. (Females at Bogoslof eat primarily squid and bathylagid fish and less pollock than in the Pribilofs, and salmon irregularly.)
Steller sea lion	pollock, Atka mackerel, Pacific herring, Capelin, Pacific sand lance, Pacific cod, and salmon

Source: NPFMC 2011

This section provides an analysis of the commercial salmon drift gillnet fishery in the Cook Inlet EEZ and the potential for interactions with identified marine mammal species.

The Cook Inlet drift gillnet fishery is classified as a Category II fishery under the Marine Mammal Protection Act (MMPA) as it has occasional incidental mortality or serious injury of marine mammals. Fishermen participating in a category II fishery are required to accommodate an Alaska Marine Mammal Observer Program observer onboard the vessel(s) upon request by NMFS (50 CFR 229.7). NMFS has placed observers on vessels on the Cook Inlet drift gillnet fishery in the past and these observer data are used to understand the impacts of these fisheries on marine mammals and seabirds detailed in the following sections. NMFS may develop and implement Take Reduction Plans for any Category II fishery that interacts with a strategic stock. Participants in a category II fishery are required to comply with any applicable Take Reduction Plans⁴⁶. NMFS has not developed a Take Reduction Plan for the Cook Inlet salmon drift gillnet fishery. Additionally, each vessel fishing in a category II fishery must have a NMFS-issued certificate exempting them from the prohibition on incidental takes of marine mammal takes during commercial fishing operations under the MMPA.

It is important to note that the classification of fisheries and the requirements NMFS places on the Category II fisheries under the MMPA applies to both State and Federal fisheries. For example, NMFS has deployed marine mammal observers on vessels participating in numerous State-managed salmon drift gillnet fisheries occurring in State waters.

⁴⁶ <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-take-reduction-plans-and-teams>

Table 3-15 Status of marine mammal stocks potentially affected by the salmon fisheries in Cook Inlet

Marine mammal species and stock	Status under the ESA	Status under the MMPA	Population Trends	Distribution in action area
Steller sea lion - Western and Eastern distinct population segment (DPS)	Endangered (WDPS)	Depleted & a strategic stock (WDPS)	There is strong evidence that non-pup and pup counts of western stock Steller sea lions in Alaska increased at 2.14% per year and 1.78% per year, respectively, between 2002 and 2017. However, there are strong regional differences across the range in Alaska. Regional variation in trends in pup counts in 2002–2017 is similar to that of non-pups. Overall, there is strong evidence that pup counts increased in the overall western stock in Alaska and that there is considerable regional variation west and east of Samalga Pass. The EDPS is increasing, driven by growth in pup counts in the majority of regions.	WDPS inhabits Alaska waters from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. EDPS inhabit waters east of Prince William Sound to Dixon Entrance. Occur throughout Alaska waters, terrestrial haulouts and rookeries on Pribilof Is., Aleutian Is., St. Lawrence Is. and off mainland. Use marine areas for foraging. Critical habitat designated around major rookeries and haulouts and foraging areas.
Humpback Whale – Western North Pacific DPS and Mexico DPS	Endangered (Western North Pacific DPS) Threatened (Mexico DPS)	Depleted & strategic	For humpback whales stocks feeding in the North Pacific, it is generally believed that stocks are increasing between 5.5 and 7% per year. While there is agreement that these stocks have a positive population trend, there is some uncertainty in the exact rate of increase.	The summer feeding range of humpback whales in the North Pacific encompasses coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk and north of the Bering Strait.
Harbor seal – Gulf of Alaska	None	None	The current (2011–2018) estimate of the Cook Inlet/Shelikof Strait population trend is -111 seals per year, with a probability that the stock is decreasing of 0.609.	GOA stock found primarily in the coastal waters and may cross over into the Bering Sea coastal waters between islands.
Harbor porpoise – Gulf of Alaska	None	Strategic	Reliable data on population trends are unavailable.	Primarily in coastal waters in the GOA, usually less than 100 meters (m).
Pacific white-sided dolphin – North Pacific Stock	None	None	Reliable data on population trends are unavailable.	Found throughout the GOA.
Dall's porpoise – Alaska	None	None	Reliable data on population trends are unavailable.	Found in the offshore waters from coastal western Alaska to Bering Sea.
Beluga Whale – Cook Inlet	Cook Inlet stock is endangered	Depleted & a strategic stock	For Cook Inlet Belugas, estimated decline of more than 70% in 30 years with 311 animals estimated in 2019. From 2006–2016, abundance declined an average of 0.5% per year. There is a 70% probability the population is declining.	Cook Inlet belugas remain in Cook Inlet year-round and eat salmon.
Fin Whale	Endangered	Depleted & a strategic stock	There are no reliable estimates of current and historical abundances and population trends for the entire Northeast Pacific fin whale stock.	Found seasonally in the offshore waters from the Gulf of Alaska to the Chukchi Sea. They have been documented in Lower Cook Inlet, but not in Upper Cook Inlet.

Source: Muto et al. 2019 and List of Fisheries for 2018 (83 FR 5349, February 7, 2018).

According to the List of Fisheries,⁴⁷ the Cook Inlet drift gillnet fishery has the potential to interact with the following marine mammal species: Cook Inlet beluga whale (*Delphinapterus leucas*), Dall's porpoise (*Phocoenoides dalli*), harbor porpoise (*Phocoena phocoena*), harbor seal (*Phoca vitulina*), and the Steller sea lion (*Eumetopias jubatus*). Additionally, NOAA's Office of Protected Resources recommended

⁴⁷The 2020 NMFS List of Fisheries is available at <https://www.Federalregister.gov/documents/2020/04/16/2020-06908/list-of-fisheries-for-2020>.

analyzing the potential impacts on fin whales (*Balaenoptera physalus*) and humpback whales (*Megaptera novaeangliae*) due to the potential range overlap of these species and the fishery. The reported interactions between this fishery and marine mammals are shown in Table 3-16. This fishery was categorized as a Category II based on takes of harbor porpoise.

A marine mammal observer program for the Cook Inlet salmon drift gillnet fishery was implemented in 1999 and 2000 in response to the concern that there may be significant numbers of marine mammal injuries and mortalities that occur incidental to this fishery (Manly 2006). Observer coverage in the Cook Inlet drift gillnet fishery was 1.75% and 3.73% in 1999 and 2000, respectively. This fishery has not been observed since 2000; therefore, no additional observer data are available. Self-reporting information is available from 1990 to 1994 (see Appendix 7 to Muto et al. 2019).

Table 3-16 Reported interactions between the Cook Inlet drift gillnet fishery and marine mammals. (Source: 2018 List of Fisheries, Muto et al. 2019, and Helker et al. 2019)

Marine Mammal	Year	Observed mortality in that year	Extrapolated mortality in that year	Estimated Mean annual mortality	Self-reporting of entanglements
Harbor Seal	No takes reported by observers.				6 incidents were self-reported in 1990. 1 incident of a dead seal was self-reported in 1992, 2011, and 2013.
Harbor Porpoise	1999	0	0	15.6	3 incidents were self-reported in 1990. 1 incident of a dead harbor porpoise was self-reported in 2013.
	2000	1	31.2		
Cook Inlet Beluga whale	No takes reported by observers.			0- based on a lack of reported mortalities	None
Dall's Porpoise	No takes reported by observers.				1 incident was self-reported in 1990 and in 1992.
Steller sea lions	No takes reported by observers and no additional information on interactions is available.				
Humpback Whales	No takes reported by observers and no additional information on interactions is available.				
Fin Whales	No takes reported by observers and no additional information on interactions is available.				
Unidentified small cetacean	An unidentified small cetacean was caught and killed in drift gillnet gear in 2011.				

3.3.1. Cook Inlet Beluga Whale

In 2008, the Cook Inlet DPS of beluga whales was listed as an endangered species under the ESA following a significant population decline (73 FR 62919, October 22, 2008). Prior to 1980, the population was estimated to be at a high of 1,300 whales (NMFS 2008). Cook Inlet belugas primarily occur in the central and northern portion of Cook Inlet. In 2018, NMFS estimated the Cook Inlet beluga whale population to be 279 individuals (Shelden and Wade 2019). During the most recent 10-year time period (2008-2018), the estimated exponential trend in the abundance estimates is a decline of 2.3% per year (95% PI: -4.1% to -0.6%), with a 99.7% probability of a decline, and a 93.0% probability of a decline that is more than 1% per year (Shelden and Wade 2019). The potential biological removal rate (PBR) for a marine mammal stock is defined under the MMPA as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times FR$. The recovery factor (FR) for this stock is 0.1, the value for cetacean stocks that are listed as endangered. Using the N_{MIN} of 311 beluga whales, the calculated PBR for this stock is 0.62 beluga whales ($311 \times 0.02 \times 0.1$) (Muto et al. 2020). NMFS will consult on the potential effects of this action on ESA-listed species under section 7 of the ESA. The result of such a consultation may include a BiOp, which could incorporate an incidental take Statement (allowed take) that may be different from the calculated PBR.

Based on the best scientific information available of the ecology and natural history of Cook Inlet beluga whales and their conservation needs, NMFS determined the following physical or biological features are essential to the conservation of this species (74 FR 63080⁴⁸):

1. Intertidal and subtidal waters of Cook Inlet with depths <30 feet (9.1 m) (MLLW) and within 5 miles (8.0 km) of high and medium flow accumulation anadromous fish streams;
2. Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole;
3. The absence of toxins or other agents of a type or amount harmful to beluga whales;
4. Unrestricted passage within or between the critical habitat areas; and
5. Absence of in-water noise at levels resulting in the abandonment of habitat by Cook Inlet beluga whales.

NMFS has identified more than one third of Cook Inlet as critical habitat (Figure 3-2, 76 FR 20180, April 11, 2011). Pacific salmon are one of the primary constituent elements for the Cook Inlet beluga whale's critical habitat. As a primary constituent element, NMFS concluded that salmon are essential to the conservation of the Cook Inlet beluga whale.

This analysis focuses on incidental take (as a result of gear or vessel interaction) of belugas in the Cook Inlet drift gillnet fishery and reduction of prey availability through fishery salmon removals. These were the two potential impacts on belugas from salmon fisheries identified in the Recovery Plan for the Cook Inlet beluga whale (NMFS 2016b) that are applicable to this action. The largest fisheries in Cook Inlet, in terms of participant numbers and landed biomass, are the State-managed salmon drift and set gillnet fisheries concentrated in the Central and Northern districts of Cook Inlet. Only the drift gillnet fishery occurs in the Cook Inlet EEZ. Fishery operation times change depending upon fishery and salmon management requirements, but in general, the drift gillnet fishery operates from late June through August. Belugas in Cook Inlet have been documented feeding on salmon (Chinook, chum, coho, and sockeye) from June to September, when the salmon fisheries occur, as well as later into the fall.

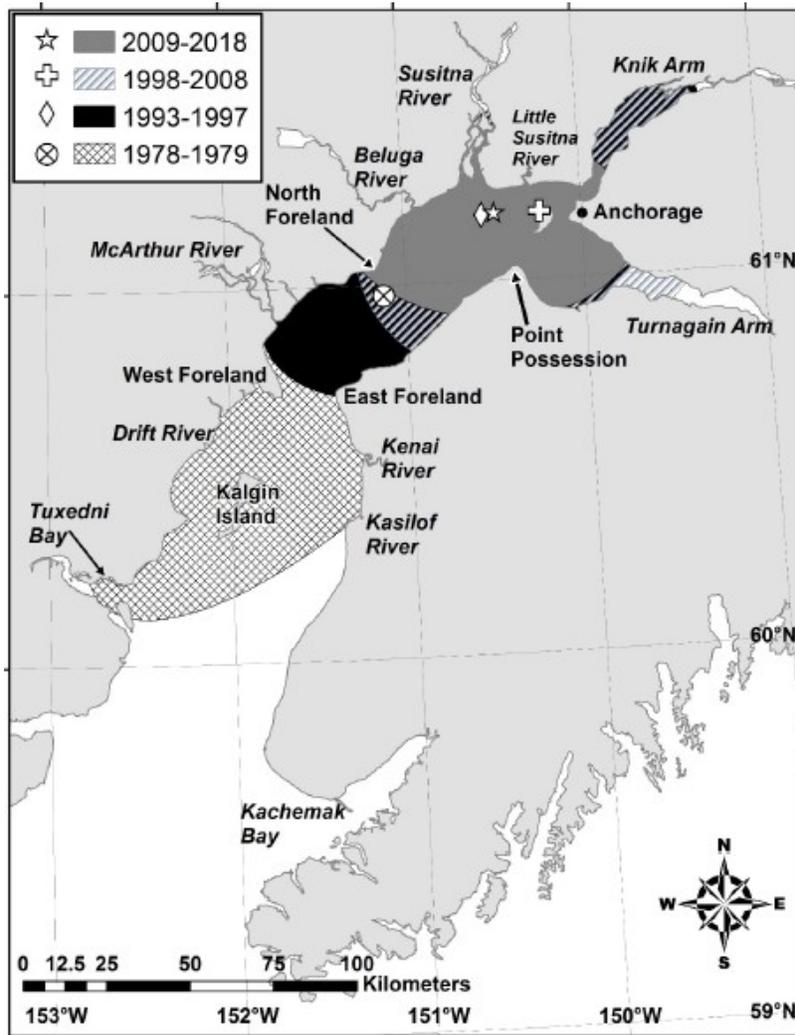
Beluga distribution overlaps with the entire action area, although there is little overlap temporally with the fishing activities under this proposed action. Belugas remain year-round in Cook Inlet, but demonstrate seasonal movements within the Inlet. During the summer and fall, beluga whales generally occur in shallow coastal waters and are concentrated in the northern district of Upper Cook Inlet near the Susitna River mouth, Knik Arm, Turnagain Arm, and Chickaloon Bay. Belugas do spend some time in the central district just south of Kalgin Island around the Kenai and Tuxedni Rivers in the summer months, but they are more likely to be present there from mid-August through May. Historical reports indicate Cook Inlet belugas used the Kenai and Kasilof Rivers year-round, but recent observations indicate that they now only forage in these rivers from late August to early May (Ovitz 2019, AKBMP 2020, NMFS unpublished data).

During winter, Cook Inlet belugas are more often in deeper waters in the mid and lower Cook Inlet. Recent evidence indicates winter presence in the Kachemak Bay area, a part of their historical range. Information on Cook Inlet beluga distribution, including aerial surveys and acoustic monitoring, indicates that the species' range in Cook Inlet has contracted markedly since the 1990s. This distributional shift and range contraction coincided with the decline in abundance. Beginning in 1993, aerial surveys have been

⁴⁸<https://www.Federalregister.gov/documents/2009/12/02/E9-28760/endangered-and-threatened-species-designation-of-critical-habitat-for-cook-inlet-beluga-whale>

conducted annually or biennially in June and August by NMFS Marine Mammal Laboratory. Historic aerial surveys for beluga whales also were completed in the late 1970s and early 1980s. Results indicate that prior to the 1990s belugas used areas throughout the upper, mid, and lower Inlet during the spring, summer, and fall. While the surveys in the 1970s showed whales dispersing into the lower inlet by mid-summer, the majority of the population is now found in northern Cook Inlet from late spring into the fall. The reason for this range contraction is unknown. Potential explanations include changing habitat, prey concentration, predator avoidance, or displacement from preferred feeding grounds due to human activities (Muto et al 2019).

Figure 3-1 Summer range contraction over time as indicated by ADFG and NMFS aerial surveys. Adapted from Sheldon and Wade (2019). The distribution of belugas around each central location (shaded regions next to symbols) for each period was calculated at 2 standard deviations (SD; capturing ca. 95% of the whales). The 95% core summer distribution contracted from 7,226 sq. km in 1978–79 to 2,110 sq. km in 2009–18 (29% of the 1978–79 range).



Incidental Take in Commercial Salmon Fisheries: NMFS implemented the Alaska Marine Mammal Observer Program (AMMOP), a rotational observer program to identify potential interaction ‘hot spots’ among State-managed commercial salmon fisheries in Alaska. With the heightened concern in Cook Inlet for belugas, the program observed two Cook Inlet fisheries in 1999 and 2000, the Cook Inlet salmon drift gillnet fishery and the upper and lower Cook Inlet set net fishery. Manly (2006) reported that the Cook

Inlet drift gillnet fishery had a total of 5,709 permit days (one permit fished for one day) of fishing in 1999 and 3,889 permit days of fishing in 2000, with all or part of 241 permit days of fishing observed for both years. No interactions with belugas were reported in the Cook Inlet salmon fisheries in 1999 and 2000 (Manly 2006). Additionally, no other takes of Cook Inlet beluga whales in the Cook Inlet salmon drift gillnet fishery have been reported. The proposed action is focused on the Cook Inlet EEZ, where vessel distribution is more dispersed than in the nearshore fishery. The EEZ fishery occurs farther away from beluga preferred summer feeding locations in rivers and nearshore habitats in the northern district. The Recovery Plan for the Cook Inlet beluga whale concluded that the current rate of direct mortality from incidental take (entanglement) due to commercial fisheries in Cook Inlet appears to be insignificant and should not delay recovery of these whales (NMFS 2016b).

Reduction of Prey: Aside from incidental take and disturbance associated with fishing activities, commercial fisheries may compete with beluga whales in Cook Inlet for salmon and other prey species. The following information is summarized from the Recovery Plan for the Cook Inlet beluga whale (NMFS 2016b). In the summer, as eulachon runs begin to diminish, belugas rely heavily on several species of salmon as a primary prey resource. There is strong indication beluga whales are dependent on access to relatively dense concentrations of high value prey throughout the summer months. Diminishment in the ability of beluga whales to reach or utilize spring/summer feeding habitat, or reductions in the amount of prey available, may impact the energetics of these animals and delay recovery. Feeding habitat occurs near the mouths of anadromous fish streams, coinciding with the spawning runs of returning adult salmon. These habitats may change quickly as each species of salmon, and often each particular river, is characterized as having its individual run timing.

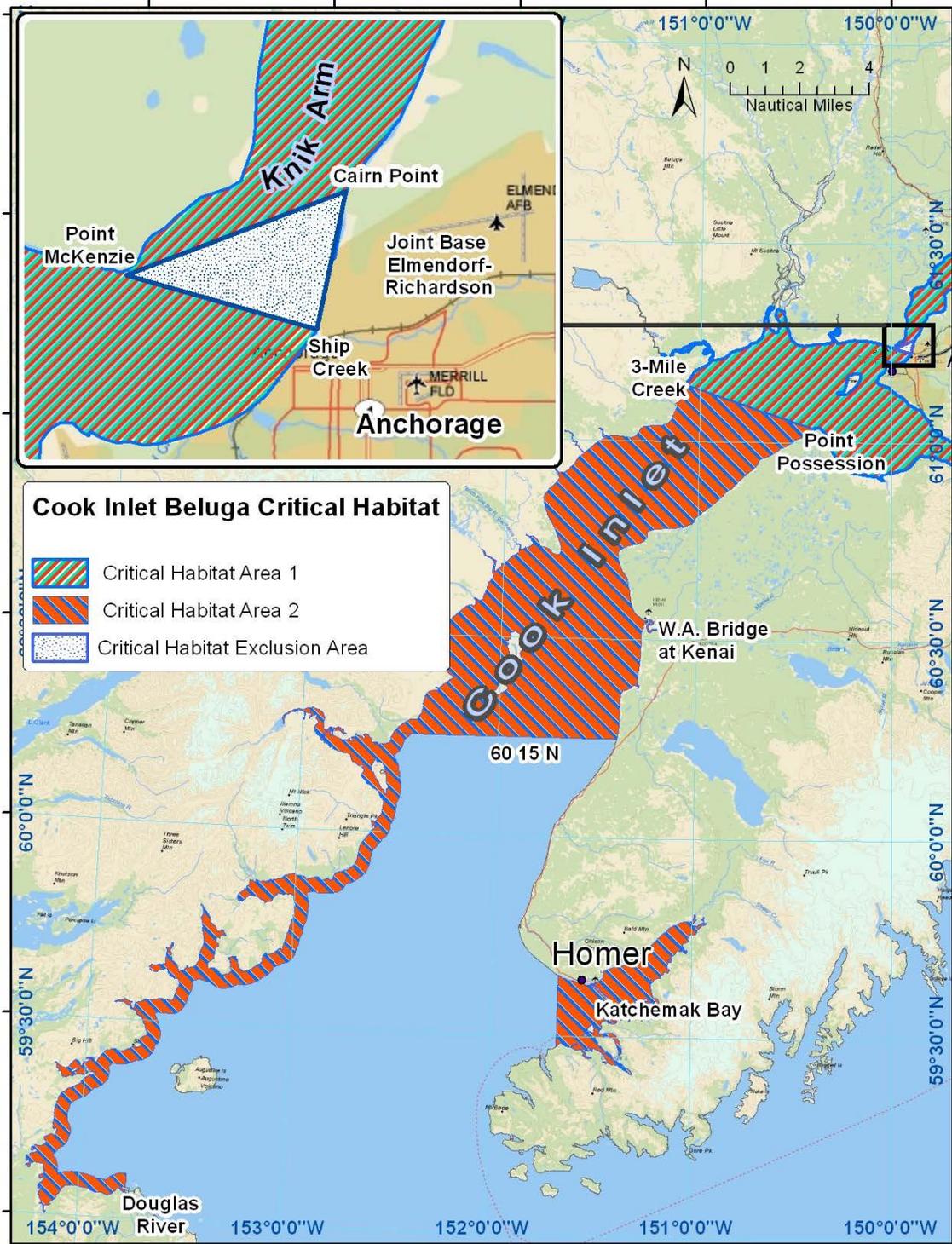
Belugas feed on salmon largely in rivers or at river mouths in the northern district. The Susitna, Little Susitna, Beluga, Eagle, 20-Mile, Placer, Portage, Chickaloon, McArthur, and Tuxedni rivers have been identified as particularly important for beluga feeding in Cook Inlet. The Kenai and Kasilof rivers are not currently used by foraging belugas in the summer, but were utilized prior to the mid 1990's. While the commercial salmon drift gillnet fishery in the EEZ is geographically removed from those feeding areas, it intercepts salmon on their way to these areas. As noted in Section 4.5.2.3 of the RIR, an average of 47% of the total salmon removals by the drift gillnet fishery may occur in the EEZ. The drift gillnet fishery in State waters likewise does not occur in the northern district, but also may intercept salmon on their way to those more northern rivers where belugas feed. The current State Salmon Management Plan, which oversees Cook Inlet fisheries in the lower, middle, and northern districts includes provisions for setting escapement goals as part of the management tools to support the sustained harvest and productivity of salmon in Cook Inlet. The salmon that escape being caught in the fishery and are able to move into rivers to reach spawning grounds are assumed to have also been available to belugas prior to escapement, as long as access to the prey is not impeded. The State actively manages the salmon fisheries inseason to meet escapement goals or indices for each stock, opening and closing the fishery throughout the season, presenting many opportunities for adequate numbers of salmon to reach their spawning streams in high density. The State also uses "in-river" goals in some systems to ensure periods of high density escapement to provide for freshwater fisheries. This provides additional opportunity for belugas to potentially access salmon in excess of the escapement goal prior to harvest in freshwater fisheries. However, in situations where escapement of a stock is not directly monitored but assumed to be represented by a closely related index stock, there is increased uncertainty about the abundance of the stock and subsequent adequacy for beluga energetic needs. There also are salmon hatcheries operating in Cook Inlet, which have measurably added to the numbers of adult fish returning to upper Cook Inlet.

While known salmon escapement numbers and commercial harvests have fluctuated widely throughout the last 40 years, samples of harvested and stranded beluga whales have shown consistent summer blubber thicknesses, suggesting adequate availability of prey (NMFS 2008). The exact quantity and density of salmon needed to allow belugas to forage efficiently and sufficiently enough to thrive is not

well known. Feeding efficiency would necessarily vary according to individual whale sex, age, size, time of year, State and stage of pregnancy, and a number of other factors. Studies are underway to better determine energetic needs for beluga whales. Preliminary results suggest that a nursing mother whale may require over 50,000 k/cal of energy per day. The average non-pregnant beluga may need to consume between 3 (Chinook) and 19 (pink) salmon per day, depending on the salmon species and size consumed, as well as other factors that affect the range of available energy from the fish. Continued research into beluga stomach and fatty acid analyses and Cook Inlet beluga whale population demographics may shed more light on overall feeding and prey requirements for these whales. Further, if funds are available, NMFS would seek to support augmentation of salmon escapement monitoring in unmonitored rivers, including those used for foraging by belugas, under a Cooperative Agreement with the State.

NMFS has recognized and acknowledged that the current management structure of the salmon fisheries has generally provided for the sustained harvest and productivity of salmon in Cook Inlet (76 FR 20180, April 11, 2011). The Recovery Plan for the Cook Inlet beluga whale concludes that it is unknown whether competition with commercial fishing operations for prey resources is having a measurable effect on Cook Inlet beluga whales (NMFS 2016b). While the reason or reasons for the lack of recovery of Cook Inlet beluga whales are unknown, there is currently no conclusive information available to suggest that the lack of recovery is linked to insufficient prey, specifically salmon, availability. A consultation under section 7 of the ESA will be conducted to assess the potential effects of this action on Cook Inlet belugas and their designated critical habitat.

Figure 3-2 Cook Inlet Beluga Critical Habitat. NMFS Alaska Region



3.3.1.1. Impacts of the Alternatives on Cook Inlet Beluga

The impacts of Alternative 1, status quo, on Cook Inlet Beluga whales are summarized in Section 3.3. No changes to the management or the overall annual progression of the fishery are expected under

Alternative 1. There is no known direct incidental take (entanglement) of Cook Inlet belugas in the Cook Inlet drift gillnet fishery under existing conditions, and this would not be expected to change without modifications to fishery management. Additionally, removals of salmon by the fishery would be expected to remain within the recently observed ranges (Section 3.1.1). The current level of fishery removal is not currently known to be a threat to Cook Inlet belugas, but as noted in Section 3.3.1, there is uncertainty regarding beluga energetic needs. Additionally, for some key rivers where beluga currently feed, escapement is estimated through the use of indices rather than direct monitoring. While studies on beluga energetic needs are in the early stages, the use of indices rather than direct monitoring of escapement may not provide a clear assessment of the prey densities available to belugas in those rivers.

Alternative 2 would delegate management of the Cook Inlet EEZ drift gillnet fishery to the State of Alaska. This is not expected to result in significant changes relative to State management of salmon stocks under the status quo. Fishing seasons, closed areas, management area, district, subdistrict, section, statistical area boundaries, and inseason management are all measures that would be delegated to the State and are not expected to change significantly. Distribution of the fishing effort in the Cook Inlet EEZ and State waters is described in Section 4.5.2.3 of the RIR. Alternative 2 is not expected to impact the temporal or spatial distribution of fishing effort. As the spatial and temporal distribution of the fishery and gear utilized would not change, Alternative 2 would maintain the existing risk profile for direct incidental take of Cook Inlet belugas, which is considered to be zero or near zero. Therefore, Alternative 2 is not expected to result in a change to the incidental take level of Cook Inlet belugas. Monitoring options presented in Section 4.5.7, or the AMMOP, could be used to obtain updated information about direct incidental take for the fishery.

As noted in Section 3.3.1, availability of salmon as prey for Cook Inlet Belugas is identified in the Cook Inlet Beluga Whale Recovery Plan as a primary biological need to recover and sustain the Cook Inlet beluga population. Removals of salmon under Alternative 2 are summarized in Section 3.1.2. The application of proposed status determination criteria and annual catch limits to removals that have occurred under State management of the fishery suggest that State management has been appropriate for the conservation of FMP salmon stocks. Given this, it is likely that salmon removals by the drift gillnet fleet will remain within or below the previously observed ranges. As Alternative 2 would maintain or reduce levels of salmon harvest in the EEZ compared to the status quo, it is not expected to have a significant impact on prey availability to Cook Inlet belugas. There may be some beneficial effect to belugas if salmon harvest is reduced under Alternative 2, resulting more salmon available to belugas feeding in the northern district in summer months. It is important to note that information about the harvest and escapement of Cook Inlet salmon stocks is expected to improve over time under Alternative 2 due to additional Federal review and resources. This could provide additional information to better evaluate the adequacy of salmon availability for Cook Inlet belugas. Of particular note, for some key rivers where beluga currently feed, escapement is estimated through the use of indices rather than direct monitoring. Improved understanding of actual escapement through direct monitoring rather than the use of indices for those rivers may provide a more reliable assessment of whether beluga energetics are being met, once those energetic needs can be estimated.

Alternative 3 would result in Federal management of the Cook Inlet EEZ drift gillnet salmon fishery without any delegation of management authority to the State. Two potential management outcomes could occur under Alternative 3. First, if MSA-compliant management measures are not in place, or the management uncertainty is too great to allow for the fishery to be opened, then the Cook Inlet EEZ would be closed to commercial salmon fishing. This would result in all commercial salmon harvest occurring in State waters. Under this scenario, overall salmon removals would be expected to be equal to or less than historical removals under State management. This action would move additional fishery effort into nearshore waters that have been documented as particularly important for Cook Inlet belugas. However, the data that is currently available on fishery incidental takes of Cook Inlet belugas has not documented

any take by the drift gillnet fishery in State waters. Under this outcome, Alternative 3 is not expected to result in a change to the incidental take level of Cook Inlet belugas. Regarding prey availability under Alternative 3, it is expected that fishery removals would be equal or less than existing conditions. There may be practical or logistical constraints that limit the amount of salmon harvested in the compressed time and space that salmon are available to the fishery in State waters that would result in larger salmon escapements. This option would maintain salmon removals at or below existing levels that have not been found to be insufficient for Cook Inlet beluga whales. If the change in beluga summer distribution away from historical feeding areas, such as the mouth of the Kenai River, is associated with human activities including commercial fishing, additional fishing effort inside State waters in such areas as a result of this alternative may further preclude access, should belugas attempt to return to those foraging grounds. Such a shift in beluga distribution is not anticipated under any of the alternatives. However, the lack of interception of fish populations headed through the EEZ toward the northern Cook Inlet rivers, where belugas currently concentrate during summer salmon runs, suggest that such fishing restrictions could benefit Cook Inlet belugas. Further, there is not currently information available to assess the impact of this potential spatial shift of fishery effort to nearshore waters on the adequacy of salmon density for efficient beluga foraging in these habitats

The second outcome under Alternative 3 would be a Federally managed drift gillnet fishery that occurs in the Cook Inlet EEZ. This fishery would occur using the same gear type and within the same absolute boundaries as the Cook Inlet EEZ drift gillnet fishery has historically occurred in. Given the scientific and management uncertainty associated with using a pre-season forecast to manage the fishery required under a Federal system without delegation to the State, it is likely that there would be reduced fishing effort and salmon removals in the Cook Inlet EEZ. However, the concurrent State drift gillnet fishery in Cook Inlet would still be able to harvest salmon that are surplus to the escapement goal. Therefore, this option would result in total amounts of fishing effort and salmon removals in Cook Inlet that are not significantly different from existing conditions. This alternative may increase the proportion of salmon drift gillnet fishing effort that occurs in State waters. However, no incidental takes are documented in available data on fishery interactions with Cook Inlet belugas, including State waters. Although there may be some very low level of incidental take that has not been detected, the Recovery Plan notes that such incidental take is not considered a threat to the population. Therefore, Alternative 3 is not expected to result in a change in takes of Cook Inlet belugas. If the change in beluga summer distribution away from historical feeding areas, such as the mouth of the Kenai River, is associated with human activities including commercial fishing, then additional fishing effort inside State waters in such areas as a result of this alternative may further preclude access, should belugas attempt to return to those foraging grounds. However, such a shift in beluga distribution is not anticipated under any of the alternatives.

3.3.2. Steller Sea Lions

The Steller sea lion range extends from California and associated waters to Alaska, including the GOA and Aleutian Islands, and into the Bering Sea and North Pacific and into Russian waters and territory. In 1997, based on biological information collected since the species was listed as threatened in 1990 (60 FR 51968), NMFS reclassified Steller sea lions as two distinct population segments under the ESA (62 FR 24345). The Eastern Distinct Population Segment (EDPS) of Steller sea lion (east of 144° W. longitude, a line near Cape Suckling, Alaska) was delisted in 2013 (78 FR 66140, November 4, 2013). The Western Distinct Population Segment (WDPS) Steller sea lion (west of 144° W. longitude) is currently listed as endangered.

NMFS designated critical habitat in 1993 (58 FR 45278) for the WDPS of Steller sea lion based on the Recovery Team's determination of habitat sites essential to reproduction, rest, refuge, and feeding. Listed critical habitats in Alaska include all rookeries, major haul-outs, and specific aquatic foraging habitats of the BSAI and GOA. The Cook Inlet drift gillnet fishery does not overlap designated critical habitat for Steller sea lions.

In 2006, NMFS reinitiated an FMP-level Section 7 consultation on the effects of the groundfish fisheries on Steller sea lions, humpback whales, fin whales, and sperm whales to consider new information on these species and their interactions with the fisheries. The final BiOp was released in October 2010. NMFS released an additional BiOp in 2014 on the effects on Steller sea lions of the Federal groundfish fisheries and State of Alaska parallel groundfish fisheries for Atka mackerel, Pacific cod, and pollock primarily in the Aleutian Islands subarea (NMFS 2014).

The Cook Inlet drift gillnet fishery occurs in the north eastern portion of the GOA, in the range of the WDPS of Steller sea lions. The following information on Steller sea lion interactions with the drift gillnet fishery is summarized from the 2018 Alaska Marine Mammal Stock Assessment (Muto et al 2019) and the 2010 BiOp (NMFS 2010) and the 2014 BiOp (NMFS 2014). The 2010 BiOp provided a review of the State managed salmon fisheries, including:

- A description of the fishery management strategy including any special measures pertaining to Steller sea lions;
- Recent changes in the spatial and temporal distribution of the fisheries; and
- A description of direct and indirect Steller sea lion interactions.

It is expected that the Cook Inlet drift gillnet fishery could have the potential for the following impacts on Stellar sea lions:

Incidental Take No incidental takes of Steller sea lions have been observed in the Cook Inlet drift gillnet fishery. The Cook Inlet drift gillnet fishery is thought to have the potential to interact with Steller sea lions, however, no takes have been reported by observers and no additional information on interactions is available (Table 3-16, Kruse et al. 2000, Ferrero et al. 2000).

Reduction of Prey Potential indirect effects of State managed fisheries include the competition for prey resources and the modification of Steller sea lion critical habitat. Prey items which occurred in greater than 10% of the Steller sea lion scats by area, season, and DPS-wide were determined to be important prey species. Salmon, pollock, and Pacific cod were identified as important prey species. Salmon was ranked fairly high, and was often higher than Pacific cod or pollock depending upon area and season. Salmon are high-energy forage species that may be seasonally important components of the diet of Steller sea lions. Salmon fisheries remove important Steller sea lion prey species, and many fisheries are concentrated in space (usually bays or river outlets) and in time (usually spawning aggregations and salmon congregating near rivers for their return to spawning grounds in spring and summer).

To date, there have been few studies specifically designed to address the effects of the salmon fisheries on Steller sea lions. Soboleff (2005) analyzed State fisheries (salmon, herring, shellfish, groundfish) fish ticket data for 1976–2002 and Steller sea lions counts by rookery (32) groupings (7). He indicated that within 50 nm of rookeries, Steller sea lion counts were both negatively and positively correlated with certain State fisheries, but few were significant and some probably spurious. This study also found negative correlation between State salmon fisheries and the Steller sea lion decline across all regions or all years, which disappeared at a regional scale. Soboleff (2005) felt this could be plausible as some salmon fisheries occur near Steller sea lion haulouts and rookeries and salmon are important Steller sea lions prey. The study concluded that few data, low power, and concentration of State fisheries outside areas where Steller sea lions declines have been most severe all may be factors that indicate a low likelihood of State-managed fisheries adversely affecting Steller sea lions. No additional studies have specifically evaluated the relationship between the Cook Inlet drift gillnet fishery or Alaskan salmon fisheries and Steller sea lions. However, a more recent study did not find a strong relationship between groundfish fisheries and condition of Steller sea lions (Hui et al. 2015). Data availability and challenges with variable selection do make inferences from these prey availability studies potentially difficult to determine with certainty (Conn et al. 2014).

The early summer salmon fisheries could affect Steller sea lions during an important weaning period for juveniles and leading up to the birth of pups. Due to intensive salmon fishing activity in such areas during the same times when Steller sea lions target concentrations of salmon, individual Steller sea lions may feed less efficiently or may avoid these feeding opportunities entirely. The commercial salmon fisheries in upper Cook Inlet occur from late June to early September. Geographically, the upper Cook Inlet salmon fisheries take place after the salmon stocks have passed by major Steller sea lion rookeries and haulouts. The salmon escapement goals limit the commercial harvest to the surplus above the amount needed for spawning (Kruse et al. 2000), but these harvest controls probably do not eliminate competition for available salmon between Steller sea lions and the fishery. However, as noted in Kruse et al. (2000) the overall abundance and biomass of salmon has increased dramatically during the time period that the WDPS of Steller sea lions was in decline.

The State employs various management measures that indirectly provide some measure of protection to Steller sea lions. All waters within 3 nm of shore within Steller sea lion rookery critical habitat are closed to vessel entry, including vessels fishing under the State programs. State managed salmon fisheries are open for relatively short periods, and only rarely remain open for 24 hours per day, 7 days per week (Kruse et al. 2000). In Cook Inlet, the drift gillnet fishery is generally open for two 12-hour periods each week, with the ability to add one additional 12-hour opening in years of high salmon abundance during mid-July (Table 4-2). This allows for pulses of high-density salmon passage and escapement during closed periods. Nevertheless, a portion of the fishery takes place at stream or river outlets where salmon congregate before moving upstream to spawn (Kruse et al. 2000). These same areas may provide important Steller sea lion foraging opportunities on high-density prey, enabling the Steller sea lions to feed efficiently and survive other periods of low prey availability.

The 2010 BiOp concluded based on available information that State managed salmon fisheries are likely to continue to compete for fish with foraging Steller sea lions. Given the importance of near shore habitats to Steller sea lions, this competition for fish may have consequential effects for animals that forage in locations where State fisheries may be prosecuted. More data on the foraging habits of Steller sea lions from research in key geographic areas could aid understanding of where and when these effects might be most important. The 2010 BiOp identified as a research priority the re-initiation of Marine Mammal Observer Program studies in the GOA to assess the significance of mortality incidental to Category II commercial fisheries with special emphasis placed on evaluating mortalities associated with the Prince William Sound salmon drift gillnet fishery.

In the 2014 BiOp, NMFS concluded based on available information that State managed fisheries for salmon may compete with foraging Steller sea lions for fish (NMFS 2014). Given the importance of near shore habitats to Steller sea lions and the nearshore execution of State fisheries, this potential competition may have consequential effects for sea lions. Specifically, these potential interactions may contribute to nutritional stress for Steller sea lions and may reduce the value of the marine portions of designated Steller sea lion critical habitat. State managed fisheries will likely continue to reduce the availability of prey within some marine foraging areas and may alter the distribution of certain prey resources in ways that reduce the foraging effectiveness of Steller sea lions. However, it is important to note that the upper Cook Inlet salmon drift gillnet fishery under consideration does not overlap with Steller sea lion critical habitat. More data on the foraging habits of Steller sea lions from research in this area could aid our understanding of potential impacts.

It is also important to note that salmon is one of many prey species eaten by Steller sea lions in the GOA. Steller sea lion population trends in the GOA, which are most likely to have potential interactions with the Cook Inlet drift gillnet fishery, have continued to increase (Muto et al. 2020) which is consistent with available information that has suggested that they do not appear to be limited by prey availability (NMFS 2010).

3.3.2.1. Impacts of the Alternatives on Steller Sea Lions

The impacts of Alternative 1, status quo, on Steller sea lions are summarized in Section 3.3.2. No changes to the management or the overall annual progression of the fishery are expected under Alternative 1. As there is insignificant incidental take of Steller sea lions in the Cook Inlet drift gillnet fishery under existing conditions, no modification would be expected under Alternative 1. Additionally, removals of salmon by the fishery would be expected to remain within the recently observed ranges (Section 3.1.1) that are not thought to be a definitive threat to Steller sea lions. Therefore, no significant impacts from Alternative 1 on Steller sea lions are expected.

Alternative 2 would establish Federal management of the Cook Inlet EEZ and delegate management of the Cook Inlet EEZ drift gillnet fishery to the State of Alaska. This is not expected to result in significant changes relative to State management of salmon stocks under the status quo. Fishing seasons, closed areas, management area, district, subdistrict, section, statistical area boundaries, and inseason management are all measures that would be delegated to the State and are not expected to change significantly. As the spatial and temporal distribution of the fishery and gear utilized would not change, Alternative 2 would maintain the existing risk profile for incidental take of Steller sea lions. No takes of Steller sea lions by the Cook Inlet salmon drift gillnet fishery have been reported or observed. Regarding the availability of salmon as prey for Steller sea lions, removals of salmon under Alternative 2 are summarized in Section 3.1.2. The application of proposed status determination criteria and annual catch limits to removals that have occurred under State management of the fishery suggest that State management has been appropriate for the conservation of FMP stocks. Given this, it is likely that salmon removals will remain within the previously observed range that have been found to not have significant direct impacts on Steller sea lions. Furthermore, the Cook Inlet drift gillnet fishery does not occur within 30 miles of major Stellar sea lion rookeries or haul-outs, with the majority of the fishery occurring further away. Therefore, Alternative 2 would not have a significant impact on Steller sea lions.

Alternative 3 would result Federal management of the Cook Inlet EEZ drift gillnet salmon fishery without any delegation of management authority to the State. Two potential management outcomes could occur under Alternative 3. First, if MSA compliant management measures are not in place, or the management uncertainty is too great to allow for the fishery to be opened, then the Cook Inlet EEZ would be closed to commercial salmon fishing. This would result in all upper Cook Inlet commercial drift gillnet salmon harvest occurring in State waters. Under this closed EEZ scenario, overall salmon removals would be expected to be equal to or less than historical removals under State management. The data that is currently available on fishery takes of Steller sea lions has not documented any takes by the Cook Inlet drift gillnet fishery in State or Federal waters. Regarding prey availability under Alternative 3, it is expected that fishery removals would be equal or less than existing conditions. If the Cook Inlet EEZ is closed to salmon fishing, there may be practical or logistical constraints that limit the amount of salmon harvested in the compressed time and space that salmon are available to the fishery in State waters. As this option would maintain salmon removals at or slightly below existing levels, this option is not likely to have a significant impact on prey availability for Steller sea lions.

The second outcome under Alternative 3 would be a Federally managed drift gillnet fishery that occurs in the Cook Inlet EEZ. This fishery would occur using the same gear type and within the same absolute spatial boundaries as existing conditions. Given the scientific and management uncertainty associated with using a pre-season forecast to manage the fishery required under a Federal system without delegation to the State, it is likely that there would be reduced fishing effort and salmon removals in the Cook Inlet EEZ. However, the State waters drift gillnet fishery in Cook Inlet would still be able to harvest salmon that are surplus to the escapement goal. Therefore, this option would result in total amounts of fishing effort and salmon removals in Cook Inlet that are not significantly different from existing conditions. Neither option under Alternative 3 would move the fishery within 30 miles, or otherwise closer to major Steller sea lion rookeries or haul outs. This may increase the proportion of effort that occurs in State

waters, but given that available data on fishery interactions with Steller sea lions, which included the State waters drift gillnet fishery found that there were no interactions, Alternative 3 is not expected to result in a significant increase in takes of Steller sea lions. Therefore, Alternative 3 is not expected to have a significant impact on Steller sea lions.

3.3.3. Humpback Whales

Humpback whales were initially listed in 1969 with the Endangered Species Conservation Act, and maintained in the status of endangered when the ESA passed into law in 1973. On September 8, 2016, NMFS published a final rule that revised the listing of humpback whales under the ESA by removing the original, taxonomic-level species listing, and in its place listing four DPSs as endangered and one DPS as threatened (81 FR 62260). Although the ESA was later amended to require the designation of critical habitat for listed species, when humpback whales were originally listed, there was no statutory requirement to designate critical habitat for this species. Section 4(a)(3)(A) of the ESA now requires that, to the maximum extent prudent and determinable, critical habitat be designated at the time of listing (16 U.S.C. 1533(a)(3)(A)). Thus, the listing of DPSs of humpback whales under the ESA in 2016 triggered the requirement to designate critical habitat, to the maximum extent prudent and determinable, for those DPSs occurring in areas under U.S. jurisdiction, including the Mexico and North Pacific DPSs. The critical habitat that has been proposed for humpback whales would include portions of Cook Inlet (84 FR 54354). A Recovery Plan for Humpback whales has been adopted (NMFS 1991). The historic summering range in the North Pacific encompasses coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk. The humpback whale population in much of this range was considerably reduced as a result of intensive commercial exploitation during this century.

Based on an analysis of migration between winter mating/calving areas and summer feeding areas using photo-identification, it was concluded that whales feeding in Alaskan waters belong primarily to the Hawaii DPS (not listed), with small numbers from the Western North Pacific DPS (endangered) and Mexico DPS (threatened) individuals (Wade et al. 2016). In Cook Inlet, Hawaii DPS individuals are estimated to comprise 89 percent of the humpback whales present, Mexico DPS individuals to comprise 10.5 percent, and Western North Pacific DPS individuals to comprise 0.5 percent (Wade et al. 2016).

NMFS has determined that for humpback whale, the mortality and serious injury incidental to commercial fishing operations will have a negligible impact (60 FR 45399; August 31, 1995). A 'negligible impact' is defined as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through an effect on annual rates of recruitment or survival. Section 7 consultation was completed on this determination, including issuance of an incidental take Statement for humpback whales for commercial fishing operations of an average annual incidental mortality and serious injury in commercial fishery of up to 2.8 humpback whales from the Central North Pacific stock. All humpback whale stocks that range into Alaska have increasing populations (Muto et al. 2019).

These three DPS of humpback whales may enter Cook Inlet to feed. This may occur at any time of the year, but is most prevalent during the summer. Summer surveys of Cook Inlet in 2016 only encountered three humpback whales over the entire season in lower Cook Inlet (Renner et al. 2017), which is outside of the area where the upper Cook Inlet drift gillnet fishery occurs.

3.3.3.1. Impacts of the Alternatives on Humpback Whales

While there have been no reported interactions with the Cook Inlet drift gillnet salmon fishery and humpback whales, the 2019 Marine Mammal Stock Assessment (Muto et al. 2020) reports interactions

between humpback whales and the Cook Inlet salmon set gillnet and purse seine fisheries, and the Southeast salmon drift gillnet fisheries. None of these fisheries are proposed to be managed by the FMP. None of the alternatives under consideration are expected to significantly change the drift gillnet gear used by the Cook Inlet drift gillnet fleet. Alternatives 1 and 2 are expected to maintain the spatial and temporal distribution of the fishery consistent with existing conditions. Alternative 3 will also maintain the outermost boundary of the fishery consistent with existing conditions, but is likely to result in additional drift gillnet fishing effort in State waters due to more conservative EEZ catch limits under Federal management. As there are no data indicating that humpbacks whales interact with the Cook Inlet drift gillnet fishery, and their infrequent occurrence in upper Cook Inlet where the drift gillnet fishery occurs, none of the alternatives under consideration are expected to have a significant impact on humpback whales.

There is the possibility of prey reduction because humpback whales are known to consume juvenile salmon in some circumstances. However, there is limited potential for this interaction because humpback whales target juvenile salmon while the Cook Inlet drift gillnet fishery targets mature adult salmon and has no bycatch of juvenile salmon due to the large size of gillnet mesh used in the fishery. As none of the alternatives under consideration are expected to increase overall removals of Cook Inlet salmon, the number of spawning salmon and subsequent juvenile salmon abundance are not expected to decrease beyond the range previously observed. Furthermore, this potential competition for salmon prey is not likely to have a significant effect on humpback whales because salmon is one of many prey species eaten by humpback whales in the GOA.

3.3.4. Fin Whales

Fin whales are listed as endangered under the Endangered Species Act of 1973, and therefore designated as depleted under the MMPA. The Northeast Pacific stock is classified as a strategic stock under the MMPA. While reliable estimates of the minimum population size and population trends are available for a portion of this stock much of the North Pacific range has not been surveyed. Therefore, the status of the stock relative to its Optimum Sustainable Population is not available. The minimum estimated mean annual level of human-caused mortality and serious injury for Northeast Pacific fin whales (0.4 whales) does not exceed the calculated PBR (5.1 whales). The minimum estimated mean annual rate of U.S. commercial fishery-related mortality and serious injury (0 whales) is less than 10% of the calculated PBR (10% of PBR = 0.5) and, therefore, can be considered insignificant and approaching a zero mortality and serious injury rate (Muto et al. 2020).

The fin whale recovery plan (NMFS 2010b) identifies high density habitat as the northern Gulf of Alaska, southeastern Bering Sea, and along the Aleutian Islands in offshore waters depending on the season. Summer surveys of lower Cook Inlet in 2016 only encountered a single fin whale over the entire season (Renner et al. 2017). While takes of fin whales off the east coast of Canada and the US have been occasionally documented, it is noted that takes of fin whales by inshore fishing gear in the North Pacific only occur very rarely (NMFS 2010b).

One incidental mortality of a fin whale due to entanglement in the ground tackle of a commercial mechanical jig fishing vessel was reported to the NMFS Alaska Region in 2012 (Table 1; Helker et al. 2019). Because observer data are not available for this fishery, this mortality results in a mean annual mortality and serious injury rate of 0.2 fin whales in U.S. commercial fisheries in 2012-2016 (Table 1). They have been no documented interactions with the Cook Inlet salmon drift gillnet fishery.

3.3.4.1. Impacts of the Alternatives on Fin Whales

There have been no reported interaction between fin whales and the Cook Inlet drift gillnet fishery, and it is uncommon for fin whales to move into upper Cook Inlet or other inshore waters. None of the alternatives under consideration will expand the outermost boundaries of where the Cook Inlet EEZ

commercial salmon fishery can occur or increase total levels of fishery effort. Because of this, interaction between the Cook Inlet drift gillnet fishery in the EEZ and fin whales are unlikely.

Fin whales have not been documented consuming salmon. Therefore, the Cook Inlet salmon fisheries would not have any impact on prey availability for fin whales.

In summary, none of the alternatives under consideration will have a significant impact on fin whales.

3.4. Seabirds

Effects of fishing activity on seabirds occur through direct mortality from collisions with vessels and entanglement with fishing gear. Indirect impacts include competition with the commercial fishery for prey, alteration of the food web dynamics due to commercial fishery removals, disruption of avian feeding habits resulting from developed dependence on fishery waste, fish-waste related increases in gull populations that prey on other bird species, and marine pollution and changes in water quality. Competition between seabirds and fisheries for forage fish is difficult to evaluate. Climatic fluctuations undoubtedly contribute to fluctuations in seabird food resources, but so may fisheries.

Fish processing provides food directly to scavenging species such as Northern Fulmars and large gulls. This can benefit populations of some species, but it can be detrimental to others, which may be displaced or preyed upon. Predation by birds has effects on fish populations, which have variously been estimated as minor to significant.

Thirty-eight species of seabirds breed in Alaska. Breeding populations are estimated to contain 36 million individual birds in Alaska, and total population size (including subadults and nonbreeders) is estimated to be approximately 30% higher. Five additional species that breed elsewhere but occur in Alaskan waters during the summer months contribute another 30 million birds.

Species Nesting in Alaska

Tubenoses-Albatrosses and relatives: Northern Fulmar, Fork-tailed Storm-petrel, Leach's Storm-petrel

Kittiwakes and terns: Black-legged Kittiwake, Red-legged Kittiwake, Arctic Tern, Aleutian Tern, Caspian Tern

Pelicans and cormorants: Double-crested Cormorant, Brandt's Cormorant, Pelagic Cormorant, Red-faced Cormorant

Jaegers and gulls: Pomarine Jaeger, Parasitic Jaeger, Long-tailed Jaeger, Bonaparte's Gull, Mew Gull, Herring Gull, Glaucous-winged Gull, Glaucous Gull, Sabine's Gull, Slaty-backed Gull

Auks: Common Murre, Thick-billed Murre, Black Guillemot, Pigeon Guillemot, Marbled Murrelet, Kittlitz's Murrelet, Ancient Murrelet, Cassin's Auklet, Parakeet Auklet, Least Auklet, Whiskered Auklet, Crested Auklet, Rhinoceros Auklet, Tufted Puffin, Horned Puffin, Dovekie

Eiders: Common Eider, King Eider, Spectacled Eider, Steller's Eider

Species that visit Alaska waters

Tubenoses: Short-tailed Albatross, Black-footed Albatross, Laysan Albatross, Sooty Shearwater, Short-tailed Shearwater

Gulls: Ross's Gull, Ivory Gull

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.

Several species of conservation concern occur in the GOA (Table 3-17). Short-tailed Albatross is listed as endangered and Steller’s Eider is listed as threatened. There are three distinct populations of Steller’s eider worldwide: two distinct Russian populations and the Alaska-breeding population. However, members of all three populations may occur at the same place and time depending on the season. The Alaska-breeding population is the only population of Steller’s eider listed as threatened under the ESA, though it is not physically discernable from the two distinct Russian populations. The ESA protects the Alaska-breeding population of Steller’s eider in Alaska waters and throughout its range. There have been no reported or observed interactions between these species and the Cook Inlet salmon drift gillnet fishery.

Table 3-17 ESA-listed seabird species that occur in the GOA

Common Name	Scientific Name	ESA Status
Short-tailed Albatross	<i>Phoebastria albatrus</i>	Endangered
Steller’s Eider	<i>Polysticta stelleri</i>	Threatened

Previously, Kittlitz’s Murrelet were listed as an ESA candidate species. However, USFWS lowered the listing priority for the species from a 2 (highest possible priority for the species) to an 8 (out of 12) (76 FR 66370, October 26, 2011), and then eventually removed Kittlitz’s Murrelets from the ESA candidate list in 2013 (78 FR 61763, October 3, 2013). This change was based on growing doubts about severity of population declines and lack of a clear link between melting glaciers and population change. USFWS has shifted focus from the loss of glaciers to poor reproductive success. Poor nest success (as opposed to adult mortality) could be the underlying reason for the population decline, and if it is occurring range-wide, the population would be expected to continue to decline. USFWS maintains that loss of the adult Kittlitz’s Murrelets is particularly important and has identified several sources of adult mortality such as hydrocarbon contamination, entanglement in gillnets, and predation. Although none of these sources of mortality alone rises to the level of a threat, in total, the chronic, low level loss of adults, in combination with evidence that a small proportion of the population is breeding, and the low reproductive success led the USFWS to conclude that it will be difficult for this species to maintain a stable population level or rebound from a stochastic event that causes population loss. The USFWS concludes that the magnitude of threat from these sources is low to moderate, depending on events that occur in a given year (number and location of oil spills/shipwrecks, number and location of gillnets) (76 FR 66370, October 26, 2011). There are no data or reports indicating that the Cook Inlet drift gillnet fishery is a cause of direct mortality for Kittlitz’s Murrelets.

Prey for Kittlitz’s Murrelets, and most other seabirds, include schooling fishes (capelin, Pacific sandlance, Pacific herring, and juvenile walleye pollock), zooplankton, and other invertebrates. The large gillnet meshes used in the Cook Inlet salmon drift gillnet fishery (5-7 inches) are not selective for these forage species. Therefore, the potential impacts of the Cook Inlet salmon drift gillnet fishery are limited to incidental take.

Potential marine bird interactions are of concern in the drift gillnet fishery, because of the high numbers of marine birds in Cook Inlet in the summer, perhaps as high as two to three million birds. Densities of up to 300 birds/km² have been reported. In particular, there is very high primary productivity around Kachemak Bay on the eastern side of Lower Cook Inlet, leading to high concentrations of birds.

3.4.1. Impacts of the Alternatives on Seabirds

The following analysis provides the best available information on seabird interactions with the Cook Inlet drift gillnet fishery. Under Section 118 of the MMPA, NMFS is required to monitor the rate of incidental take of marine mammals in commercial fisheries. To accomplish this, NMFS managed the Alaska Marine Mammal Program to observe State fisheries, including salmon gillnet fisheries, to estimate take of marine mammals. Observers for this program have also collected information related to seabird bycatch, but the study methodologies were designed for estimating marine mammal take, not seabird take. However, the seabird bycatch information collected by this program is the best available information we have to assess the potential impact of the Cook Inlet drift gillnet fishery on seabirds.

The Alaska Marine Mammal Observer Program for the Cook Inlet salmon drift gillnet fishery was implemented in 1999 and 2000 (Manly 2006). Observer coverage in the Cook Inlet drift gillnet fishery was low; 1.75% in 1999 and 3.73% in 2000. In 1999, the observed incidental take of seabirds consisted of Common Murres (three released dead) and gulls (two released alive without serious injuries). This extrapolated to an estimated take of 182.6 Common Murres and 121.7 gulls (Manly 2006). In 2000, the observed incidental take of seabirds was one Common Murre (released alive without serious injuries). This extrapolated to an estimated take of 31.2 Common Murres (Manly 2006). Although Kittlitz's Murrelets occur in Cook Inlet (Kuletz et al. 2011), none were noted by observers in 1999 or 2000. No Short-tailed Albatrosses or Steller's Eiders were encountered, which means they were not observed within 10m of active drift gillnets in this fishery. Although observer coverage rates were very low in this region for both years of the Alaska Marine Mammal Observer Program, these are the only quantifiable data we have for seabird bycatch in this area. This fishery has not been observed since 2000; therefore, no additional observer data are available.

While observer data indicates that the Cook Inlet drift gillnet fishery does result in some direct impact to seabirds, the estimated annual take (up to 182.6 Common Murres and 121.7 gulls) resulting from the fishery are not significant in the context of regional seabird populations numbering in the tens to hundreds of thousands. This indicates that impacts of the Cook Inlet salmon drift gillnet fishery on seabirds are not significant under existing conditions. Alternative 1 would maintain all existing conditions in the fishery, and therefore would not result in significant impacts to seabirds.

Alternative 2 would establish Federal management of the Cook Inlet EEZ with delegation of management authority to the State. It is expected that delegating management to the State would maintain existing levels of salmon removals, gear type, and fishing effort by time and area. This would maintain the existing risk profile for take of seabirds in the fishery which available information has determined to be minimal. Therefore, Alternative 2 would not have significant impacts on seabirds.

Alternative 3 would establish Federal management of the Cook Inlet EEZ with no delegation of management authority to the State. It is likely that at least some additional fishing effort would occur in State waters due to increased Federal management uncertainty and associated reductions in EEZ catch limits. Available information does not provide an understanding of whether previously documented interactions with seabirds in the fishery occurred in the EEZ or in State waters. If additional nearshore fishing effort occurs under Alternative 3 due to more conservative catch limits in the EEZ, it could result in additional fishery interactions with seabirds in State waters with a corresponding decrease of interactions in the EEZ. Given that Alternative 3 would maintain the outermost boundary, gear-type, and total drift gillnet effort level consistent with existing conditions, it is still not expected to have a significant impact on Cook Inlet seabirds.

In addition, Alternatives 2 and 3 would reestablish Federal discretion over salmon fishing activities in the EEZ within Cook Inlet that may affect listed species or critical habitat, and thus would establish the Federal nexus that triggers ESA section 7 consultations. NMFS would conduct a § 7 consultation with the USFWS on the proposed action as part of the approval process for the revised FMP.

3.5. Essential Fish Habitat

Section 303(a)(7) of the MSA requires all FMPs to describe and identify EFH, which it defines as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” In addition, FMPs must minimize effects on EFH caused by fishing and identify other actions to conserve and enhance EFH. These EFH requirements are detailed in Amendment 13 to the Salmon FMP, the EFH EIS (NMFS 2005), and subsequent 5-year review documents.

EFH designations are done through a prescribed process and EFH can be designated in both Federal and State waters depending on the habitat (water) needs for each life history stage of each FMP species. Because of habitat characteristics, salmon EFH is (1) Federal and State waters (0–200nm) covering juvenile and adult maturing life history stages and ranges from Dixon Entrance to Demarcation Bay (Arctic) and (2) all freshwaters listed as anadromous for mature, juvenile, and egg stages of the five salmon species. Amendment 12 to the FMP did not change salmon EFH. For example, removing the Cook Inlet traditional net fishing area from the FMP did not affect the salmon EFH designation in that region because salmon EFH is based on the life history needs of salmon.

As part of the 5-year review process, the NMFS Alaska Region and AFSC staff have developed a new methodology using oceanic variables to refine EFH descriptions for all marine life stages of salmon. This methodology has undergone peer review and was published (Echave et al. 2012). The Council recommended Amendment 13 to amend the FMP to include these new marine salmon EFH descriptions as part of its 2015 5-year review. NMFS approved Amendment 13 on May 31, 2018 (83 FR 31340, July 5, 2018).

No evidence suggests salmon drift gillnet gear directly impacts habitat. The activity targets only adult salmon in the water column, largely avoiding any significant disturbance of the benthos, substrate, or intertidal habitat. The EEZ salmon fishery does not occur on any areas designated as Habitat Areas of Particular Concern.

Loss of salmon drift gillnet gear could adversely impact habitat. Derelict gillnets can become entangled on rough seafloors, boulders, and other benthic structures (Carr 1988, Williamson 1998, Barnette 2001). Entanglement on benthic structures can break, displace, or cover benthic structures that fish use as EFH components (Macfadyen et al. 2009). Derelict gillnets can also alter the seafloor by shifting or scouring the sediment, or by concentrating fine sediments once settled and blocking vegetation growth (Gilardi et al. 2010). In flat, sandy or muddy benthic habitats, derelict gillnets are more likely to form balls instead of getting entangled, with the balled up gear concentrating sediments and potentially disturbing established submerged aquatic vegetation (Matsuoka et al. 2005, Good et al. 2009). It is unknown, however, if there are long term effects to EFH if derelict gillnets are fully covered by concentrated sedimentation. There are no data available on rates of drift gillnet gear loss in Cook Inlet. Fishery participants and ADFG personnel familiar with the fishery indicated that loss of a drift gillnet would be highly unusual in Cook Inlet.

A number of ongoing and future actions impact salmon spawning habitat, including in-river fisheries, development, and pollution. A complete discussion of non-fishing impacts to salmon habitat is contained in the report *Impacts to Essential Fish Habitat from Non-fishing Activities in Alaska* (Limpinsel et al. 2017). That report is incorporated by reference. A review of non-fishing impacts specific to Cook Inlet salmon EFH follows in Section 3.6.2.

Coordination and consultation on EFH is required by MSA § 305(b). However, this consultation does not supersede the regulations, rights, interests, or jurisdictions of other Federal or State agencies. The report *Impacts to Essential Fish Habitat from Non-fishing Activities in Alaska* contains non-binding recommendations for reasonable steps that could be taken to avoid or minimize adverse effects of non-fishing activities on EFH (Limpinsel et al. 2017).

Non-fishing activities discussed in Impacts to Essential Fish Habitat from Non-fishing Activities in Alaska (Limpinsel et al. 2017) are subject to a variety of regulations and restrictions designed to limit environmental impacts under Federal, State, and local laws. Any future activity that potentially impacts salmon spawning habitat would be subject to these regulations and the MSA's EFH consultation requirements.

Regarding the effects of recreational fishing on EFH, recreational fishing in State waters falls under non-MSA fishing activities that may adversely affect EFH (50 CFR 600.815(a)(3)). The regulations require FMPs to identify any fishing activities that are not managed under the MSA that may adversely affect EFH, including fishing managed by State agencies or other authorities. NMFS identified and addressed those activities in Section 2.3 of the Summary Report (Simpson et al. 2017). Section 2.3 of the Summary Report notes that the effects of non-MSA fishing activities are covered within the discussion of fishing effects on habitat in the 2005 EFH EIS and remain valid.

NMFS works closely with the Council, which includes State and Federal agency representatives as well as industry representatives in a collaborative decision-making process for managing Federal fisheries. Coordination and consultation on EFH is required by section 305(b) of the MSA. However, this consultation does not supersede the regulations, rights, interests, or jurisdictions of other Federal or State agencies. The MSA requires NMFS to make conservation recommendations to Federal and State agencies regarding actions that may adversely affect EFH. These EFH conservation recommendations are advisory, not mandatory, and may include measures to avoid, minimize, mitigate, or otherwise offset the potential adverse effects to EFH. Within 30 days of receiving NMFS' conservation recommendations, Federal action agencies must provide a detailed response in writing. The response must include measures proposed for avoiding, mitigating, or offsetting the impact of a proposed activity on EFH. State agencies are not required to respond to EFH conservation recommendations. If a Federal action agency chooses not to adopt NMFS' conservation recommendations, it must provide an explanation. Examples of Federal action agencies that permit or undertake activities that may trigger EFH consultation include, but are not limited to, the U.S. Army Corps of Engineers, the Environmental Protection Agency, Bureau of Ocean Energy Management, the Federal Energy Regulatory Commission, and the Department of the Navy. The Non-fishing Effects Report contains non-binding recommendations for reasonable steps that could be taken to avoid or minimize adverse effects of non-fishing activities on EFH.

3.6. Cumulative Effects

Analysis of the potential cumulative effects of a proposed Federal action and its alternatives is a requirement of NEPA. Cumulative effects are those combined effects on the quality of the human environment that result from the incremental impact of the proposed actions when added to other past, present, and reasonably foreseeable future actions, regardless of which Federal or non-Federal agency or person undertakes such other actions (40 CFR 1508.7, 1508.25(a) and 1508.25(c)). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. The concept behind cumulative effects analysis is to capture the total effects of many actions over time that would be missed if evaluating each action individually. Concurrently, the Council on Environmental Quality (CEQ) guidelines recognize that it is most practical to focus cumulative effects analysis on only those effects that are truly meaningful. Based on the preceding analysis, the effects that are meaningful are potential effects on salmon. The cumulative effects on the other resources have been analyzed in numerous documents and the impacts of this proposed action on those resources is minimal, therefore there is no need to conduct an additional cumulative impacts analysis.

This EA analyzes the cumulative effects of each alternative and the effects of past, present, and reasonably foreseeable future actions (RFFA). Past and present actions that are related to the other resources analyzed are contained in the appropriate section of Chapter 5. The past and present salmon-

related actions are described in Section 3, the fishery impact Statement, and several other documents which are incorporated by reference. These documents include the 1997 EA for the salmon fisheries in the EEZ and State waters off Alaska (NMFS 1997), the FPEIS (NMFS 2003), the 2008 BiOp (NMFS 2008a), the 2010 BiOp (NMFS 2010), and the 2014 BiOp (NMFS 2014).

This section provides a review of the RFFA that may result in cumulative effects on salmon. Actions are understood to be human actions (e.g., a proposed rule to designate northern right whale critical habitat in the Pacific Ocean), as distinguished from natural events (e.g., an ecological regime shift). CEQ regulations require consideration of actions, whether taken by a government or by private persons that are reasonably foreseeable. This requirement is interpreted to indicate actions that are more than merely possible or speculative. In addition to these actions, this cumulative effects analysis includes climate change. Actions are considered reasonably foreseeable if some concrete step has been taken toward implementation, such as a Council recommendation or NMFS's publication of a proposed rule. Actions only "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. Identification of actions likely to impact a resource component within this action's area and time frame will allow the public and Council to make a reasoned choice among alternatives. The following RFFAs are identified as likely to have an impact on a resource component within the action area and timeframe:

- Invasive species
- Non-fishing impacts to habitat
- Climate change

3.6.1. Invasive Species

According to Executive Order 13112, an "invasive species" is defined as a species:

1. that is nonnative to the ecosystem under consideration, and
2. whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Nonnative invasive species are introduced to new marine environments through shipping and boat traffic, aquaculture operations, marine laboratories, aquariums, and intentional introductions. Increases in shipping traffic have led to increases in nonnative and invasive species spreading between ports and waterways. The new species can be delivered to Cook Inlet through ballast water discharges or from attaching to the hulls of ships. Ballast water, the water taken in or discharged to compensate for weight changes in the vessel, is a major source of invasive species by taking in new organisms in port or underway and releasing them elsewhere (Bailey 2015).

Nonnative species become invasive in a new environment when the natural predators, diseases, or other biological mechanisms that kept the species in check within its former habitat are missing in its new environment. Lacking this biological balance, the invading species effectively changes the biodiversity of a locale. The invasive species can compete with native species for resources, prey upon native species, foul infrastructure and alter habitat, and/or spread disease. This has severe impacts to EFH and can cause millions of dollars in damage to local economies (Lovell et al. 2006).

In Alaska, ADF&G is responsible for management of fisheries, wildlife and habitats. ADF&G strives to protect native fish and wildlife and the habitats that support them from impacts imposed by invasive species. The Alaska Department of Natural Resources (DNR) has management responsibility for terrestrial and freshwater plants. As appropriate, the two agencies collaborate to safeguard Alaska ecosystems from aquatic invasive species.

3.6.1.1. Northern Pike Control and Eradication

Although native to much of the State, northern pike (*Esox lucius*) were illegally introduced south and east of their native range, resulting in impacts to fisheries in the Cook Inlet watershed. In 2007, when ADF&G wrote the Alaska Northern Pike Management Plan, widespread damage to resident rainbow trout, grayling and salmon populations in the Susitna River drainage had been observed, resulting in northern pike being identified as the “highest invasive species threat in Southcentral [Alaska].” Since 2007, ADF&G has spent more than \$800,000 and has formed partnerships with the USFWS, the United States Geological Survey (USGS), NOAA, and private organizations to control and eradicate Northern pike from Southcentral Alaska. In 2009, ADF&G received National Invasive Species Act funds from NOAA for pike control and eradication projects.

The State has continued to lead efforts to eliminate northern pike populations from closed-system lakes in Southcentral Alaska, and has initiated large-scale control efforts in Alexander Creek, a tributary of the Susitna River, where reduction of salmonid abundance has been observed. However, northern pike continue to affect important resident and anadromous fisheries from Anchorage and the Matanuska-Susitna Valley to the Kenai Peninsula.

ADF&G plans to continue to investigate options to control and eradicate northern pike in systems that support valuable commercial, subsistence and sport fisheries in the Cook Inlet watershed, and to implement options as feasible. ADF&G’s projects and partnerships to control and eradicate northern pike are reasonably foreseeable future action that will mitigate the negative impacts of pike predation on salmonid abundance in freshwater lakes and rivers and will reduce the potential for pike to move into estuarine waters of Cook Inlet.

Known water bodies with northern pike within Cook Inlet watershed

- Susitna River tributaries, including lakes and sloughs
- Knik Arm drainages, including the Little Susitna River
- West Cook Inlet rivers and lakes
- Matanuska-Susitna Valley lakes
- Anchorage lakes (Lower Fire)
- Kenai Peninsula lakes (Vogel and North Vogel Lakes)

ADF&G’s Northern pike management, control, or eradication projects

In 2007, ADF&G—

- developed the Invasive Pike Management Plan as part of Aquatic Nuisance Species Management Plan,
- removed >400 pike from 5 lakes on Kenai Peninsula, and
- gathered data on three pike populations within Cook Inlet drainage.

In 2008, ADF&G—

- removed >600 pike from three lakes in Mat-Su Valley,
- eradicated two populations of pike from closed system lakes - Anchorage and Soldotna,
- evaluated Alexander Lake pike size structure to assess if slot limit is an effective method for controlling pike, and
- initiated telemetry study of pike movement in Stormy Lake on Kenai Peninsula.

In 2009, ADF&G—

- removed >200 pike from three lakes in Matanuska-Susitna valley, including Deshka River sloughs,
- eradicated three populations of pike from closed system lakes: Kenai Peninsula, Anchorage, Yakutat,
- evaluated the 2008 eradication projects,
- completed Stormy Lake pike movement study,
- investigated alternatives for Stormy Lake pike population, including using rotenone for pike eradication, and
- studied the use of gillnets as control measure for northern pike populations in 20 sloughs off Alexander Creek and found gillnetting to be a feasible option to control populations from Alexander Lake to Sucker Creek.

In 2010, ADF&G—

- removed >1500 pike during continued gillnetting in 20 sloughs of Alexander Creek from Alexander Lake to Sucker Creek,
- evaluated 2008 and 2009 eradication projects, and
- conducted strategic planning for invasive northern pike priorities and projects.

In 2011, ADF&G—

- Began the first year of Alexander Creek northern pike suppression. ~4,000 pike were removed.
- Began a three-year radio telemetry project to investigate pike movements between Alexander Lake and Alexander Creek.
- Conducted under ice-gillnetting to prevent illegally-introduced pike from spawning and re-establishing in the lake (the effort was successful).
- Acquired funding for Stormy Lake pike eradication

In 2012, ADF&G—

- Removed ~3,000 pike from Alexander Creek during the annual pike suppression program.
- Continued the Alexander Lake pike telemetry study.
- Eradicated pike from Stormy Lake in Nikiski.
- Conducted a large-scale native fish rescue effort in Stormy Lake.

In 2013, ADF&G—

- Removed ~3,800 pike from Alexander Creek during the annual pike suppression program
- Worked in collaboration with USGS and the USFWS to develop eDNA markers for northern pike and began applying eDNA to pike monitoring.
- Acquired an AKSSF grant to eradicate pike from the entire Soldotna Creek drainage.

In 2014, ADF&G—

- Removed ~2,700 pike from Alexander Creek during the annual pike suppression program.
- Eradicated pike from West Mackey Lake in Soldotna.
- Eradicated pike from East Mackey Lake in Soldotna.
- Eradicated pike from Union Lake in Soldotna.
- Eradicated pike from Derks Lake in Soldotna.

In 2015, ADF&G—

- Removed ~2,000 pike from Alexander Creek during the annual pike suppression program.
- Conducted study to test eDNA for evaluating pike eradication projects.

- Conducted large-scale native fish rescue from Soldotna Creek
- Eradicated pike from Otter Lake on Joint Base Elmendorf-Richardson.

In 2016, ADF&G—

- Removed ~2,200 pike from Alexander Creek during the annual pike suppression program.
- Eradicated pike from Sevena Lake near Soldotna.
- Eradicated pike from Soldotna Creek and surrounding wetlands.

In 2017, ADF&G—

- Removed ~1,100 pike from Alexander Creek during the annual pike suppression program.
- Eradicated pike from Loon Lake in Soldotna.
- Continued large-scale native fish restoration in the Soldotna Creek drainage.
- Acquired AKSSF grant for Tote Lakes pike eradication.

In 2018, ADF&G—

- Removed ~1,200 pike from Alexander Creek during the annual pike suppression program.
- In partnership with the Tyonek Tribal Conservation District (TTCD), Mark-Recapture assessment to determine pike population size in Threemile Lake in Beluga.
- In Partnership with TTCD, removed ~1,000 pike from the Threemile Lake complex in Beluga during the first year of annual suppression.
- Eradicated pike from Crystal Lake in Soldotna.
- Eradicated pike from Rancho Lake in Soldotna.
- Eradicated pike from Fred's Lake in Soldotna.
- Eradicated pike from CC Lake in Soldotna.
- Eradicated pike from Leisure Lake in Soldotna.
- Eradicated pike from Leisure Pond in Soldotna.
- Eradicated pike from Hope Lake in Soldotna.
- Continued large-scale native fish restoration in the Soldotna Creek drainage.

In 2019, ADF&G—

- Removed ~900 pike from Alexander Creek during the annual pike suppression program.
- In Partnership with TTCD, removed ~1,000 pike from Threemile Lake during annual suppression.
- In Partnership with TTCD, mark-Recapture assessment to determine pike population size in Chuitbuna Lake in Beluga.
- In Partnership with TTCD, removed ~150 pike from Chuitbuna during the first year of annual suppression.
- Acquired AKSSF grant for pike eradication in Anderson and Kings Lakes in Wasilla.

Future Efforts (scheduled for 2020)—

- Continue annual pike suppression in Alexander Creek.
- Continue annual pike suppression in Threemile and Chuitbuna Lakes in partnership with TTCD.
- Eradicate pike from Anderson and Kings Lakes in Wasilla.

3.6.1.2. Elodea Detection and Response Action in the Cook Inlet Drainage, 2011–2018

An infestation of the submerged aquatic macrophyte *Elodea* spp. was detected in Chena Slough (Tanana River drainage) and brought to the attention of natural resource managers in Alaska in September of 2010. Aside from early northern pike eradication projects in Southcentral, Alaska had little experience managing aquatic invasive species. At the time, there was uncertainty about which State agency had

statutory authority for management of the nonindigenous aquatic plant as well as ambiguity about the threat or injury it posed to ecological systems. Meanwhile, subsequent infestations of the invasive species were detected in numerous locations Statewide.

In 2011, Elodea was found in DeLong, Little Campbell and Sand lakes in the Anchorage Bowl. This prompted additional surveys that detected Elodea in Lake Hood, and Little Survival Creek. The following year, ADF&G detected Elodea was on the Kenai Peninsula in Stormy Lake during a pike eradication project and then later that year in Daniels Lake. Partnerships emerged among Federal, State and local entities to tackle the problem. The U.S. Fish and Wildlife Service, Kenai National Wildlife Refuge, DNR, ADF&G, Kenai Peninsula Cooperative Weed Management Area, and Kenai Peninsula Borough collaborated with other partners Statewide to begin eradication efforts in the Cook Inlet Drainage.

Elodea remains an invasive species of high priority for Alaska. DNR quarantined the import, export, transport of Elodea in Alaska, as well as four other aquatic invasive plants. Outreach to targeted audiences, including boaters, floatplane pilots, and pet store owners, provide instructions on how to prevent spreading or introducing Elodea and other aquatic invasive species. Surveys are regularly conducted to detect the spread of elodea and evaluate control efforts. Management actions outlined here have been accomplished by a consortium of agencies and organizations.

2015

- June Elodea detected in Lake Hood
- July Emergency Exemption granted by Alaska Department of Environmental Conservation (ADEC), Lake Hood treated with Diquat
- Aug. Fluridone applied to DeLong, Little Campbell and Sand lakes
- Sept. Fluridone applied to Lake Hood

2016

- Sept. Fluridone applied to Lake Hood
- Oct. Elodea detected in Little Survival Creek

2017

- May Fluridone application in Little Survival Creek
- Aug. Fluridone concentrations at or below lethal range, additional Fluridone application in Little Survival Creek
- Surveys in DeLong, Little Campbell and Sand lakes detect no Elodea

2018

- Feb. Fluridone concentrations in DeLong, Little Campbell and Sand lakes ideal range for Elodea mortality
- May Survey of Lake Hood, no Elodea detected
- June Diquat application in Little Survival Creek, small Elodea infestation still present
- July Survey of Lake Hood, no Elodea detected, Fluridone concentrations remain in ideal range for mortality of Elodea
- Aug. Diquat treatment in Lake Hood
- Fall Survey Anchorage lakes, Fluridone treatment planned for Little Survival Creek

2019

- Survey Lake Hood, Fluridone application in Little Survival Creek, surveys to follow

Kenai Peninsula: Beck, Daniels, Stormy lakes

2012

- Sept. Elodea detected in Stormy Lake during a northern pike control project (ADF&G)
- Oct. Elodea detected in Daniels Lake prior to ice up (ADF&G)

2013

- Feb. Survey of spatial extent of Elodea in Daniels Lake by KP-CWMA, Elodea public meeting on Kenai Peninsula (Nikiski)
- May Survey of Daniels Lake
- Presentation and petition to the Kenai Peninsula Borough Assembly
- June Surveys for Elodea in other Kenai Peninsula lakes
- Kenai Peninsula Borough Assembly allocated \$40K for Elodea response
- July Elodea detected in Beck Lake
- Aug. Environmental Assessment approved by DNR and USFWS for herbicide applications to control Elodea Beck, Daniels and Stormy lakes
- Sept. A total of 65 lakes on the Kenai Peninsula surveyed for Elodea during summer months
- Dec. Integrated Pest Management plan completed for herbicide control in Kenai Peninsula lakes

2014

- Jan. National Fish and Wildlife Foundation grant (\$40K) received by USFWS
- April Second public/landowner meeting on Elodea held in Nikiski
- Two grants received from USFWS for \$155K
- Special session on Elodea at the Kenai Peninsula Cooperative Weed Management Assoc. Annual Conference,
- May Pre-herbicide treatment surveys to evaluate product efficacy in Beck, Daniels and Stormy lakes (50 sites per lake)
- Pre-treatment surveys of water quality and non-target impacts
- Kenai Peninsula Fish Habitat Partnership contributes \$120K for Elodea response
- Kenai Peninsula Borough contributes additional \$400K for Elodea response
- Cook Inlet Aquaculture Association installed nets at the outlet of Daniels and Beck Lakes
- June First herbicide application in Beck and Daniels lakes under ADEC Pesticide Use Permit
- July First herbicide application in Stormy Lake,
- Sept. Second herbicide application in Beck, Daniels and Stormy lakes.

2015

- July Third herbicide application in Daniels Lake
- Oct. Supplemental Fluridone application in Daniels Lake
- Beck, Daniels and Stormy lakes have been surveyed in May and September from treatment date through 2018.
- Fluridone concentration was monitored in all three lakes in May and September in 2017.
- In September 2016, 2017, and 2018 sediment samples will have been assayed from all three lakes for residual Fluridone.
- Grid-based aquatic plant surveys have been done in June 2015, 2016, and 2018 to assess native plant recovery.

Sport Lake and North-South Lake

2017

- Feb. Elodea detected in Sport Lake,
- March Through-the-ice survey for Elodea,
- April Public meeting regarding Elodea in Sport Lake held at Cook Inlet Aquaculture Assoc.,
- May Public boat launch at the lake was partially closed, when open watercraft were inspected prior to launch and prior to departure,
 - Pre-treatment 50-point rake survey,
 - ADEC issues Emergency Exemption from the PUP, other permits approved,
 - First application of Diquat and Fluridone,

- June Re-surveyed Sport Lake at 50-sites and water samples assayed for Fluridone concentration,
- July Second application of Fluridone in Sport Lake,
 - Sport Lake boat launch opened,
 - Elodea detected in North-South lakes in Nikiski,
- Aug. Cook Inlet Aquaculture installed nets to contain Elodea at North-South Lake,
 - ADEC grants Emergency Exemption to the PUP for North-South Lake,
- Sept. All other permits granted for North-South Lake Fluridone applications,
 - Pre-application 50-point rake survey completed,
 - First application of liquid and pellet Fluridone applied to North-South Lake,
- Oct. Assayed water samples for Fluridone concentrations in North-South Lake,
- Nov. Supplemental Fluridone applied in North-South Lake.

2018

- May Assayed water samples from North-South and Sport lakes for Fluridone concentration
- June 50-point rake survey conducted in all five treated lakes on the Kenai Peninsula
- July Third application of Fluridone in Sport Lake
- Aug. Assayed water samples from North-South Lake for Fluridone concentration

Matanuska- Susitna Valley: Alexander Lake and Sucker Lakes

2014

- Aug. Ten-acre infestation of Elodea detected in Alexander Lake.

2016

- Aug. Elodea infestation in Alexander Lake expanded to 500 acres, Fluridone application.

2017

- May Fluridone application in Alexander Lake,
- Spring Elodea confirmed in Sucker Lakes,
- Sept. Alexander Lake application unsuccessful,
- Oct. Sucker Lakes surveyed, all three lakes infested.

Future: Hydrology studies are needed for all Mat-Su waterbodies.

3.6.2. Habitat in Cook Inlet

Salmon EFH extends from the marine ecosystem to freshwater spawning streams of Cook Inlet. The waters and substrates that comprise salmon EFH are susceptible to a wide array of human activities unrelated to fishing. These activities include, but are not limited to, mining, dredging, fill, impoundment, discharge, water diversions, thermal additions, actions that contribute to nonpoint source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. For Cook Inlet specifically, salmon EFH is susceptible to human activities both in Cook Inlet waters and terrestrial influences from coastal communities. These include oil and gas development, shipping traffic, and coastal development. For each of the broad activity categories, known and potential adverse impacts to EFH are described in Impacts to Essential Fish Habitat from Non-fishing Activities in Alaska (Limpinsel et al. 2017).

Cook Inlet hosts some of the State's oil and gas development leases. There are 203 active leases in Cook Inlet that cover 412,252.76 on-shore and off-shore acres. From these leases, Cook Inlet produces approximately 5 million barrels of oil each year, which is roughly 2.5% of the total State production (ADNR 2020). Oil and gas operations inherently lead to leaks and spills into the surrounding environment, with accidental discharges occurring at every stage of exploration, development, and production. Crude oil spills in Alaska have adverse impacts on salmon EFH and can cause mortality

events or developmental changes in embryo, larval, and juvenile salmon (Thomas and Rice 1987, Rice et al. 1996).

Natural gas development also provides adverse impacts to salmon EFH. The infrastructure required to extract natural gas changes the benthic habitat and natural gas production lead to leaks similar to oil production. The natural gas leak from a Hilcorp 8-inch pipeline in Cook Inlet lasted nearly four months before being contained affected salmon EFH. The Alaska DEC also noted that several other fish species were in the vicinity of the natural gas leak including salmon prey species Pacific herring, eulachon, and walleye pollock (ADEC 2017). Leaks from both oil and gas production can change the chemical makeup of the benthic environment, kill prey species, and lead to disturbances of the shoreline during necessary cleanup measures.

Cook Inlet experiences a high volume of dredging activity. Dredging sediments from the Port of Anchorage can impact EFH by altering the physical habitat, increasing turbidity and sedimentation in the water column, releasing contaminants that had previously settled in the sediment, and burying habitat features like submerged aquatic vegetation. The changes to water clarity and introduction of disbursed contaminants can impact water quality for salmon, their prey, and benthic habitat (NMFS 1998). Cook Inlet waters are turbid and experience seasonally varying levels of sedimentation naturally, so some of these impacts may not apply (USACE 2017).

The Port of Anchorage draws cargo ships, tankers, tug boats, and fishing vessels. Vessel traffic offers another source for adverse effects through fuel spills, waste discharges, and ballast water introducing invasive species (discussed in Section 1.2.1). Diesel is the most commonly used fuel and is also one of the most toxic to marine organisms (Michel et al. 2013). Salmon, their prey, or submerged aquatic vegetation exposed to spilled diesel may be killed. Small spills in open water may have less of an adverse impact through dilution (Michel et al. 2013). Waste discharges can change water quality for salmon and their prey, and the impacts include changes in behavior, changes to benthic habitats, and the introduction of toxic contaminants (Limpinsel et al. 2017).

Regarding freshwater, Cook Inlet and Knik Arm connect to thousands of salmon spawning rivers, streams, and creeks (Giefer and Blossom 2020). Activities in or adjacent to watersheds that drain into Cook Inlet include, but are not limited to, mining, road construction and runoff, development, river/stream access, and freshwater boat traffic.

Mining, whether active and small or proposed and large, in the watersheds adjacent to Cook Inlet can have adverse impacts on salmon EFH. There are thousands of State and Federal mining claims in these watersheds (ADNR 2020b). There are existing regulations in place to mitigate many potential environmental impacts of mining, there are unavoidable changes to the landscape, natural resources, and the watershed that come from mining (NRC 1999). Small recreational mining impacts streams through panning, dredging, and stream access. Commercial mining is on a larger scale and has a greater environmental footprint (Williamson et al. 1995). The disturbance of salmon spawning streams can lead to destroyed salmon spawning habitat or redds, increased turbidity and shifting sedimentation, changes to riparian ecology, and the introduction of chemical pollutants. The exposure of metal contamination can also change fish behavior and development (see Limpinsel et al. 2017 for a review).

Coastal development has major impacts to salmon EFH (NMFS 1998). The development of roads, building construction, and installation of freshwater docks are some of the ways coastal development can lead to changes in marine and freshwater habitat features, affect stream flow and access, and introduce chemical pollutants. Similar to mining activities, impacts to salmon EFH include changes to riparian ecology, disturbance of spawning streams, and altering benthic structures. Stormwater runoff from roads, parking lots, buildings, and drainage ditches is a vector for transferring pollutants into watersheds (EPA

2017). As development increases in Cook Inlet watersheds, these impacts to salmon EFH will increase as well.

The watersheds surrounding Cook Inlet are also accessed for outdoor recreation. Irresponsible access to these and the methods of access can cause adverse impacts to salmon EFH. Hiking into an area can cause trampling of riparian vegetation and disturbance of stream beds. Small boat traffic in spawning streams can displace sediment, increase turbidity, result in fuel spills, and disturb spawning and juvenile fish habitat (Asplund 2000). Finally, the use of off-road vehicles to access streams has adverse impacts to habitat. These include, but are not limited to, vegetation loss, destabilization of stream banks, disturbance of stream beds, and fuel spills (Davenport and Davenport 2006).

3.6.3. Climate Change

Evidence from studies in the Bering Sea, Arctic, and Gulf of Alaska have shown that the region is experiencing significant warming trends in ocean temperatures and major declines in seasonal sea ice. This has both direct and indirect impacts on Cook Inlet salmon stocks in adjacent freshwater and marine habitats in the North Pacific. While climate warming trends are being studied and increasingly understood on a global scale, the ability for fishery managers to forecast specific biological responses to changing climate continues to be difficult. The North Pacific Ocean is subject to periodic climatic and ecological “regime shifts.” These shifts change the values of key parameters of ecosystem relationships and can lead to changes in the relative success of different species and stocks.

In marine waters, many efforts are underway to assess the relationship between climate-driven oceanographic conditions, ocean mortality of salmon, and the timing of their migrations. Changes in ocean temperature can alter food availability, metabolism, growth, and maturation timing for salmon. Regime shifts and consequent changes in climate patterns in the North Pacific Ocean have been shown to correspond with changes in salmon production (Mantua et al. 1997, Litzow et al 2018). A correlation between sea surface temperature and juvenile salmon survival rates in their early marine life has also been proposed (Mueter et al. 2002). Additionally, ocean habitats for salmon species are being shifted northward as southerly waters continue to warm (Poesch et al. 2016). While the historical relationship between climate features and ocean salmon productivity have become more apparent over time, it is also clear that the drivers of these relationships are subject to change and the response of salmon populations to future climate changes may not mirror what has been previously observed (Malick 2020).

The impact of climate change on freshwater salmon habitat is another essential area of study. It has been found in the Pacific Northwest that juvenile survival is reduced when in-stream temperatures increase (Marine and Cech 2004, Crozier and Zabel 2006). The response of salmon stocks to climate changes is highly variable at small spatial scales, and among individual populations (Schindler et al. 2008). This diversity among salmon populations means that the uncertainty in predicting biological responses of salmon to climate change remains large, and the specific impacts of changing climate on salmon are not consistent. Some stocks will benefit, while others will decline because of differential thermal and hydrological changes resulting from climate shifts. For example, Kenai River Chinook salmon have generally declined in both abundance and size, while Kenai River sockeye have been marginally above long-term abundance averages in recent years (Schoen et al. 2017). Around Cook Inlet, it has generally been found that summers are drier while the fall season has experienced increased precipitation. The impact of these conditions on freshwater systems, in addition to density dependent conditions, have reduced the productivity of Chinook salmon stocks across southcentral Alaska (Jones et al. 2020). The impacts to specific watersheds depend on their predominant water source, glaciers or rainfall. Increases the temperature of glacial systems will be temporarily buffered by additional glacier meltwater (Milner et al 2009). Long term, it is expected that a consistent trend of increasing temperatures resulting from current climate change trajectories will present challenges for Cook Inlet salmon stocks as physiological temperature thresholds are exceeded more regularly in freshwater habitats (Mauger et al. 2016). However,

some salmon stocks have already responded to increased temperatures with increased growth rates and decreased freshwater residency (Cline et al. 2019). In addition to direct impacts of climate change, it will be essential to evaluate the compounding impacts on salmon productivity of climate change and human habitat modifications in and around the freshwaters of Cook Inlet.

The Council, NMFS, and the State have taken actions that demonstrate adaptation of fishery management to be proactive in the face of changing climate conditions. The Council currently receives an annual update on the status and trends of indicators of climate change in the GOA through the presentation of the Ecosystem Status Report (Zador et al. 2019). This information is used by existing Council's plan teams to inform their assessment of stocks and would also be used by the Salmon Plan Team. As the impacts of climate change become apparent, fishery management will also adapt in response. Because of the large uncertainties as to what these impacts might be, however, and our current inability to predict such change, it is not possible to estimate what form these adaptations may take.

3.6.4. Cumulative Effects Conclusions

Considering the direct and indirect impacts of the alternatives, when added to the impacts of past and present actions analyzed in this EA, and the other documents that are incorporated by reference, and the impacts of the reasonably foreseeable future actions listed above, the cumulative impacts of the proposed action and its alternative are determined to be not significant.

Beyond the cumulative impacts discussed above and documented in the referenced analyses, no additional past, present, or reasonably foreseeable cumulative negative impacts on the biological and physical environment (including salmon stocks, essential fish habitat, ESA-listed species, marine mammals, or seabirds) have been identified that would accrue from the proposed action or its alternatives.

4. Regulatory Impact Review

This Regulatory Impact Review (RIR) examines the benefits and costs of a proposed regulatory action that would amend the *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* (Salmon FMP) to manage the salmon fisheries that occur in Federal waters of Cook Inlet. The proposed action (or alternatives) may affect private individuals or firms participating in Upper Cook Inlet commercial and sport salmon fisheries, the communities engaged in these fisheries, the Council, and NMFS.

The preparation of an RIR is required under Presidential Executive Order (E.O.) 12866 (58 FR 51735, October 4, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following Statement from the E.O.:

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 nevertheless 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.

E.O. 12866 requires that the Office of Management and Budget 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, the environment, public health or safety, or State, 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 E.O. 12866.

4.1. Statutory Authority

Under the Magnuson-Stevens Act (16 U.S.C. 1801, *et seq.*), the United States has exclusive fishery management authority over all marine fishery resources found within the EEZ. The management of these marine resources is vested in the Secretary and in the regional fishery management councils. In the Alaska Region, the Council has the responsibility for preparing FMPs and FMP amendments for the marine fisheries that require 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.

The salmon fishery in the vast majority of the EEZ off Alaska is managed under the Salmon FMP. The proposed action under consideration would amend this FMP and Federal regulations at 50 CFR section 679 to include the Cook Inlet EEZ and the commercial salmon fishery that occurs within it. Depending on the alternative chosen, NMFS may add implementing regulations to Part 679 or create a new part to the CFR for implementing regulations, similar to what was done for BSAI Crab at 50 CFR Part 680. Actions

taken to amend FMPs or implement regulations governing these fisheries must meet the requirements of applicable Federal laws, regulations, and Executive Orders.

4.2. Draft Purpose and Need for Action

The Council intends to amend the Salmon FMP to manage the traditional net fishing area that occurs in Federal waters of Cook Inlet, referred to in this analysis as the Cook Inlet EEZ. Federal management in an FMP must meet the MSA required provisions for an FMP in section 303(a) and related MSA provisions. This proposed action is necessary to bring the Salmon FMP into compliance with the MSA consistent with the recent Ninth Circuit ruling (*UCIDA et al. v. NMFS*).

4.3. Draft Alternatives

Alternative 1: No Action. No amendment to the Salmon FMP. This alternative would maintain the existing management regime. Alternative 1 is not a viable alternative given the Ninth Circuit decision; however, NEPA requires that Federal agencies analyze a no action alternative.

Alternative 2: Federal management with specific management measures delegated to the State. Amend the Salmon FMP to include the Cook Inlet EEZ in the FMP's fishery management unit in the West Area and establish a Federal management regime for these salmon fisheries that delegates specific management measures to the State of Alaska, to use existing State salmon management infrastructure, in compliance with the Magnuson-Stevens Act and Ninth Circuit ruling. Alternative 2 would identify the management measures that would be managed by the Council and NMFS, the management measures that would be delegated to the State to manage with Federal oversight, and the process for delegation and oversight of management.

Alternative 3: Federal management. Amend the Salmon FMP to include the Cook Inlet EEZ in the FMP's fishery management unit in the West Area and apply Federal management to those portions of the fisheries that occur in the EEZ.

Options: The Council also requested NMFS and Council staff to work with the State of Alaska to develop Options for Alternative 2 and Alternative 3 that address:

- management policy and objectives,
- conservation and management measures,
- status determination criteria,
- annual catch limits and accountability measures,
- methods to report bycatch and measures to minimize bycatch and the mortality of unavoidable bycatch,
- the salmon plan team or other process for annually determining status of the stocks and providing stock assessment and fishery evaluation information, and
- the process for review and appeal of State management measures applicable under the FMP.

4.4. Methods Used for the Impact Analysis

The evaluation of impacts in this analysis is designed to meet the requirement of E.O. 12866, which dictates that an RIR evaluate the costs and benefits of the alternatives, to include both quantifiable and qualitative considerations. Additionally, the analysis should provide information for decision makers "to maximize net benefits (including potential economic, environment, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach." The costs and benefits of the alternatives with respect to these attributes are described in the sections that

follow. Each action alternative is compared with Alternative 1: No Action, with “no action” not necessarily meaning a continuation of the present situation, but instead being the most likely scenario for the future, in the absence of other alternative actions. The analysis then provides a qualitative assessment of the net benefit to the nation of each alternative, with Alternative 1: No Action as a baseline.

This analysis was prepared using a combination of qualitative and quantitative sources. Quantitative data on harvest, harvesting vessels, and value were obtained from ADF&G fish tickets sourced through AKFIN using the Comprehensive Fish Ticket (Comprehensive FT) database and NMFS catch accounting system. Additional data were obtained from CFEC publications, in particular CFEC (2019).

4.5. Description of the Upper Cook Inlet Salmon Drift Gillnet Fishery

In Cook Inlet the use of drift gillnet gear to commercially harvest salmon is restricted to the Central District in the Upper Cook Inlet Management Area, which Alaska Department of Fish and Game (2020a) defines as that portion of Cook Inlet north of the latitude of the Anchor Point Light. The Central District includes all waters between a line extending from Boulder Point at 60°46'23" N. lat., to Shell Platform C, to a point on the west shore at 60°46'23" N. lat., and the latitude of Anchor Point. The District is approximately 75 miles long and averages 32 miles in width, with a total area of approximately 2,267 square miles. To maintain consistency with the parlance of fishery participants, this RIR refers to the commercial salmon drift gillnet fishery occurring in the Central District as the Upper Cook Inlet (UCI) salmon drift gillnet fishery.

The UCI salmon drift gillnet fishery occurs in both State of Alaska and Federal waters. Currently, the FMP does not include the Cook Inlet EEZ, or contain management measures to monitor the UCI salmon drift gillnet fishery in the EEZ or to measure total salmon catch or bycatch from EEZ waters. The State-Federal boundary has not been relevant to active salmon management in the UCI salmon drift gillnet fishery because the fishery is managed by districts, subdistricts, and sections, which are comprised of salmon statistical areas that overlap both State and Federal waters. Further, the 2012 revisions to the Salmon FMP removed the commercial salmon fishery that occurs in the EEZ waters of Cook Inlet from Federal management. While the description of potentially affected fisheries in this RIR includes approximations of the percentages of the salmon harvest in the UCI salmon drift gillnet fishery (Section 4.5.2.3) and UCI saltwater salmon sport fishery (Section 4.6.2.2) occurring in EEZ waters versus State waters, a comprehensive description of the Federal waters portion of the Cook Inlet commercial and sport salmon fisheries is not possible at this time. As described in Section 2.6, revision of the FMP to include management measures to monitor catch and effort in salmon fisheries occurring in the Cook Inlet EEZ is considered under Alternative 2 and Alternative 3.

4.5.1. Management

4.5.1.1. Role of the North Pacific Fishery Management Council and U.S. Department of Commerce, NOAA, and NMFS

With Amendment 12, the Council modified the Salmon FMP’s management area to exclude the three traditional net fishing areas and the sport fishery from the West Area. The Council maintained the prohibition on commercial fishing in the West Area.

The Council accepts the harvest levels set by the Pacific Salmon Commission and the State of Alaska, as long as those levels are consistent with the Council’s policy and the objectives of the Salmon FMP. Further, it accepts the allocations of harvests among the various groups of fishermen set by the BOF, as long as those allocations are consistent with the Council’s policy and objectives and the national standards of the Magnuson-Stevens Act.

The Magnuson-Stevens Act assigns to the Secretary of Commerce (Secretary) the authority to approve fishery management plans and implement them with Federal regulations and to provide the regional fishery management councils with a number of services. The Secretary has delegated fishery management authority and responsibility to NOAA, an agency with the Department of Commerce, and NOAA, in turn has delegated some of its authority and responsibility to NMFS, an agency within NOAA. In its regular activities, the Council works with the Secretary, the Department of Commerce, and NOAA through the NMFS Alaska Region.

4.5.1.2. Role of the State of Alaska

Four State of Alaska agencies/entities are involved in managing the salmon fisheries under its jurisdiction. The BOF sets policy and promulgates the regulations for allocation of salmon resources, ADF&G manages the fisheries according to the policies and regulations of the BOF and State law, the CFEC limits the number of permit holders eligible to participate in the fisheries, and the Alaska Department of Public Safety enforces the regulations.

With the exclusion of the Cook Inlet EEZ from the West Area by the Council under Amendment 12, the FMP “deferred” management of the salmon fisheries occurring within the Cook Inlet EEZ to the State of Alaska. The State currently manages the salmon fisheries occurring in the Cook Inlet EEZ and can regulate participating vessels that are registered under the laws of the State of Alaska (16 U.S.C 1856(a)(3)).

4.5.1.2.1. Alaska Board of Fisheries

The BOF has the authority to adopt regulations described in AS 16.05.251, including establishing open and closed seasons and areas for taking fish; setting quotas, bag limits, harvest levels and limitations for taking fish; and establishing the methods and means for the taking of fish. The BOF establishes fishing regulations through a public forum that provides for public and agency input. This public review and comment process satisfies most, if not all, of the Council’s needs for public review, thereby making maximum use of limited State and Federal resources and preventing duplication of effort. On a three-year cycle, the BOF solicits proposed changes to the regulations governing each of Alaska’s fishery management areas.⁴⁹ Usually, chief among those submitting proposals is ADF&G. The BOF distributes these proposals to the public for review and comment and then conducts open public meetings to evaluate and take action on the proposals. The fishing community has come to rely on this regularly scheduled participatory process as the basis for changing Alaska’s fishing regulations. Among those things considered by the BOF are fishing periods and areas for the salmon fisheries, and the allocation of harvests among the various groups of fishermen. The BOF system provides for extensive public input, is flexible enough to accommodate changes in salmon abundance and fishing patterns, and is familiar to salmon fishermen, fish processors, and other members of the public.

The regulations formulated by the BOF specific to the UCI salmon drift gillnet fishery are set forth in the Central District Drift Gillnet Fishery Management Plan, which was established in 2005. As Stated in 5 AAC 21.353, “The purpose of the management plan is to ensure adequate escapement and a harvestable surplus of salmon into the Northern District drainages and to provide management guidelines to the department. [ADF&G] shall manage the commercial drift gillnet fishery to minimize the harvest of Northern District salmon and Kenai River coho salmon in order to provide all users with a reasonable opportunity to harvest these salmon stocks over the entire run, as measured by the frequency of inriver

⁴⁹ From time to time, the BOF receives a proposed change to the regulations that, according to the proposal, needs to be addressed on an emergency basis under AS 44.62.250. An “emergency” is defined as “an unforeseen, unexpected event that either threatens a fish or game resource, or an unforeseen, unexpected resource situation where a biologically allowable resource harvest would be precluded by delayed regulatory action and such delay would be significantly burdensome to the petitioners because the resource would be unavailable in the future” (5 AAC 96.625(f)).

restrictions.” The management plan does not allocate fishery resources among user groups (e.g., commercial, personal use, and sport fisheries); rather, it achieves its purpose by means of fishing time and area restrictions for the UCI salmon drift gillnet fishery.

4.5.1.2.2. Alaska Department of Fish and Game

ADF&G manages the fisheries during the fishing season (i.e., inseason) and issues emergency regulations to achieve conservation objectives and to implement allocation policies established by the BOF. ADF&G also monitors the fisheries and collects data on the stocks and the performance of the fisheries. ADF&G has managed salmon fisheries in Federal waters since Statehood in 1959 and has made substantial investments over the years in facilities, communications, information systems, vessels, equipment, and experienced personnel capable of carrying out extensive management, research, and enforcement programs. Since the implementation of the FMP in 1979, the State of Alaska has played the major role in managing the salmon fisheries in the EEZ, and the Council, for the most part, has coordinated its management with the State.

ADF&G manages the UCI drift gillnet fishery primarily under the guidance of the Central District Drift Gillnet Fishery Management Plan. As described in Section 4.5.1.2.1, the purpose of this management plan is to ensure adequate escapement of salmon into Northern Cook Inlet drainages and to provide the ADF&G with management guidelines..

4.5.1.2.3. Alaska Commercial Fisheries Entry Commission

The CFEC is an independent, quasi-judicial State agency responsible for helping promote the conservation and sustained yield management of Alaska’s fishery resources and the economic health and stability of commercial fishing by regulating entry into the fisheries. Its primary duties are limiting the number of persons eligible to hold permits; issuing permits and vessel licenses to qualified individuals in both limited and unlimited fisheries; providing due process hearings and appeals; performing critical research; and providing data to governmental agencies, private organizations, and the general public.

4.5.1.2.4. Alaska Department of Public Safety

The Fish and Wildlife Protection Division of the Alaska Department of Public Safety enforces State regulations in cooperation with the NOAA Office of Law Enforcement and the U.S. Coast Guard. Many agents are cross-deputized so that they can enforce both State and Federal regulations.

4.5.1.3. Role of the Joint Protocol Committee

Because many of the marine and anadromous fish populations in Alaska spend some of the year in both Federal and State waters, the Council and BOF established the Joint Protocol Committee to keep each other informed on cross-jurisdictional issues and to help coordinate compatible and sustainable management of fisheries within each organization’s jurisdiction. The committee includes three members from each organization, and it meets at least once a year to identify and discuss issues of mutual interest.

4.5.1.4. Role of the North Pacific Anadromous Fish Commission and the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean

The North Pacific Anadromous Fish Commission was established in 1993 under the *Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean* (Convention). The Convention dissolved the prior International North Pacific Fisheries Commission, established through the 1952 *International Convention for the High Seas Fisheries of the North Pacific Ocean* between Canada, Japan, and the United States.

The member Parties include the United States, Canada, Japan, the Republic of Korea, and the Russian Federation (collectively “the Parties”), which are the major countries of origin and migration for Pacific

anadromous fish stocks. The area to which the Convention applies is the “waters of the North Pacific Ocean and its adjacent seas, north of 33 degrees North Latitude beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured” (Article I). The Convention’s principle objective is to “promote the conservation” of anadromous fish species in the Convention Area, including chum, coho, pink, sockeye, and Chinook salmon (Article VIII).

To promote conservation, the Convention prohibits direct fishing for anadromous fish in the Convention Area. The Convention also prohibits retention of anadromous fish taken as incidental catch during fishing for non-anadromous fish and requires minimization, to the maximum extent practicable, of any incidental taking of anadromous fish (Article III). The Parties are also encouraged to take appropriate measures to prevent trafficking in anadromous fish. The North Pacific Anadromous Fish Commission Science Plan, however, allows fishing of anadromous fish for scientific research purposes. The Science Plan is a long-term, cooperative scientific research plan that endeavors to predict the annual variations in Pacific salmon production, in order to forecast returning salmon abundances for accurate salmon population conservation and management (Article VII).

Finally, pursuant to the Convention, each member Party has the authority to board, inspect, and detain fishing vessels of other Parties found operating in violation of the Convention, though only the authorities of the Party to which the violating person or vessel belongs may try the offense and impose penalties (Article V). The Parties are to cooperate in exchange of information on any violation of the provisions of the Convention and on any enforcement action undertaken (Article VI).

4.5.2. Harvest

4.5.2.1. Overview of UCI Salmon Drift Gillnet Fishery

Drift gillnet gear works by entangling the fish as they attempt to swim through the net. In the UCI salmon drift gillnet fishery the net may not be more than 150 fathoms long and 45 meshes in depth.⁵⁰ Floats are positioned along a line on top of the net, and lead weights line the bottom. Mesh openings are designed to be large enough to allow fish to get their heads stuck or “gilled” in the mesh. Net deployment and retrieval are accomplished using a hydraulic-powered rotating drum on which the net is rolled. The drum is mounted near the bow (“bow picker”) or stern (“stern picker”) (Petterson and Glazier 2004). Primarily stern picking is used by the UCI salmon drift gillnet fleet. The net stays attached or in close proximity to the vessel and is suspended by the floats as it soaks. The duration of sets can vary from 20 minutes to four or more hours, depending on fishing conditions and other variables, with between four and 20 sets per day (National Marine Fisheries Service 2012). Fish are removed from the net by hand “picking” them from the mesh as the net is reeled aboard (Petterson and Glazier 2004)

Current regulations open the UCI salmon drift gillnet fishery on the third Monday in June or June 19, whichever is later.⁵¹ The season remains open until closed by emergency order but no later than August 15 (Farrington et al. 2014).⁵² Salmon may only be harvested in the UCI salmon drift gillnet fishery during time periods known as “openers,” which are established by ADF&G inseason. ADF&G posts weekly notices of fishing openers and announces the openers on regular radio channels. Openers generally occur on Mondays and Thursdays for 12 hours beginning at 7:00 a.m., although additional fishing time has been

⁵⁰ Regulations allow two permit holders to fish concurrently from the same vessel and jointly operate up to 200 fathoms of gillnet (5 AAC 21.333).

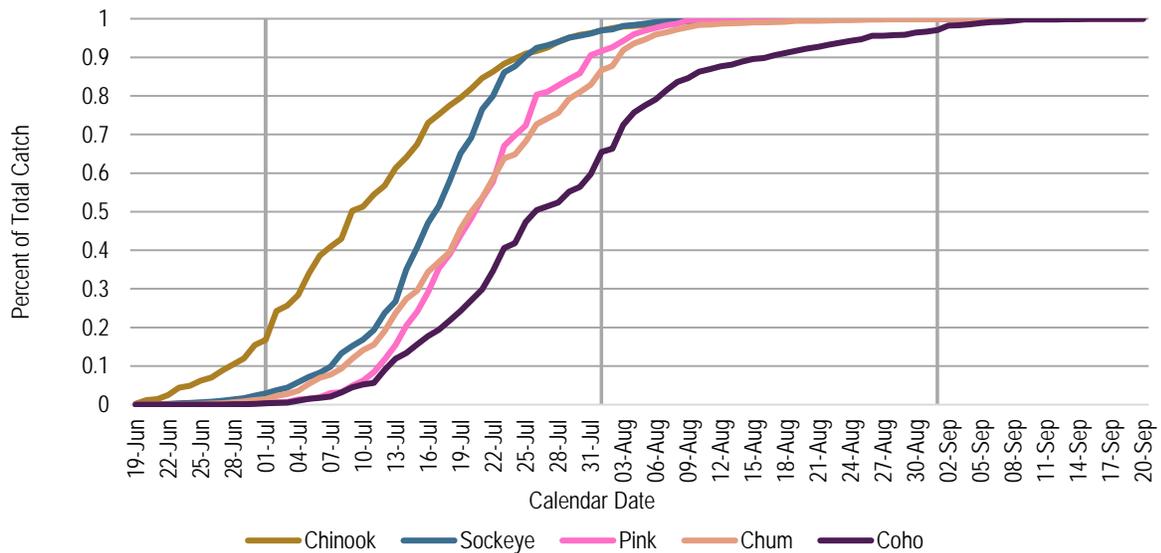
⁵¹ However, fishing with drift gillnets may not occur within (A) two miles of the mean high tide mark on the eastern side of the Upper Subdistrict until those locations have been opened for fishing with set gillnets; (B) one and one-half miles of the mean high tide mark of the Kenai Peninsula shoreline in (i) that area of the Kenai and Kasilof Sections of the Upper Subdistrict south of the Kenai River and (ii) the Anchor Point Section, if fishing with drift gillnets is open in the Anchor Point Section under 5 AAC 21.353; (C) one mile of the mean high tide mark of the Kenai Peninsula shoreline in that area of the Kenai and East Forelands Sections of the Upper Subdistrict north of the Kenai River (5 AAC 21.310 (b) (3)).

⁵² From August 16 until closed by emergency order, Drift Gillnet Areas 3 and 4 are open for fishing during regular fishing periods (5 AAC 21.353).

allowed via emergency orders depending on catches, escapements, and the projected run size of sockeye salmon (Willette and Dupuis 2017).

Figure 4-1 shows the temporal distribution of catch in the UCI salmon drift gillnet fishery in terms of the average timing of harvest percentages for each of the five salmon species taken in the fishery from 2009–2018. The temporal differences in harvest among species are largely a function of differences in run timing. Chinook salmon are the first species to enter Cook Inlet, followed by sockeye salmon, which is the most consistently abundant species and the mainstay of the UCI salmon drift gillnet fishery. Chum, pink, and coho salmon appear later in the season, although there is considerable overlap across all five species with respect to both run timing and migration routes.

Figure 4-1 Average harvest percentages in the UCI salmon drift gillnet fishery by date and species, 2009–2018.



Note: The harvest percentages for each species were calculated by summing the catch by each calendar day from 2009–2018 and dividing by the total catch in all years.

Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Table 4-1 summarizes the interannual variability in the timing of harvests of each species in the UCI salmon drift gillnet fishery from 2009–2018. The table separates percentage of total catch attained into four groups: 25%; 50%; 75%; and 100%. The variability is shown by the earliest, average, and latest dates that each percentage group was attained. For example, half of the sockeye salmon harvest in the fishery occurred by July 17 during an average year, but in one year the 50% mark was attained as early as July 12, and in another year as late as July 25.

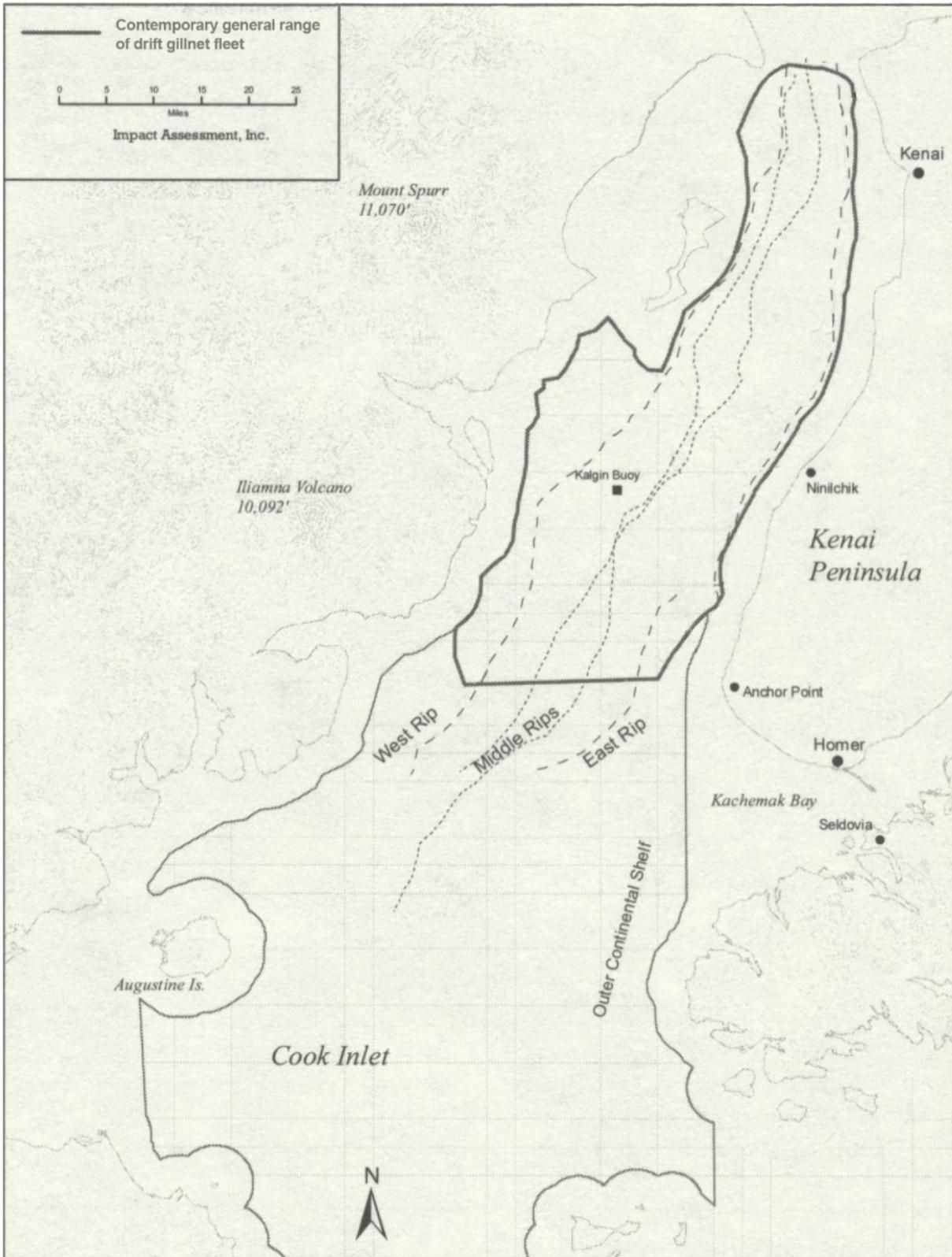
Table 4-1 Earliest, latest and average dates of harvest in the UCI salmon drift gillnet fishery by catch percentile group and species, 2009–2018.

Species	Day	25% of Harvest	50% of Harvest	75% of Harvest	100% of Harvest
Chinook	Earliest	June 25, 2019	July 5, 2018	July 9, 2018	August 6, 2012
	Average	July 3	July 9	July 17	September 9
	Latest	July 8, 2013 & 2015	July 16, 2012	July 25, 2019	September 9, 2017
Sockeye	Earliest	July 5, 2018	July 12, 2018	July 16, 2018	September 1, 2011 & 2012
	Average	July 13	July 17	July 21	September 20
	Latest	July 20, 2015	July 25, 2015	August 1, 2015	September 20, 2017
Chum	Earliest	July 5, 2018	July 10, 2018	July 13, 2018	September 1, 2011
	Average	July 14	July 20	July 28	September 20
	Latest	July 22, 2011	July 29, 2019	August 3, 2017	September 20, 2017
Pink	Earliest	July 9, 2019	July 14, 2015	July 18, 2016	August 26, 2013
	Average	July 16	July 21	July 26	September 16
	Latest	July 21, 2012	July 25, 2011 & 2012	July 29, 2010 & 2017	September 16, 2016
Coho	Earliest	July 12, 2018	July 22, 2010 & 2014	July 24, 2018	September 1, 2011
	Average	July 20	July 26	August 4	September 20
	Latest	August 1, 2017	August 4, 2017	August 14, 2017	September 20, 2017

Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

With respect to where in Cook Inlet the UCI salmon drift gillnet fleet fishes, Figure 4-2 depicts the general range of the fleet based on input from fishery participants (Pettersen and Glazier 2004; Glazier et al. 2006). As noted in the legend, the heavy black line indicates the parameters of fleet activity. A combination of bottom conditions, salmon migration patterns, and other factors render the first six or so miles of Upper Cook Inlet due west of the Anchor Point shoreline and northeastward to a point about three miles offshore of Ninilchik largely unused by the fleet. The western limit of the fleet is effectively delimited by shallows along western Upper Cook Inlet. Water depth in the area where most fishing occurs is typically in the range of 25 to 50 fathoms. Of particular note on the map is the location of the east, middle, and west rip zones in the center of Cook Inlet. While the location of these zones shifts somewhat with water volume and to a lesser degree with changes in bathymetry, the map shows their approximate locations over time. These turbulent rip tide zones where salmon congregate are highly favored for salmon drift gillnet fishing (Glazier et al. 2006). Where along the rip zones vessel operators decide to fish depends on the point in time in the fishing season. Typically, vessels will congregate near the Anchor Point line at the beginning of the season. As the season progresses the fleet follows the concentrations of salmon as they shift northward up the Inlet.

Figure 4-2 Map of fishing areas in the UCI salmon drift gillnet fishery.

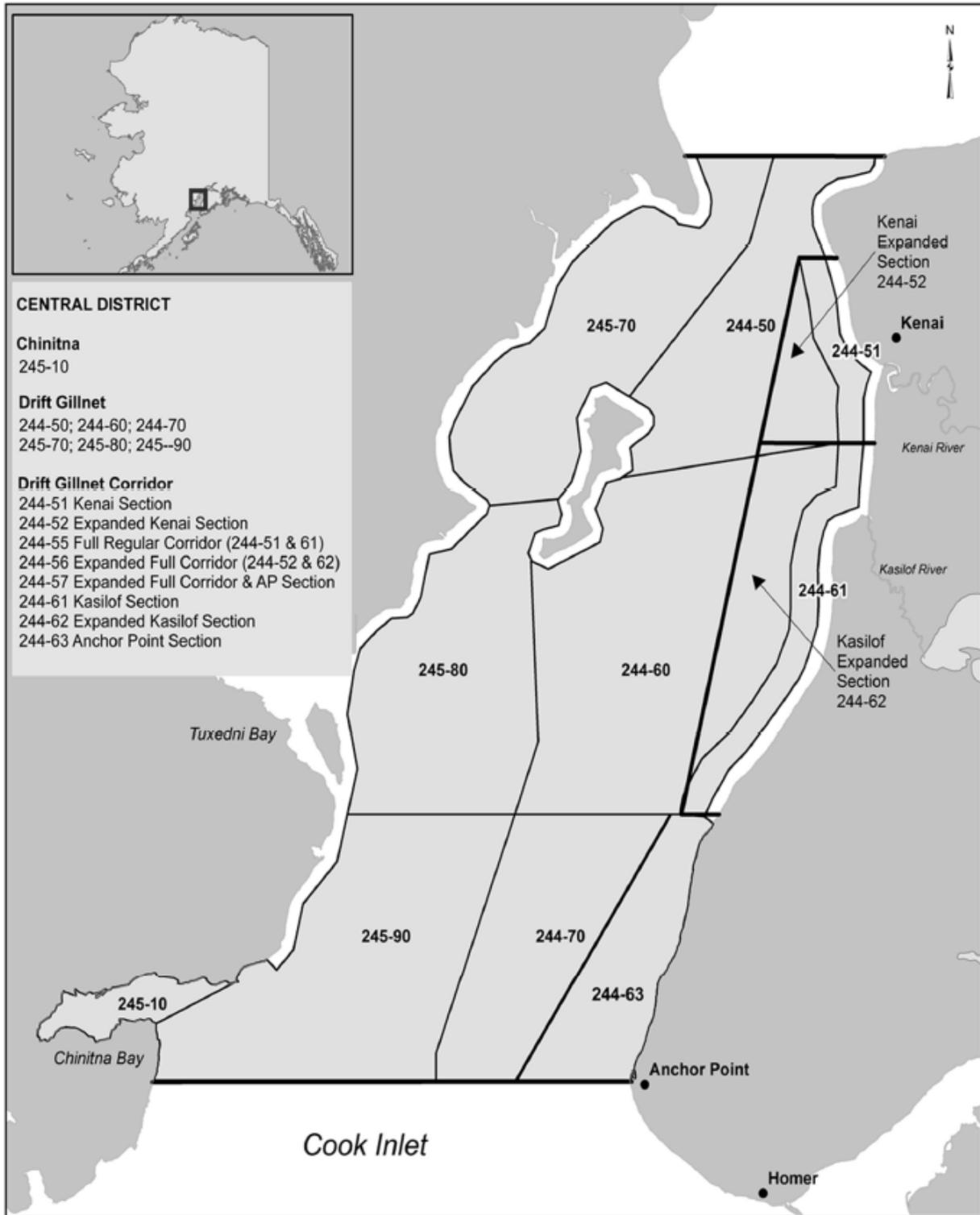


Source: Adapted from Glazier et al. (2006).

Fishing areas in the UCI salmon drift gillnet fishery are also determined by the BOF's Central District Drift Gillnet Fishery Management Plan, which imposes area restrictions to regular fishing periods. These area restrictions can vary throughout fishing seasons and across years, as they are based on preseason forecasts and inseason evaluations of the total Kenai River late-run sockeye salmon return during the fishing season. ADF&G uses its emergency order authority to make inseason adjustments to both fishing area and time.

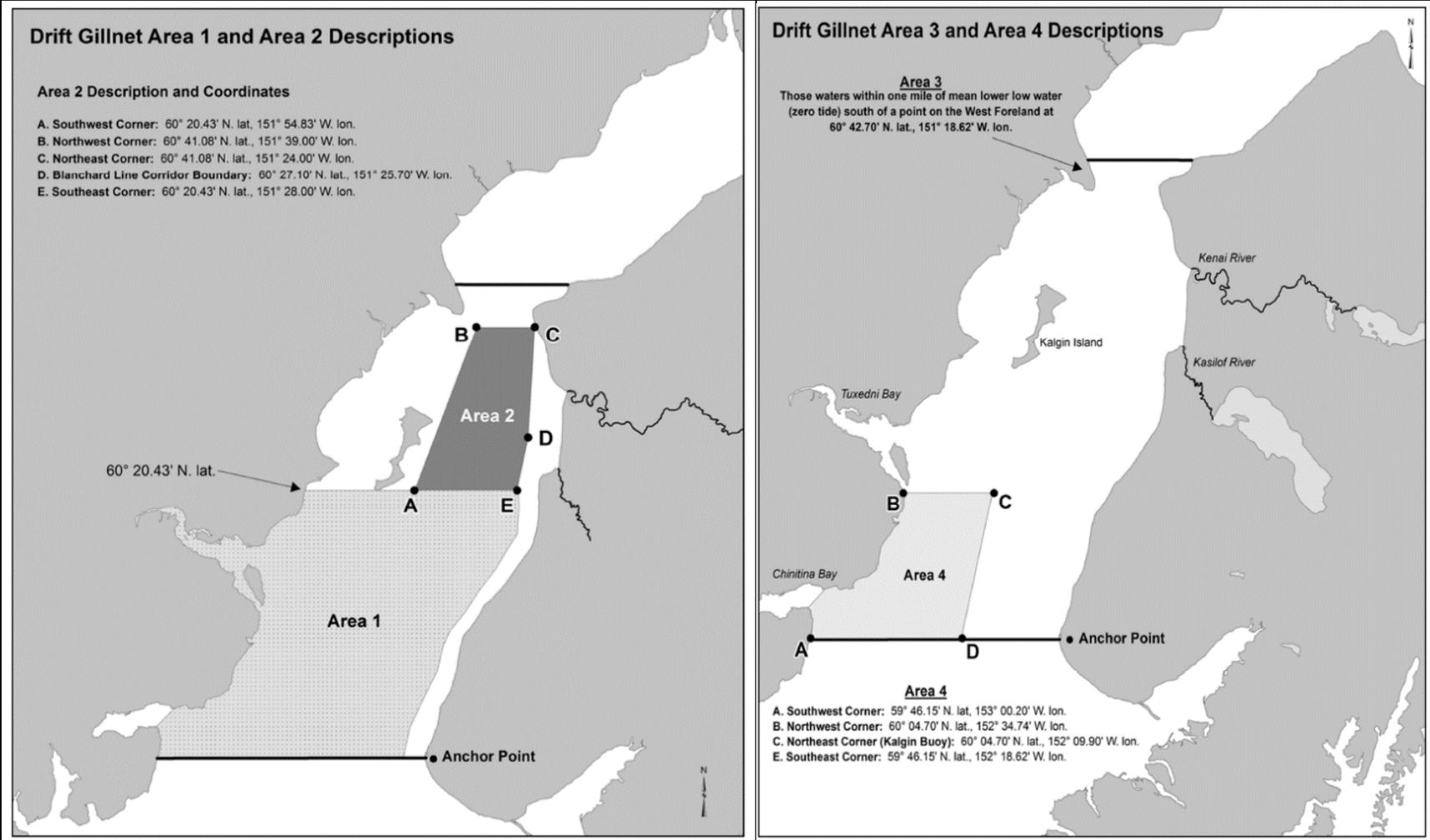
Figure 4-3 and Figure 4-4 show the boundaries of area provisions of the Central District Drift Gillnet Fishery Management Plan. In 2011, the BOF created the Expanded Kenai and Kasilof Sections shown in Figure 4-3 to provide for harvest of Kenai and Kasilof river sockeye salmon while minimizing harvests of Susitna River sockeye salmon and Northern District coho salmon (Willette and Dupuis 2017). The areas push fishing effort toward the east side of Cook Inlet, leaving a corridor free of drift gillnets in the middle in an effort to let fish continue swimming north. The Anchor Point Section was created by the BOF in 2014 to increase fishing opportunities for Homer-based drift gillnetters during some time periods when the corridor is in place (Matanuska-Susitna Borough Fish and Wildlife Commission 2017). The Drift Gillnet Areas shown in Figure 4-4 are also regulatory areas that ADF&G opens and closes as part of inseason management in the Central District.

Figure 4-3 Map of the UCI salmon drift gillnet fishery statistical areas, including Expanded Kenai and Kasilof Sections and Anchor Point Section.



Source: Marston and Frothingham (2019).

Figure 4-4 Map of the Drift Gillnet Areas.



Source: Marston and Frothingham (2019).

The key area and time provisions of the Central District Drift Gillnet Fishery Management Plan are summarized in Table 4-2.

Table 4-2 Summary of key time and area provisions of the Central District Drift Gillnet Fishery Management Plan.

Dates	Kenai Sockeye Run Strength Triggers	District Wide	Drift Gillnet Area 1	Expanded Kenai and Kasilof Sections	Anchor Point Section	Drift Gillnet Area 3 and 4
Jun 19–Jul 8*		Two 12-hr periods/week				
July 9–15	> 2.3 million		Both 12-hr periods			
			One additional 12-hr period may be allowed by emergency order			
July 16–31	< 2.3 million			Two 12-hr periods/week		
	2.3-4.6 million		One 12-hr period/week			
	> 4.6 million	One 12-hr period/week		One 12-hr period/week		
August 1–15			Two 12-hour periods/week**			Two 12-hour periods if there is a 1% closure
After Aug 16						Two 12-hour periods/week until closed by emergency order

* Season opens 3rd Monday in June or June 19, whichever is later.

** Prior to 2020, fishing periods were allowed district wide. Closure triggered by two consecutive fishing periods of less than 1% of the seasons' total sockeye catch taken per period.

Notes: Other than the two standard 12-hour periods/week, additional fishing time may be allowed by emergency orders in any of the time periods—such openings will be limited to Expanded Kenai and Kasilof Sections or the Anchor Point Section

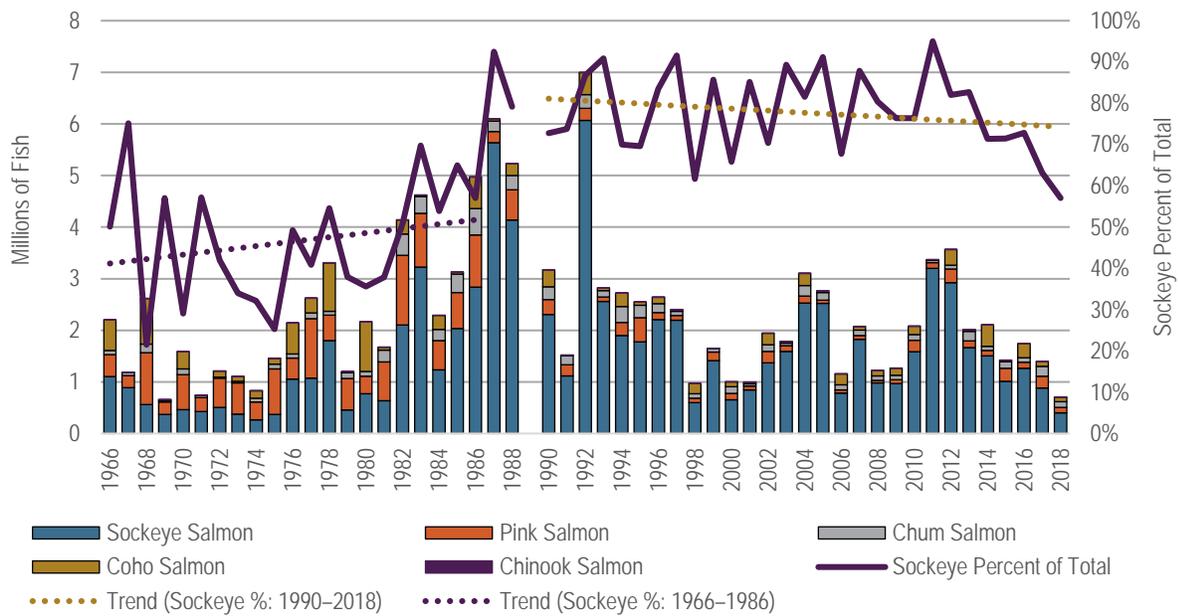
Source: Developed by Northern Economics based on data provided by Alaska Department of Fish and Game (2020c).

4.5.2.2. Salmon Harvest in the UCI Salmon Drift Gillnet Fishery

Due to the inherent annual variability in the scale of wild salmon runs, harvest levels in the UCI salmon drift gillnet fishery fluctuated dramatically from 1966–2018 (Figure 4-5). The exact causes of changes in salmon abundance are unknown, but they may involve a variety of factors outside the control of fishery managers, including ocean conditions, freshwater environmental factors, and disease.

The UCI salmon drift gillnet fishery landed an average of 2.27 million salmon annually from 1966–2018 (Figure 4-5). Although all five species of Pacific salmon are caught in the fishery, since the late 1980s the fishery has been temporally and spatially managed by the State to target sockeye salmon and ensure escapements of Chinook, coho, and chum salmon are met. Sockeye salmon accounted for 80% of the salmon caught in the fishery during 1990–2018. Since 2011, the sockeye percentage of the harvest has shown a downward trend due to decreases in the size of sockeye runs. In 2018, the sockeye run in Upper Cook Inlet deviated particularly sharply from most previous runs, both in terms of size and timing. The total sockeye run was about 32% below what was forecast (Marston and Frothingham 2019), and sockeye landings were 22% of the 1990–2017 annual average. For only the second time in ADF&G's records, more than half the Kenai River sockeye run arrived after August 1 (Earl 2018b).

Figure 4-5 Harvest (in numbers of fish) in the UCI salmon drift gillnet fishery by species, 1990–2018.

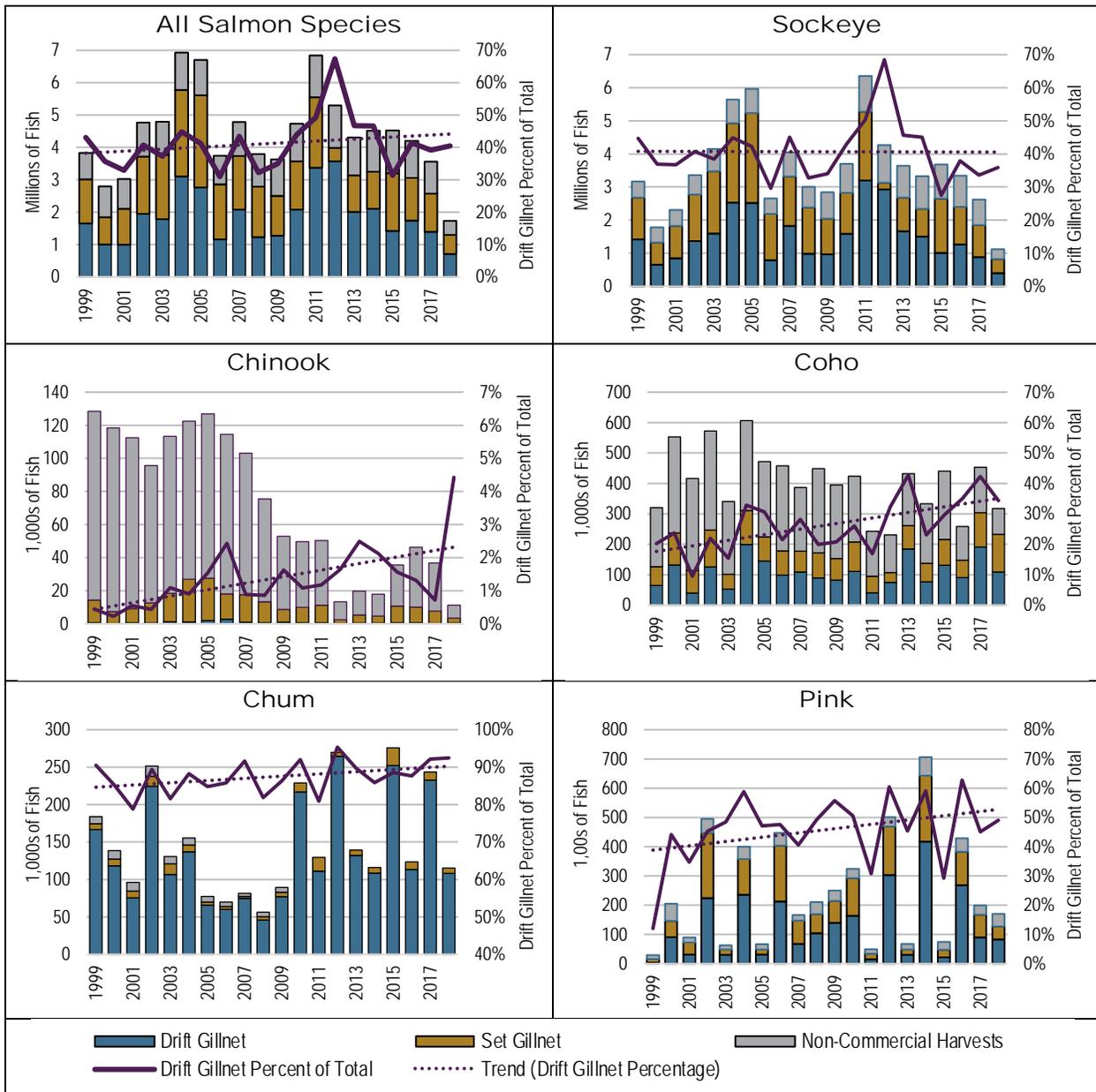


Notes: Data for 1989 omitted because the fishery was largely closed due to the *Exxon Valdez* oil spill in Prince William Sound.
Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-6 compares the salmon harvest in the UCI salmon drift gillnet fishery to salmon harvests in other Upper Cook Inlet fisheries, both commercial and non-commercial. The other commercial salmon fishery occurring in Upper Cook Inlet besides the drift gillnet fishery is the set gillnet fishery. The non-commercial salmon fisheries include the sport, personal use, and subsistence/educational fisheries. The set gillnet fishery and non-commercial fisheries are described in more detail in Section 4.6.

From 1999–2018, the UCI salmon drift gillnet fishery accounted for 42% of the total sockeye salmon harvest in all Upper Cook Inlet salmon fisheries; 1% of the total Chinook salmon harvest; 26% of the total coho salmon harvest; 52% of the total pink salmon harvest; and 89% of the total chum salmon harvest. Over all species combined, the UCI salmon drift gillnet fishery accounted for 55% of the total harvest. As shown in Figure 4-6, from 1999–2018, the UCI salmon drift gillnet fleet harvested an overall increasing percentage of the total salmon catch and catch of each species, with the exception of sockeye salmon—the fleet accounted for a relatively flat proportion of the Upper Cook Inlet sockeye harvest.

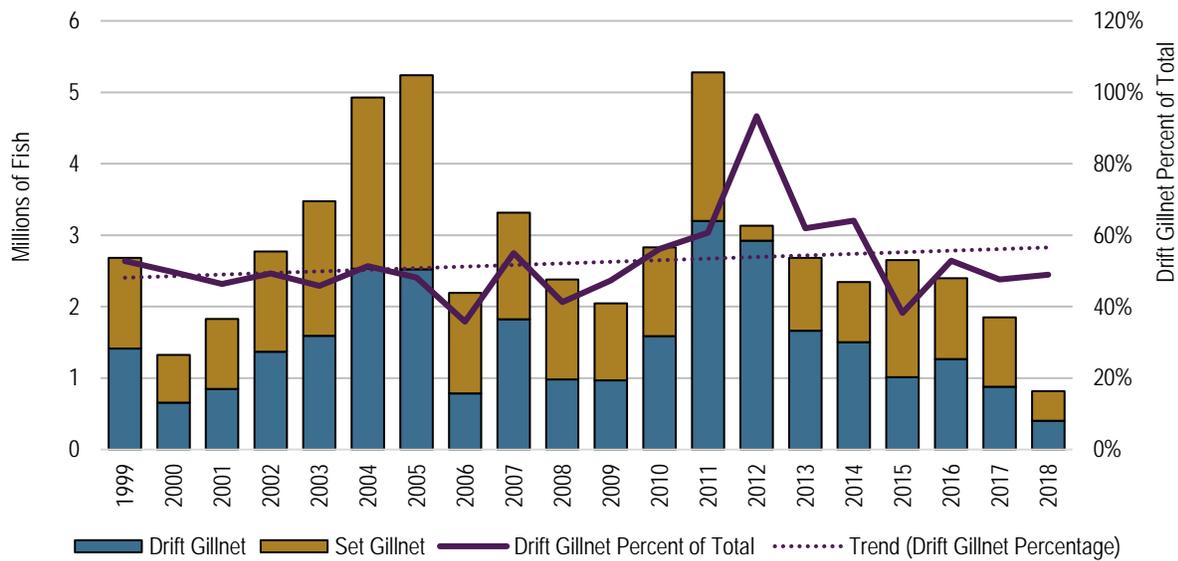
Figure 4-6 Salmon harvest (in numbers of fish) in Upper Cook Inlet by fishery and species, 1990-2018.



Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT; ADF&G (2020c); Baumer and Blain-Roth (2020); Booz et al. (2019); Lipka et al. (2020); Marston and Frothingham (2019); and Oslund et al. (2020).

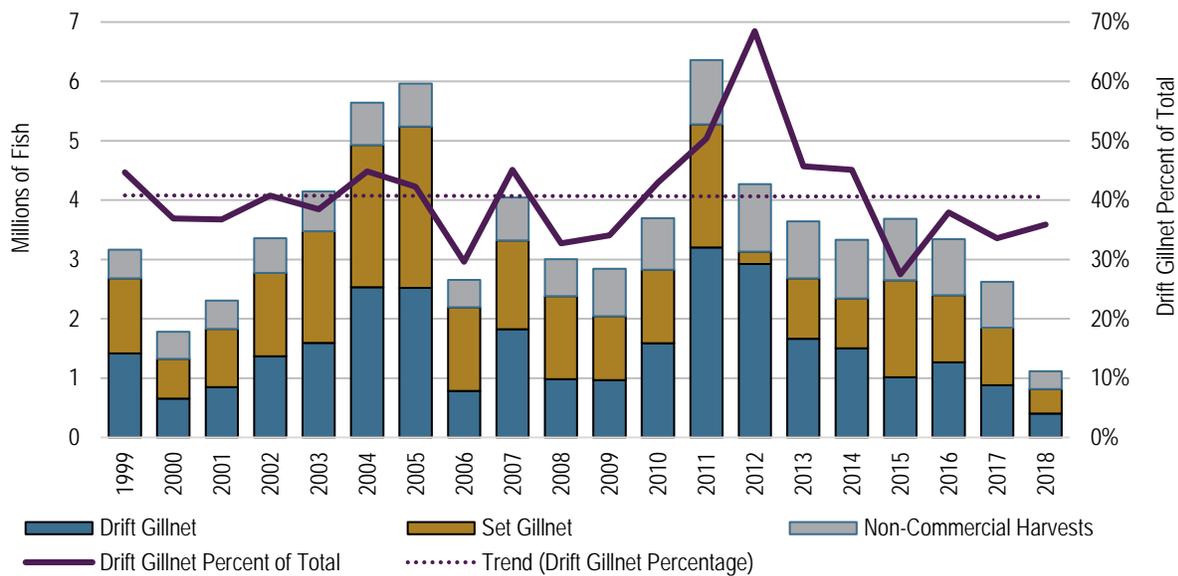
As noted above, sockeye salmon has been the primary target species in the UCI salmon drift gillnet fishery for the past three decades. To show more recent trends in the sockeye salmon harvest levels in the fishery relative to levels in other Upper Cook Inlet fisheries, the following two figures present comparative data from 1999–2018. Figure 4-7 shows that the UCI salmon drift gillnet fishery proportion of the total commercial harvest of sockeye trended slightly upward during that time period, while Figure 4-8 shows that the UCI salmon drift gillnet fishery proportion of the total sockeye harvest (commercial and non-commercial combined) showed little change.

Figure 4-7 Sockeye salmon harvest (in numbers of fish) in Upper Cook Inlet by commercial fishery, 1999–2018.



Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-8 Sockeye salmon harvest (in numbers of fish) in Upper Cook Inlet by fishery, 1999–2018.



Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.5.2.3. Salmon Harvest in the UCI Salmon Drift Gillnet Fishery Inside the EEZ

A comparison of Figure 4-2 and Figure 1-2 shows that much of the southwestern range of the fleet approximates the boundaries of the Cook Inlet EEZ. However, the boundaries of EEZ waters do not align with the areas used by ADF&G fish tickets to record the location of salmon harvests. Therefore, the percent of the salmon harvest of the UCI salmon drift gillnet fleet occurring in EEZ waters versus State waters was estimated. Required harvest location information on fish tickets consists of 1) statistical area (Figure 4-3), including the percent in numbers of fish per statistical area, and 2) “area caught,” which corresponds to the Drift Gillnet Areas in the Central District (Figure 4-4).

To estimate the amount of salmon harvested by the UCI salmon drift gillnet fleet in the EEZ as a percent of its total harvest, ADF&G sorted salmon harvests reported by the UCI salmon drift gillnet fleet on fish tickets from 1999–2018 into combinations of statistical area and locale code, where the locale code was based on Drift Gillnet Areas (Table 4-3) (Shields 2020). ADF&G then assigned percentage splits for each combination of locale code and statistical area based on their knowledge of the fishery and the management priorities at the time of an opening. Finally, these percentage splits, which are listed in Table 4-4, were applied to the reported landings from fish tickets for each opening on a species by species basis from 1999–2018.

Table 4-3 Locale codes.

Locale Code	Drift Gillnet Area	Statistical Area
1	1	244-60
2	2	244-60
3	3	244-60
4	3 & 4	244-60
5	1 & 2	244-60

Source: Shields (2020).

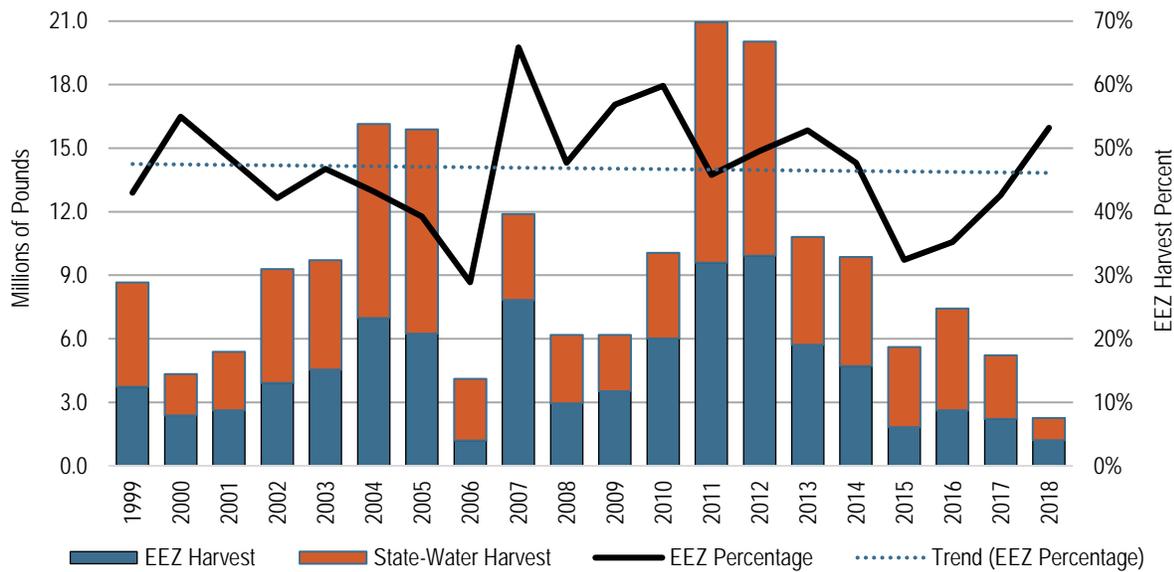
Table 4-4 Assumed percent of the UCI salmon drift gillnet fishery salmon harvest in State waters versus the EEZ by statistical area.

Statistical Area	Name/Description	Locale Code	State Water Percent (%)	EEZ Percent (%)
24426	Kasilof Special Harvest Area	All	100	0
24451	Kenai Section	All	100	0
24455	Full Corridor	All	100	0
24456	Expanded Full Corridor	0	100	0
		1	25	75
24457	Expanded Kenai/Kasilof & Anchor Point Section	0	94	6
		1	25	75
24460 (District Wide)	All areas available	0	50	50
	Fishing Limited to Drift Area 1	1	25	75
	Fishing Limited to Drift Area 3	3	75	25
	Fishing Limited to the Drift Areas 3 & 4	4	75	25
	Fishing Limited to Drift Areas 1 & 2	5	50	50
24461	Kasilof Section	All	100	0
24510	Chitina Bay	All	100	0

Source: Shields (2020).

As shown in Figure 4-9, the estimated amount of salmon harvested by the UCI salmon drift gillnet fleet in the EEZ as a percent of its total harvest varied from 1999–2018, but showed an overall slight decreasing trend. The average was 47%, with a low of 29% in 2006 and a high of 66% in 2007. During a given year, the percentage of salmon harvested by the fleet in the EEZ in the district wide openings declines as the fishing season progresses. At the beginning of the fishing season the EEZ percentage is higher than the “season-long” percentage reported for each year in Figure 4-9. The EEZ percentage then gradually declines as the salmon migrate up Cook Inlet and the fleet becomes more dispersed. Toward the latter part of the season, most of the UCI salmon drift gillnet fleet’s catch in the district wide openings is generally north of the EEZ (i.e., in State waters). However, some vessel operators may eventually resume fishing in the EEZ in order to target coho salmon. As shown in Figure 4-1, the majority of the coho harvests generally occur after the primary sockeye run.

Figure 4-9 Approximate percent of total salmon harvests (in pounds) in the UCI salmon drift gillnet fishery inside the EEZ, 1999–2018.

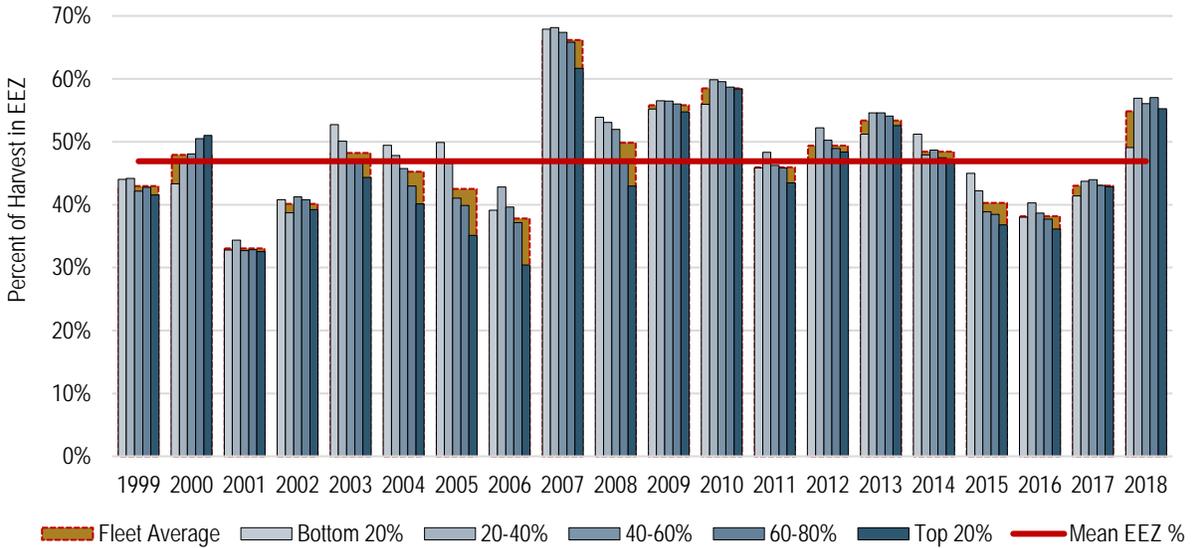


Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Given the location of sought-after fishing grounds within the boundaries of the Cook Inlet EEZ (Figure 4-2 and Figure 1-2), practically the entire active UCI salmon drift gillnet fleet must fish in the EEZ at some time during each fishing season. As noted above, the EEZ is likely most heavily fished during the beginning of the season.

However, the level of economic dependency on fishing grounds in the EEZ may differ across vessels when viewed over an entire fishing season. To examine differences in EEZ use within the UCI salmon drift gillnet fleet, the analysis examined the relationship between annual percent of salmon harvest inside the EEZ and 1) vessel length, and 2) vessel average annual catch. The analysis showed no significant correlation between EEZ percentage and vessel size on a vessel-by-vessel basis. However, the annual salmon catch of vessels was significantly ($P < 0.01\%$ based on Students t-test) and negatively correlated with EEZ percentage. This negative relationship is depicted in Figure 4-10, which separates individual active vessels into five percentile groups based on their catch compared to total fleet catch: bottom 20%; 20-40%; 40-60%; 60-80%; and top 20%. The figure shows the average annual catch of each group from 1999–2018. While there is considerable annual variability within each percentile group, in general the EEZ accounted for a higher proportion of the catches of vessels that caught less fish. It is possible that the operators of these vessels are choosing to forego some opportunities to fish in the Expanded Kenai/Kasilof and Anchor Point Sections (which are in State waters). Although the vessels could increase their annual harvests by fishing in these areas, they may be unwilling to endure the often congested and competitive fishing conditions in the areas. Although statistically significant, the difference between the percentile groups is relatively small: on average, from 1999–2018, the EEZ accounted for 50% of the annual catch of vessels in the group catching the fewest fish, and 44% of the annual catch of vessels in the group catching the most fish

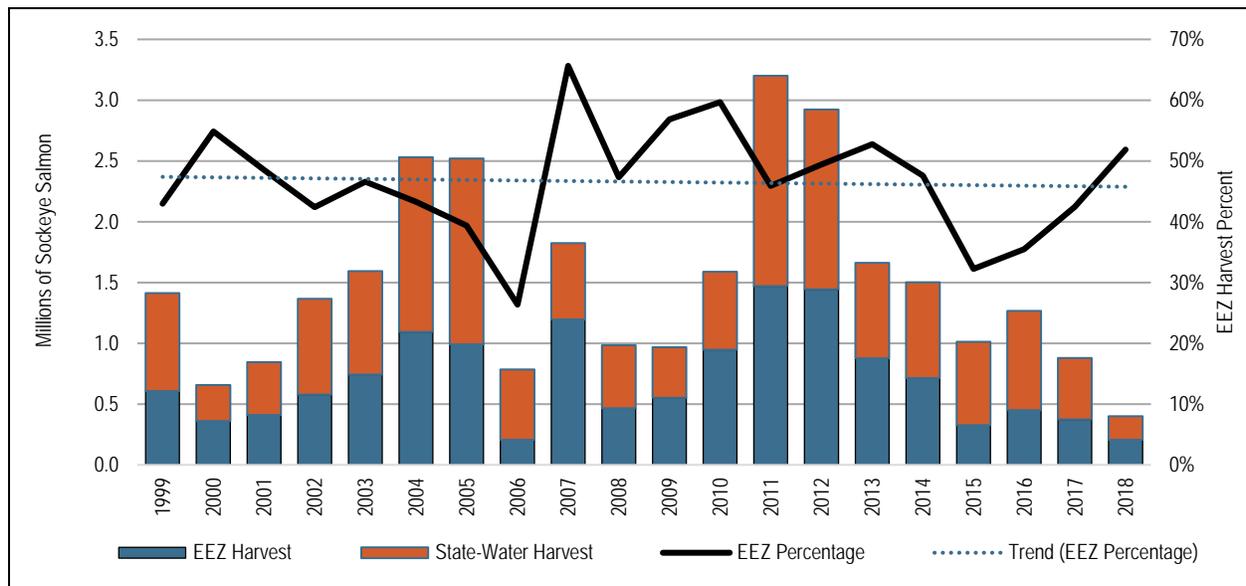
Figure 4-10 Average annual percent of salmon harvest (in pounds) in the UCI salmon drift gillnet fishery inside the EEZ by catch percentile group, 1999–2018.

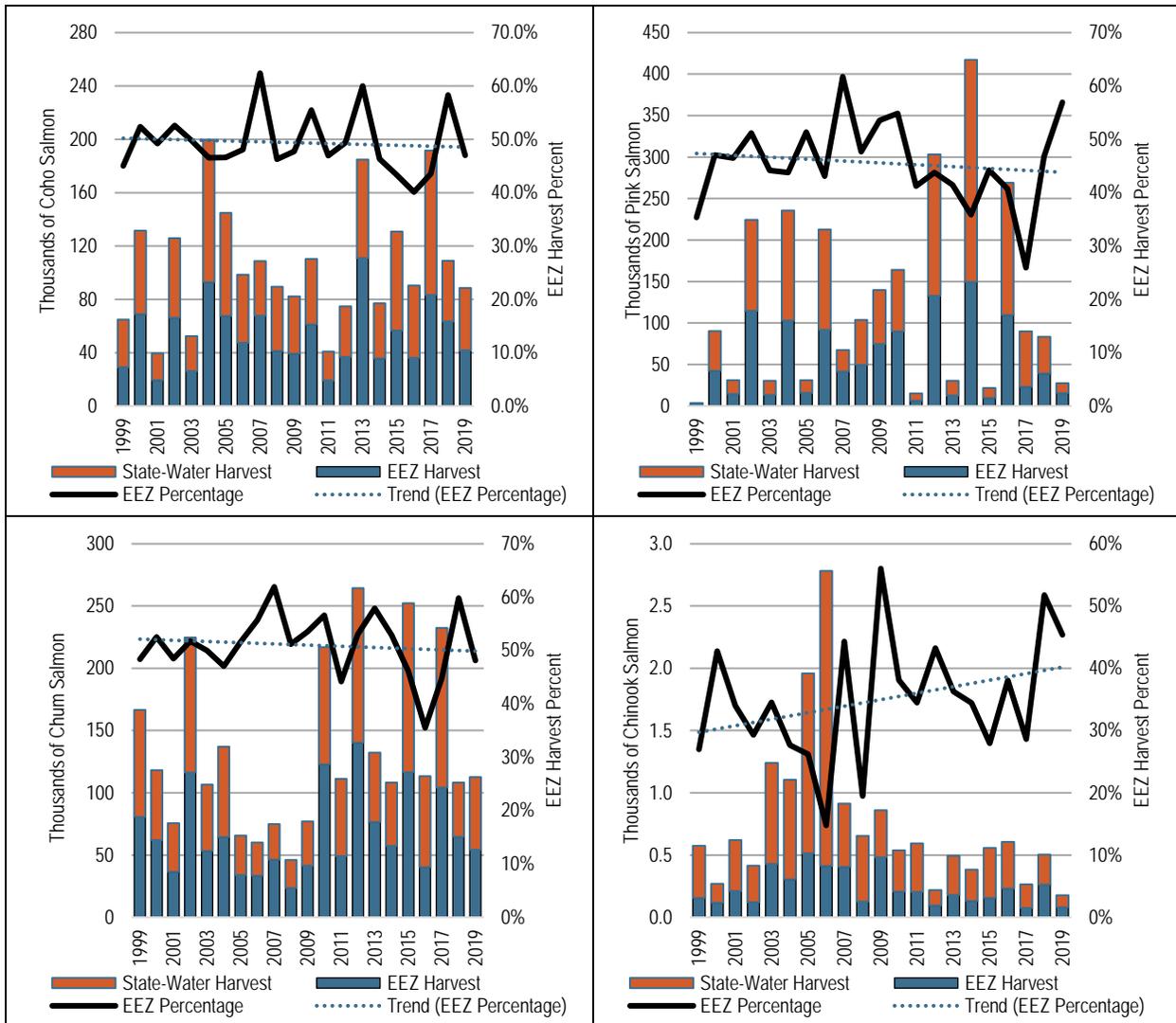


Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-11 shows the estimated percentage of the UCI salmon drift gillnet fishery harvest that occurred inside the EEZ by species from 1999–2018. The EEZ accounted for an average of 47% of the harvest of sockeye salmon, the primary target species in the fishery, with a low of 26% in 2006 and a high of 66% in 2007; for coho salmon, the average was 50%, with a low of 40% in 2016 and a high of 62% in 2007; for chum salmon, the average was 51%, with a low of 36% in 2016 and a high of 62% in 2007; and for Chinook salmon, the average was 34%, with a low of 26% in 2005 and a high of 56% in 2009.

Figure 4-11 Approximate percent of salmon harvests (in numbers of fish) in the UCI salmon drift gillnet fishery inside the EEZ by species, 1999–2018.





Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.5.2.4. Non-target Harvest in the UCI Salmon Drift Gillnet Fishery

Catches in the UCI salmon drift gillnet fishery of species other than salmon consist primarily of groundfish. Alaska groundfish regulations accommodate incidental groundfish bycatch from directed salmon gillnet fisheries. In the Cook Inlet Area (Registration Area H), an emergency order is issued annually by ADF&G to set groundfish bycatch limits.⁵³ Since 2014, this emergency order allowed participants in the UCI salmon drift gillnet fishery to retain 20% pollock round weight as a percent of the target species harvested, which is the maximum bycatch level allowed under 5 AAC 28.070 (Rumble et al. 2019).

However, groundfish species are present in low abundance in most areas where salmon fishing with drift gillnets occurs in Cook Inlet. As a result, the reported catch of groundfish and other non-target species in the UCI salmon drift gillnet fishery has been minimal. According to AKFIN data, between 2002 and 2015, only seven drift gillnet vessels made a landing of groundfish. These landings ranged from three

⁵³ The Cook Inlet Area has as its eastern boundary the longitude of Cape Fairfield (148°50'25" W. long.) and as its southern boundary the latitude of Cape Douglas (58°51'10" N. lat.) (5 AAC 27.400).

pounds to 962 pounds. The amount of non-target species discarded at sea by the UCI salmon drift gillnet fleet is not reported.

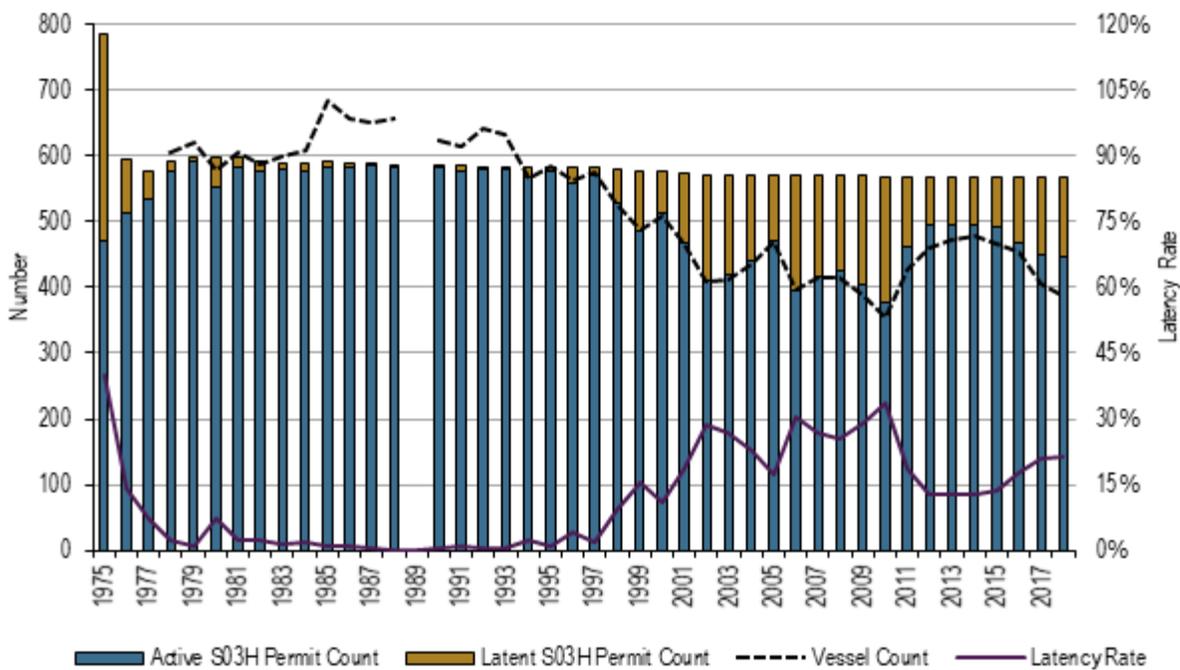
4.5.3. Harvesting Vessels

4.5.3.1. Harvester Participation

4.5.3.1.1. Number of Permits and Vessels

CFEC permits for the Cook Inlet salmon drift gillnet fishery were issued starting in 1975. The permits for the fishery are designated as S03H permits.⁵⁴ Figure 4-12 shows that the annual number of holders of S03H permits from 1975–2018 averaged around 580, with only a slight downward trend. Permit counts represent the total number of issued permits and include both interim-entry permits and permanent permits.⁵⁵

Figure 4-12 Number of S03H permits by active/latent status, 1975–2018.



Notes: Data for 1989 omitted because the fishery was largely closed due to the *Exxon Valdez* oil spill in Prince William Sound. From 2008 to 2018, there were an average of 28 permits which were registered as a part of a dual permit operation, but which did not have landings attributed to them. Their activity in dual permits operations implies a smaller level of latency than is shown in the figure. Source: Developed by Northern Economics based on data from Alaska Commercial Fisheries Entry Commission (2020).

CFEC regulations require individuals to renew their permits annually, regardless of whether they actually fish. Permits that are not used (do not record landings) in a given year are referred to as “latent” permits for that year. Figure 4-12 indicates the number of S03H permits used and rate of permit latency each year. Latency rates peaked in the 2000s due to low ex-vessel prices caused by saturation of the domestic seafood market with farm-raised salmon. Many vessel operators chose not to fish their permits, opting to wait until prices improved (Glazier et al. 2006). In 2011, the rate of latent permits began to decline. Farrington et al. (2014) suggest that the increase in participation and related reduction in latent permits may have been due to an improvement in salmon prices (Section 4.5.3.4.2), together with new regulations

⁵⁴ The CFEC’s four-digit code to designate permits refers to the species group, gear, and permit area. In the case of a S03H permit, S = salmon; 03 = drift gillnet; and H = Cook Inlet.

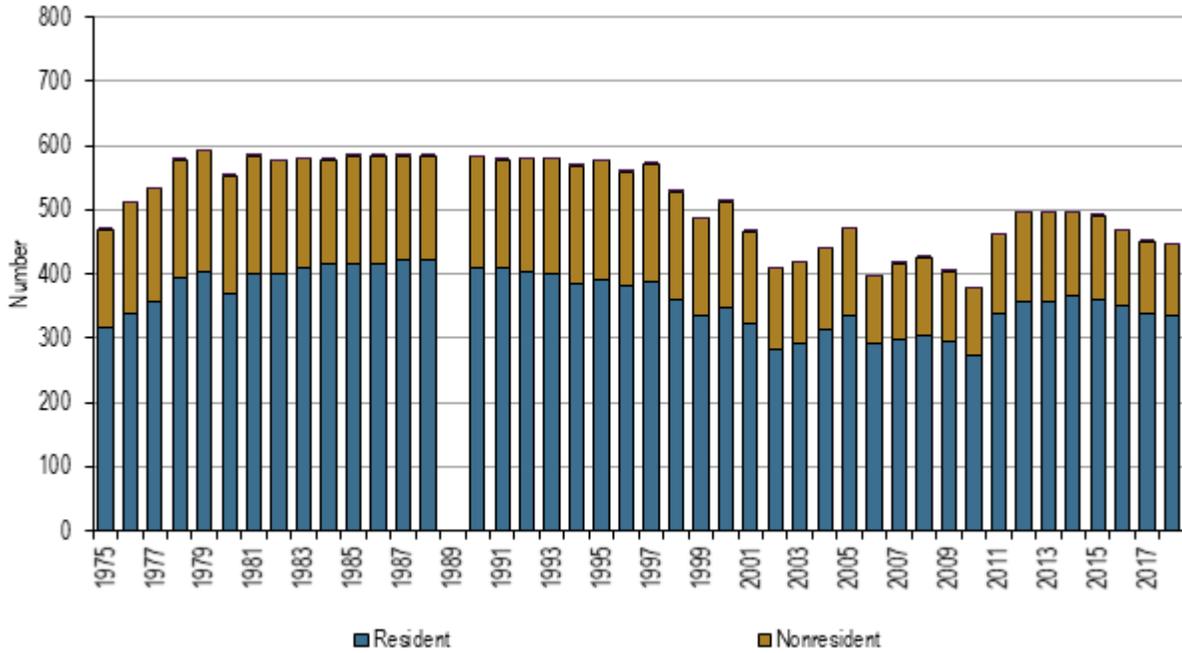
⁵⁵ Interim-entry permits are issued to individuals during the period when their applications for permanent permits are in adjudication. The last year an interim-entry permit was held was in 2005 (Alaska Commercial Fisheries Entry Commission 2019).

that allowed the formation of dual-permit operations (Section 4.5.3.1.4). More recently, however, the latency rate has increased.

4.5.3.1.2. Residency of Permit Holders

In the UCI salmon drift gillnet fishery, an average of 70% of active permits were fished by Alaska residents from 1975–2018 (Figure 4-13). The relatively high percent of resident participation in the fishery is likely a result of the fishery’s proximity to Alaska’s major population base (McDowell Group 2015).

Figure 4-13 Number of active S03H permits by resident type, 1975–2018.



Notes: Data for 1989 omitted because the fishery was largely closed due to the *Exxon Valdez* oil spill in Prince William Sound. Source: Developed by Northern Economics based on data from Alaska Commercial Fisheries Entry Commission (2020).

Table 4-5 indicates the initial distribution and historical net changes in permit holdings for the UCI salmon drift gillnet fishery by resident type from 1975–2018. The number of permits can change for three reasons: permits can be transferred to other resident types (transfer); permit holders can move from one location to another (migration); or permits can be cancelled (such as when a permit holder does not pay the renewal fee for two consecutive years). Table 4-5 indicates the extent to which these factors have contributed to net changes in permit holdings in this fishery. Transfers have had the largest impact on the changes, particularly between locals and nonresidents; however, some of the change has been offset by migrations. Two of the four cancelled permits were due to nonpayment (Alaska Commercial Fisheries Entry Commission 2019).

Table 4-5 Initial issuance and year-end 2018 totals of S03H permits, with net changes due to permit transfers, migrations, and cancellations by resident type, 1975–2018.

Initial Issue			Transfers		Migrations		Cancelled		2018 Year-End	
Resident Type	Total	Percent (%)	Change	Percent Change from Initial (%)	Change	Percent Change from Initial (%)	Change	Percent Change from Initial (%)	Total	Percent (%)
Local Resident	367	64.00	73	19.9	-45	-12.3	-1	-0.3	394	69.4
Nonlocal Resident	21	3.70	2	9.5	-2	-9.5	0	0.0	21	3.7
Nonresident	185	32.30	-75	-40.5	47	25.4	-4	-2.2	153	26.9
Total	573	100.00	0	0.0	0	0.0	-5	-0.9	568	100.0

Notes: "Local" means residing in the ADF&G Cook Inlet Management Area, including Anchorage.
Source: Alaska Commercial Fisheries Entry Commission (2019).

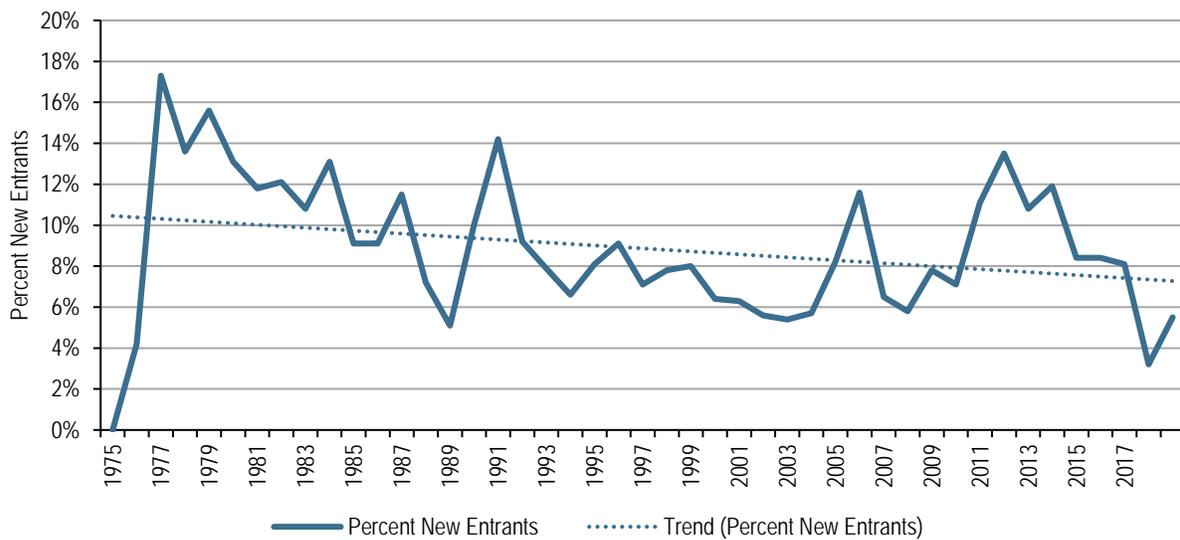
From 1980–2018, 58.8% of all transfers of S03H permits were sales, 36.0% were gifts, 1.5% were trades, and 3.6% were other transfer types. The annual acquisition methods for the permits did not change substantially throughout the time period (Alaska Commercial Fisheries Entry Commission 2019). During the same period, 40.8% of all permit transfers were between immediate family members and other relatives, 15.0% were between business partners/friends, and 44.2% were between other types of entities (Alaska Commercial Fisheries Entry Commission 2019).

4.5.3.1.3. New Entrants

Figure 4-14 shows the level of new entry into the UCI salmon drift gillnet fishery from 1975–2018 as a percent of total participants in the fishery. New entrants are individuals who, for the first time, record a landing on a permanent S03H permit (Alaska Commercial Fisheries Entry Commission 2019). The figure describes individuals rather than permits. An individual may hold up to two permits for the same fishery but can only fish one of them. An individual may hold one S03H permit one year, and then in subsequent years hold a different permit in the fishery. Likewise, individuals may enter and exit the fishery multiple times over the years. Individuals are only counted once as a new entrant and only in the year in which they made their first documented landing. Initial permit holders are not considered new entrants because they needed a proven fishing history prior to 1975 in order to become an initial holder of a CFEC permit. Individuals who only make landings on an emergency transfer or interim-entry permit for any given year are also not considered in the figure (Alaska Commercial Fisheries Entry Commission 2019).

The average annual rate of new entry in the UCI salmon drift gillnet fishery from 1975–2018 was 9.1%, with a high of 17.3% in 1976 and a low of 3.2% in 2017. In comparison, the average annual rate of new entry over the same time period was 11.7% in the Cook Inlet salmon purse seine fishery, and 8.5% in the Cook Inlet salmon set gillnet fishery (Alaska Commercial Fisheries Entry Commission 2019).

Figure 4-14 New entrants as a percent of total participants in the UCI salmon drift gillnet fishery, 1975–2018.



Source: Alaska Commercial Fisheries Entry Commission (2019).

4.5.3.1.4. Dual-Permit Operations

Historically, two holders of S03H permits could fish in tandem from one vessel; however, the maximum amount of net that could be fished from a vessel was the same as that of a single permit holder. This changed in 2008 when the BOF implemented a new regulation that allows two permit holders in the UCI salmon drift gillnet fishery to fish concurrently from the same vessel and jointly operate up to 200 fathoms of gillnet (5 AAC 21.333), which is one-third more than the net length a permit holder operating alone is allowed.⁵⁶ Areas open to these “dual-permit operations” were the so-called “inlet wide” ADF&G statistical areas in the Central District. In 2011, the BOF included the Expanded Kenai and Kasilof Sections in the area available to dual-permit operations (Farrington et al. 2014). The dual-permit regulation was intended to make it possible for young fishermen to enter the UCI salmon drift gillnet fishery without the need to purchase a vessel as well as a permit. In addition, the regulation could help local permit holders get back into the UCI salmon drift gillnet fishery if they did not own a boat (Kotlarov 2019).

The effect of the dual-permit regulation on new entry in the UCI salmon drift gillnet fishery appears to be limited. As shown in Figure 4-14, the annual rate of new entry was relatively high from 2010–2013, but it started declining in 2014. However, data suggest that the regulation may be achieving the goal of helping inactive S03H permit holders resume their participation in the UCI salmon drift gillnet fishery. Farrington et al. (2014) suggest that the basis for forming at least some of the dual-permit operations in the UCI salmon drift gillnet fishery has been the sizable pool of latent S03H permits (Section 4.5.3.1.1). By affording fishermen an opportunity to team up, collectively fish extra gear, and hopefully become more profitable, the dual-permit option brought permits out of latency.⁵⁷

Further, it appears that many of the S03H permit owners who were formerly inactive but have resumed participation in the UCI salmon drift gillnet fishery under the dual-permit option are local residents. Table

⁵⁶ The BOF implemented a similar regulation in the Bristol Bay salmon drift gillnet fishery in 2003.

⁵⁷ Interviews conducted by Farrington et al. (2014) with S03H permit holders indicate that the decision to enter into a dual-permit operation depends on a range of individual circumstances, included the availability of a good partner, processor support of dual-permit operations, dynamics within an exclusive fishing-group, weather and tide conditions, vessel and gear capacities, family fishing, and inseason fishing dynamics. The variability of these circumstances likely contributes to the intermittency of dual-permit operations, with permit holders switching from fishing as a dual-permit operation during part of the season to a single-permit operation at other times.

4-6 reports on the resident type combinations of the individuals in dual-permit operations with landings from 2008–2018. Resident type is counted as the residency status of the permit holder at the end of the year. The percentages are for the entire resident type participating in the fishery as dual-permit operations. Note that permit holders can regroup, thereby increasing the total count of dual-permit operations (Alaska Commercial Fisheries Entry Commission 2019). As shown in the table, local Alaska residents constituted the largest number of dual-permit operations in all years.

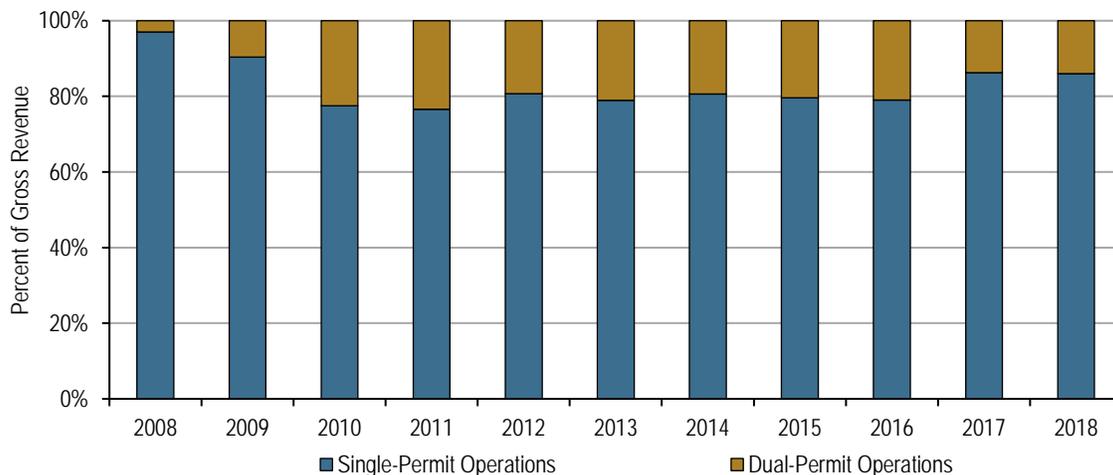
Table 4-6 Number of individuals in dual-permit operations in the UCI salmon drift gillnet fishery by resident type, 2008–2018.

Year	Both Local Resident		Both Nonlocal Resident		Both Nonresident		Local Resident and Nonlocal Resident		Local Resident and Nonresident		Nonlocal and Nonresident		Total
	Count	Percent (%)	Count	Percent (%)	Count	Percent (%)	Count	Percent (%)	Count	Percent (%)	Count	Percent (%)	
2008	5	55.6	0	0.0	2	22.2	0	0.0	2	22.2	0	0.0	9
2009	18	85.7	1	4.8	1	4.8	0	0.0	0	0.0	1	4.8	21
2010	45	76.3	2	3.4	4	6.8	1	1.7	7	11.9	0	0.0	59
2011	54	78.3	2	2.9	6	8.7	0	0.0	6	8.7	1	1.4	69
2012	40	64.5	2	3.2	10	16.1	1	1.6	9	14.5	0	0.0	62
2013	38	55.9	1	1.5	12	17.6	2	2.9	13	19.1	2	2.9	68
2014	41	64.1	3	4.7	8	12.5	2	3.1	9	14.1	1	1.6	64
2015	35	57.4	2	3.3	6	9.8	1	1.6	15	24.6	2	3.3	61
2016	34	55.7	2	3.3	6	9.8	3	4.9	14	23.0	2	3.3	61
2017	23	63.9	2	5.6	7	19.4	1	2.8	3	8.3	0	0.0	36
2018	26	66.7	2	5.1	4	10.3	3	7.7	3	7.7	1	2.6	39

Notes: "Local" means residing in the ADF&G Cook Inlet Management Area, including Anchorage.
Source: Alaska Commercial Fisheries Entry Commission (2019).

Figure 4-15 shows the percent of annual landings in the UCI salmon drift gillnet fishery for single- and dual-permit operations. Landings are defined as all landings made on a given day by a permit operation. Two permit holders who made a commercial landing together as a dual-permit operation were only counted as a single entity for that day. Some permit holders who participated in the fishery both as a single-permit operation and as part of a dual-permit operation had landings counted in both categories (on different days), depending how they were fishing the day the landing was made (Alaska Commercial Fisheries Entry Commission 2019). In 2008, dual-permit operations accounted for only about 3% of total gross revenue in the UCI salmon drift gillnet fishery. After increasing for a couple of years, the number of dual-permit operations leveled off. Between 2010 and 2018, the percent of gross revenue attributable to dual-permit operations averaged around 19%.

Figure 4-15 Percent of gross revenue in the UCI salmon drift gillnet fishery by operation type, 2008–2018.



Source: Alaska Commercial Fisheries Entry Commission (2019).

4.5.3.1.5. Permit Stacking

Since 2017, the BOF has allowed for stacked permit operations in the UCI salmon drift gillnet fishery. A stacked permit operation is where an individual who holds two S03H permits can fish up to two full complements of gear (5 AAC 21.333(a)).

Table 4-7 provides data on participation in stacked permit operations in terms of individuals rather than permits.⁵⁸ Allowing the purchase and use of two permits by individuals within a fishery can directly benefit those individuals by providing increased fishing opportunities that can make their fishing operations more efficient (Gho 2012). As shown in the table, individuals with stacked permits accounted for a disproportionately high percentage of total gross revenue across all resident types in both 2017 and 2018. Between those years, the count of local individuals with stacked permit operations increased from 26 to 47, while there was a decline or no substantial change among nonlocals and nonresidents.

Table 4-7 Number and percent of gross revenue in the UCI salmon drift gillnet fishery by operation type and resident type, 2017–2018.

Year	Resident Type	Operation Type	Number of Individuals with Landings	Percent of Total Number of Individuals with Landings (%)	Percent of Total Gross Revenue (%)
2017	Local	Stacked	26	6.1	11.0
		Single	274	64.8	65.2
	Nonlocal Resident	Stacked	0	0.0	0.0
		Single	17	4.0	4.3
	Nonresident	Stacked	8	1.9	3.0
		Single	98	23.2	16.5
	Total	Stacked	34	8.0	14.0
		Single	389	92.0	86.0
2018	Local	Stacked	47	11.9	19.1
		Single	225	57.0	50.5
	Nonlocal Resident	Stacked	1-3	**	**
		Single	NA	**	**
	Nonresident	Stacked	NA	**	**
		Single	NA	**	**
	Total	Stacked	61	15.4	23.9
		Single	334	84.6	76.1

Notes: “Local” means residing in the ADF&G Cook Inlet Management Area, including Anchorage.

NA = Data are masked for confidentiality.

Source: Alaska Commercial Fisheries Entry Commission (2019).

4.5.3.2. Age of Harvesters

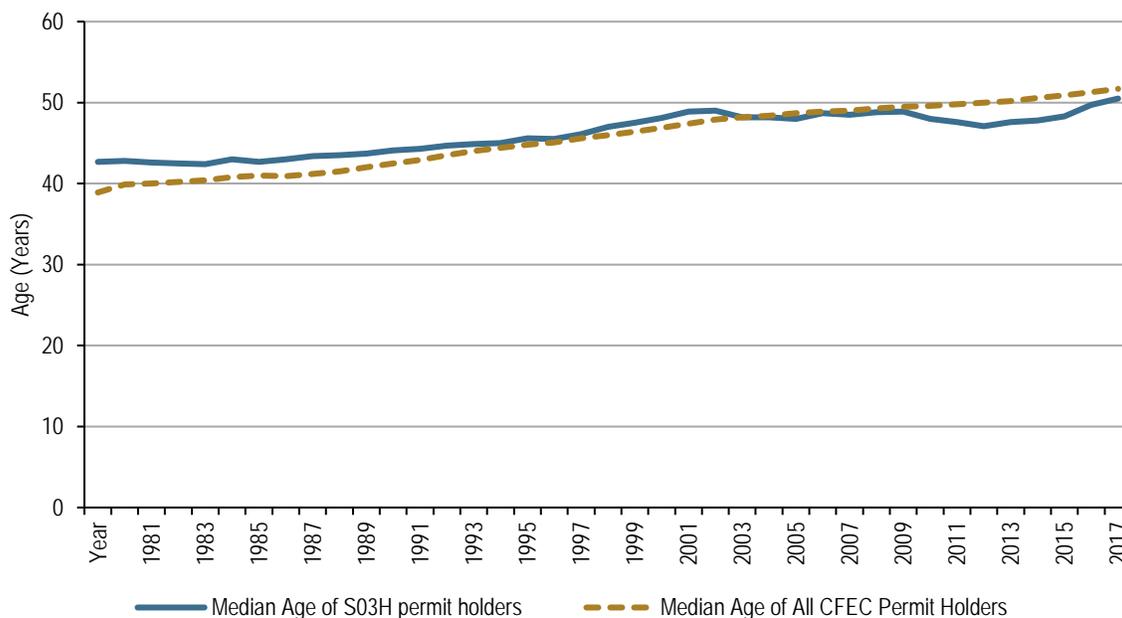
Recent studies (e.g., Cullenberg et al. 2017) have suggested that financial and other socioeconomic challenges have created barriers to entry for the next generation of harvesters in some Alaska fisheries. The resulting “graying of the fleet” especially threatens the healthy succession of fishing as an economic and cultural mainstay in small rural fishing communities. With specific regard to the UCI salmon drift gillnet fishery, fishermen have recently expressed concern that fewer young people are entering and staying in the fishery because of increasing operating costs, relatively low earnings, and unpredictable openings (Earl 2018a).

Figure 4-16 shows the median age of S03H permit holders from 1975–2018 and compares it to the median age of all CFEC permit holders. Although new permit holders have entered the UCI salmon drift

⁵⁸ Alaska Commercial Fisheries Entry Commission (2019) notes that reporting on counts of stacked permit operations is not a simple task. Permits can change hands multiple times throughout the year. An individual may fish in a single permit operation at the beginning of season then fish as a stacked operation after acquiring a second permit midseason. An individual in a stacked permit operation might use an emergency transfer permit for part of the season, and then have a permanently held second permit for the rest of the season.

gillnet fishery over the years (Section 4.5.3.1.3), the median age of S03H permit holders increased by approximately eight years between 1984 and 2018, which represents a 19% increase. The higher median age indicates that older harvesters may be continuing to fish beyond their expected retirement age and/or younger harvesters have been slow to replace them. However, the median age increase of S03H permit holders was lower than the 28% increase for CFEC permit holders as a whole over the same time period.

Figure 4-16 Median age of S03H permit holders, 1975–2018.



Source: Alaska Commercial Fisheries Entry Commission (2019).

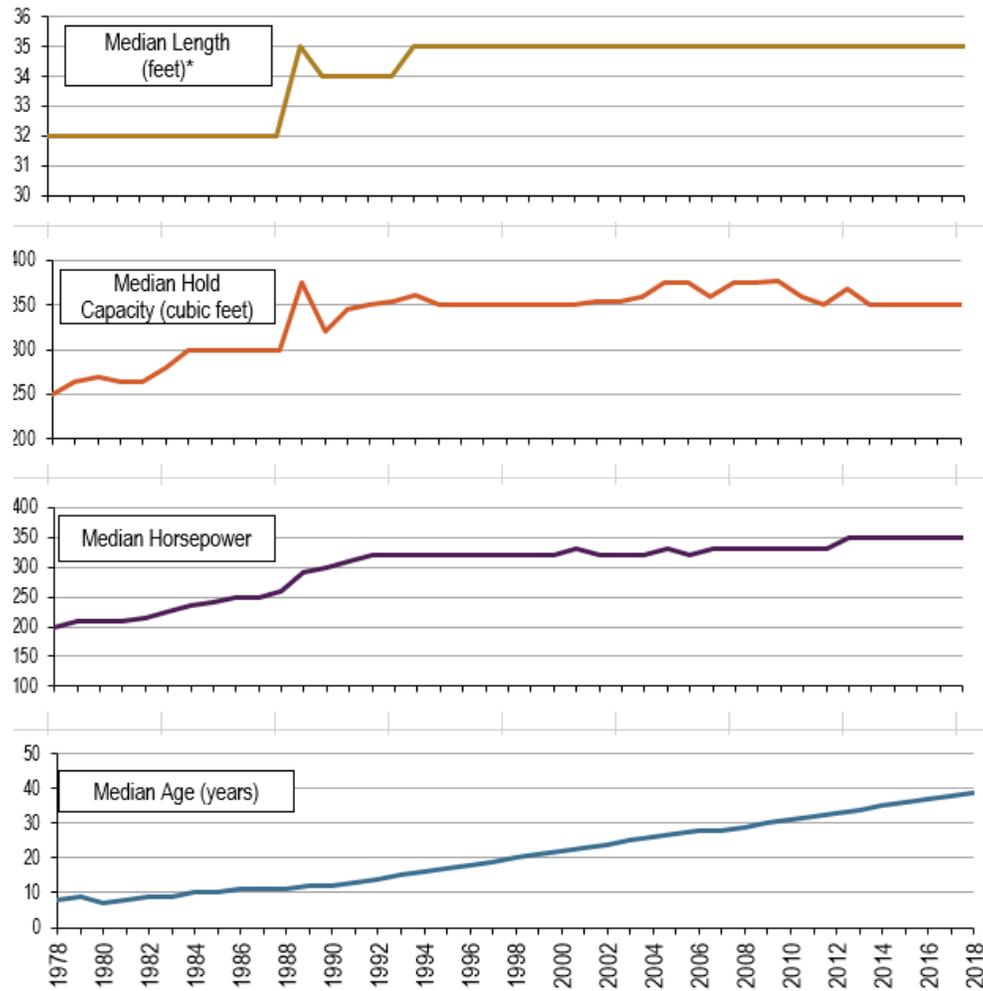
4.5.3.3. Vessel Characteristics

Figure 4-17 reports on various vessel characteristics of the UCI salmon drift gillnet fleet. As captains sought to fish larger portions of Upper Cook Inlet during a fishery opening, median vessel length, net tonnage, horsepower, and hold capacity substantially increased during the 1980s.^{59, 60} Hull types also changed during the time period, with a trend away from the original wooden boats to fiberglass and aluminum boats (Iverson and Sears 2008; Alaska Commercial Fisheries Entry Commission 2019). Since then, however, vessel characteristics have been fairly stable, with the exception of vessel age. From 1980–2018, the median vessel age in the fleet steadily increased from 8 years to 39 years, suggesting that vessel replacement in the fleet has been minimal.

⁵⁹ The increase in median vessel length in the 1990s might reflect not only a change in actual vessel sizes, but also in the way the data were collected. In 1989, the U.S. Coast Guard changed its method for measuring registered length. In addition, in the mid-1990s the CFEC vessel license application began to ask for overall length instead of registered length (Iverson and Malecha 2000; Iverson and Sears 2008).

⁶⁰ Stronger pickup trucks for towing, more reliable boat trailers, and improved road conditions also were important in increasing the range of the fleet (Pettersen and Glazier 2004).

Figure 4-17 Vessel characteristics in the UCI salmon drift gillnet fishery, 1997–2018.



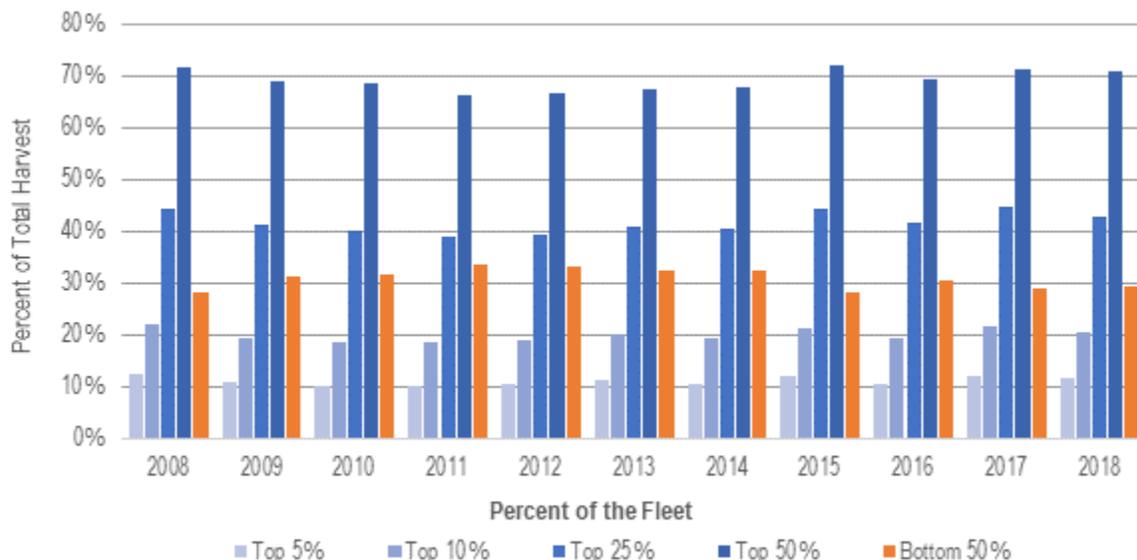
* The increase in median vessel length in the 1990s might reflect not only a change in actual vessel sizes, but also in the way the data were collected. See Footnote 59.
Source: Alaska Commercial Fisheries Entry Commission (2019).

4.5.3.4. Vessel Dependency

4.5.3.4.1. Distribution of Salmon Harvest

Figure 4-18 shows the distribution of the salmon harvest across the UCI salmon drift gillnet fleet from 2008–2018. In general, the top 5% of vessels caught approximately 10% of the total catch; the top 10% caught 20% of the total; the top 25% caught 37% of the total; and the top 50% caught 69% of the total. The blue columns are cumulative, while the orange column shows the catch of the bottom 50% of the fleet (31% on average).

Figure 4-18 Distribution of salmon harvests in the UCI salmon drift gillnet fishery by catch percentile group, 2008–2018.

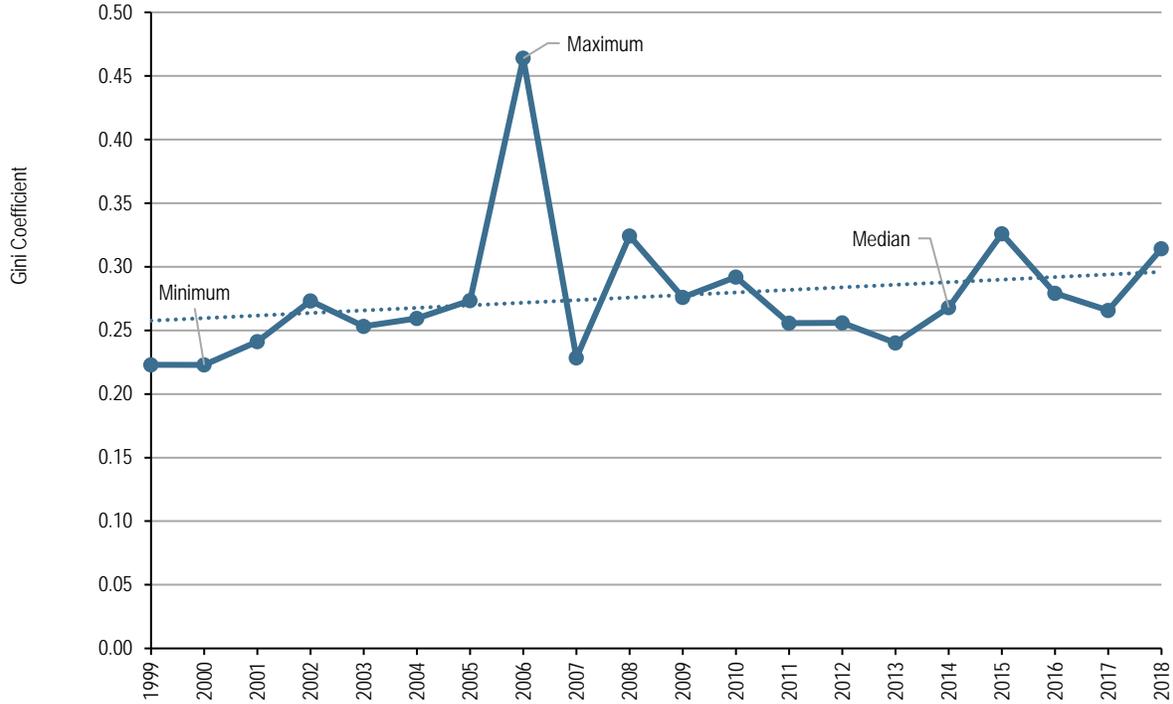


Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

The analysis also computed the Gini coefficient for the sockeye salmon harvest in the UCI salmon drift gillnet fishery from 1999–2018 (Figure 4-19). This coefficient measures the equality of catch distribution among active vessels. A Gini coefficient equal to zero represents a perfectly equal distribution of catch amongst vessels, whereas a value of 1.0 represents a perfectly unequal distribution, with a single vessel accounting for the entire harvest. The median Gini coefficient for the sockeye salmon harvest in the fishery from 1999–2018 was 0.27, while the mean was 0.28. Figure 4-19 shows that the Gini coefficient trended upward from 1999–2018, which indicates that catch became less equally distributed across the fleet. However, the degree of concentration of harvests among vessels is still relatively low, which is likely due to the fact that participants in the fishery operate similarly sized vessels and exhibit similar effort levels. By comparison, the average Gini coefficient for gross revenue in the halibut IFQ fishery and sablefish IFQ fishery from 2005–2014 was 0.67 and 0.58, respectively (North Pacific Fishery Management Council and National Marine Fisheries Service 2016).⁶¹

⁶¹ The Gini coefficient was calculated across catcher vessels in the sablefish IFQ fishery.

Figure 4-19 Gini coefficient for sockeye salmon harvest in the UCI salmon drift gillnet fishery, 1999–2018.



Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

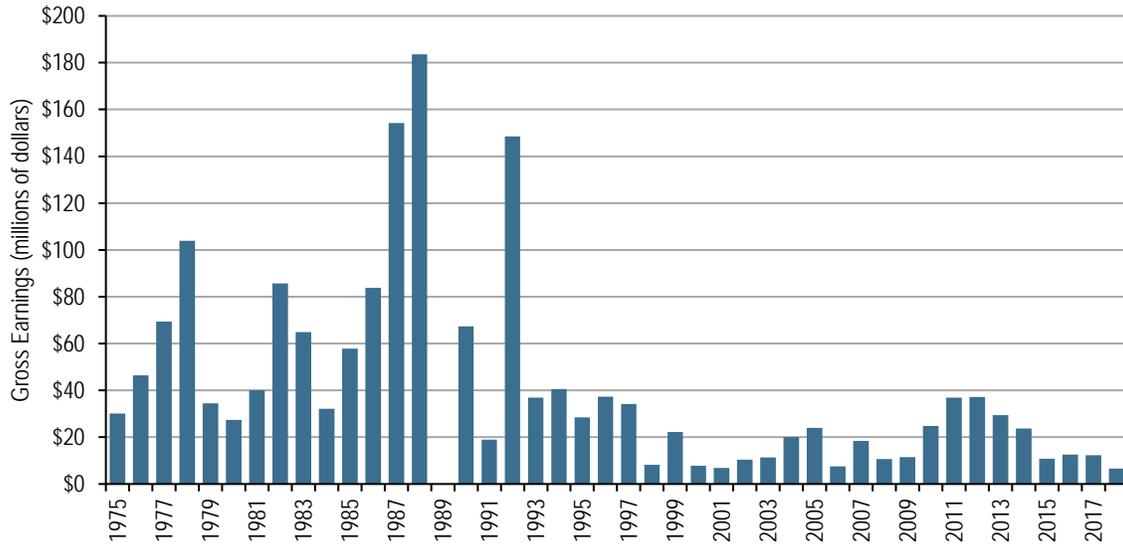
4.5.3.4.2. Gross Revenue from Salmon Harvests

The gross revenue from salmon harvests in the UCI salmon drift gillnet fishery is a function of the harvest and ex-vessel prices. Harvest levels in the fishery fluctuate with salmon run strength, while ex-vessel prices for salmon products vary due to shifting market demand and changes in international currency exchange rates.

As shown in Figure 4-20, gross revenue in the fishery experienced a sharp rise in the late 1980s prior to the *Exxon Valdez* oil spill. During this period, salmon ex-vessel prices (Figure 4-21) as well as landings (Figure 4-5) were high.⁶² Beginning in the 1990s the price of Alaska salmon dropped across the State, in part because of the large output of farmed Atlantic salmon and a shift in global salmon markets. Landings and gross revenue declined in concert. More recently, salmon prices have increased. The estimated ex-vessel price per pound paid for sockeye salmon in 2018 was \$2.07, which was 7% more than the average price of \$1.97 over the previous ten years (2008–2017). However, this price increase was not sufficient to offset the decrease in landings, and gross revenue in the fishery fell as a result.

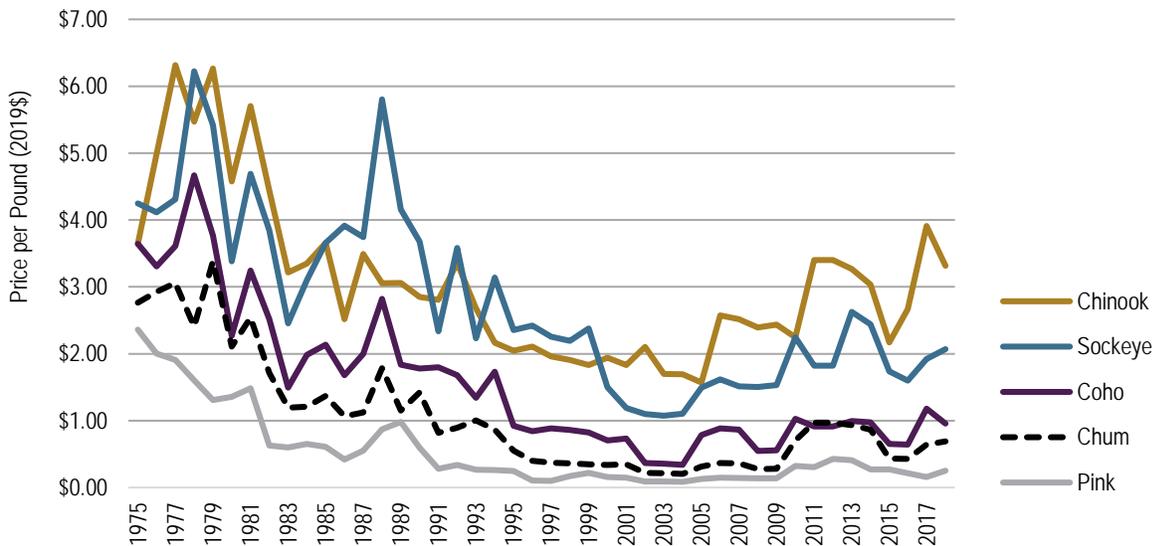
⁶² Estimating average annual price paid per pound of salmon caught in Upper Cook Inlet salmon fisheries is challenging because an increasing number of fishermen are self-marketing their catches rather than selling their harvest to regional shorebased processors. By selling some or all of their harvest to niche markets, they often receive higher prices. In addition, early-season price of Chinook and sockeye salmon is often much higher than what is paid later in the season because local markets have kept demand high for early-season fresh fish (Shields 2010; Marston and Frothingham 2019).

Figure 4-20 Gross revenue (inflation adjusted) from salmon harvests in the UCI salmon drift gillnet fishery, 1975–2018.



Notes: The 1989 fishery was cut short by the Exxon Valdez Oil Spill. Values are adjusted for inflation to 2019 dollars using U.S. BLS Producer Price Index for unprocessed and prepared seafood.
Source: Alaska Commercial Fisheries Entry Commission (2019).

Figure 4-21 Average annual ex-vessel price (inflation adjusted) of salmon harvested in Upper Cook Inlet salmon fisheries by species, 1975–2018.



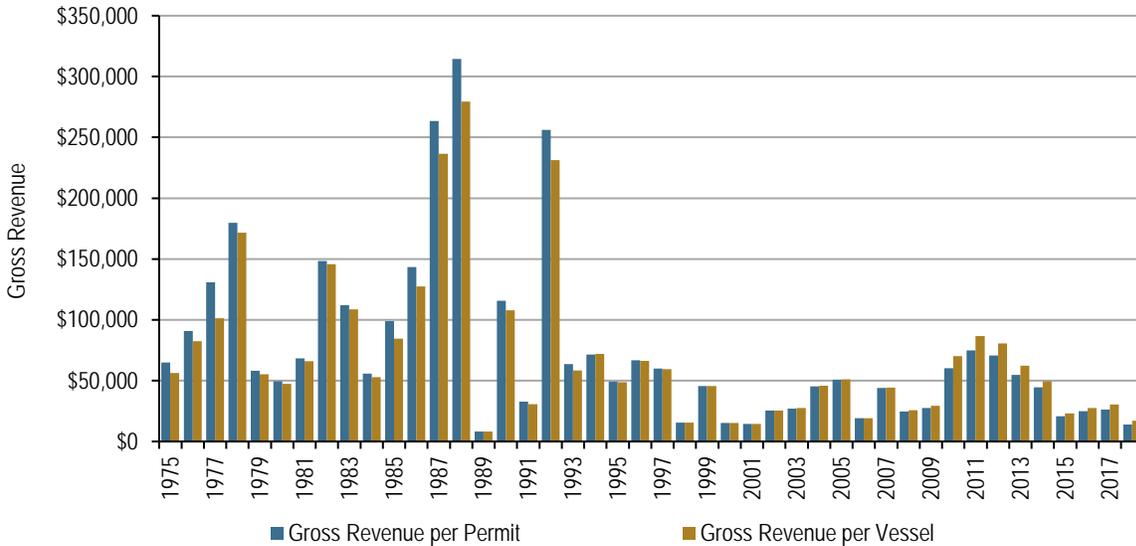
Notes: Prices are based on random fish ticket averages in both the set and drift gillnet fisheries in the UCI, and do not include bonuses or postseason adjustments. Values are adjusted for inflation to 2019 dollars using U.S. BLS Producer Price Index for unprocessed and prepared seafood.
Source: Marston and Frothingham (2019).

4.5.3.4.2.1. Gross Revenue Per Permit and Vessel

Figure 4-22 shows the estimated gross revenue per permit and per vessel in the UCI salmon drift gillnet fishery from 1975–2018. Revenue was estimated from weighted average ex-vessel prices. The revenue values by permit or vessel span the entire year, regardless of who held the permit or however many times

the permit was transferred. Permit counts include interim-entry permits and permanent permits. Some individuals made landings on both an interim-entry permit and subsequently on their adjudicated permanent permit in the same year; for these instances, only the permanent permit was counted (Alaska Commercial Fisheries Entry Commission 2019). The average gross revenue per permit from 1975–2018 was about \$73,830 for the UCI salmon drift gillnet fleet. However, over that period the average fluctuated considerably, with a high of more than \$314,000 in 1988 and a low of around \$14,500 in 2001 (not counting the year of the *Exxon Valdez* oil spill).

Figure 4-22 Gross revenue (inflation adjusted) per active permit and vessel in the UCI salmon drift gillnet fishery, 1975–2018.

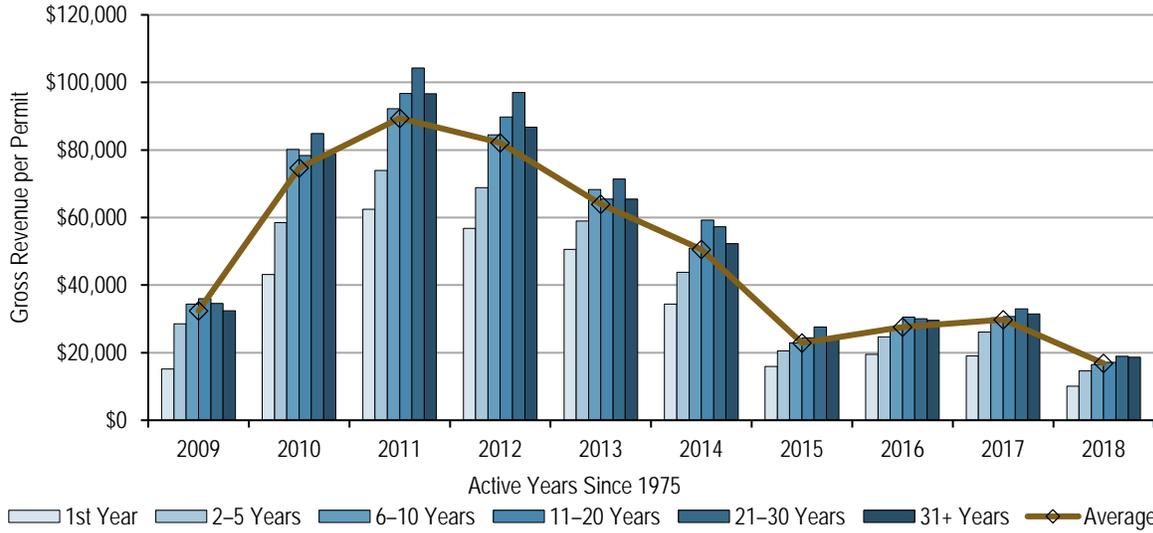


Notes:
Nominal gross revenue adjusted for inflation to 2019 dollars using U.S. BLS Producer Price Index for unprocessed and prepared seafood.
The 1989 fishing season was cut short due to the *Exxon Valdez* oil spill that occurred in Prince William Sound that year.
Source: Alaska Commercial Fisheries Entry Commission (2019).

4.5.3.4.2.2. Gross Revenue Per Permit by Longevity in the Fishery

Figure 4-23 summarizes average gross revenue per active S03H permit from 2009–2018 by the number of years of participation in the UCI drift gillnet fishery since 1975. Permit holders with less than six years of experience in the fishery generated less revenue than the average permit holder. First-year participants in the fishery generated 67% of the average gross revenue per permit across all permit holders, while permits holders with two to five years of experience generated 85% of the average gross revenue per permit. Permits holders with 21 to 30 years of experience in the fishery had the highest earnings, averaging 114% of the average gross revenue per permit.

Figure 4-23 Average gross revenue (inflation adjusted) per active S03H permit by years of participation UCI drift gillnet fishery, 2009–2018.



Notes: Nominal gross revenue adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted)
Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.5.3.4.3. Diversification of S03H Permit Holders

As discussed in Section 4.5.2.1, fishing opportunities in the UCI salmon drift gillnet fishery consist of only about two months during the summer salmon runs. As a result, most participants supplement their income from the fishery during the remainder of the year. This section examines the diversification of S03H permit holders in terms of participation in other fisheries and participation in wage-and-salary employment.

Table 4-8 summarizes participation by active S03H permit holders in other Alaska fisheries from 2009–2018, and the relative importance of these fisheries to permit holders in terms of gross revenue. The first section of the table shows that an average of 122 active S03H permit holders (27%) were also active in other Alaska fisheries, the most important being the halibut fishery.⁶³ The second section shows that active S03H permit holders averaged \$22.6 million in gross revenue in the UCI salmon drift gillnet fishery, and they averaged \$18.3 million in gross revenue in other fisheries. The third section shows that the gross revenue generated in these other fisheries accounted for 45% of the total fishery gross revenue of active S03H permit holders. The fourth section shows the percentage of active S03H permit holders in four categories of dependence on the UCI drift gillnet fishery: permit holders in the first category generated all of their fishery gross revenue in the UCI drift gillnet fishery; permit holders in the second category generated 50–99% of their fishery gross revenue in the fishery; permit holders in the third category generated 25–49%; and permit holders in the fourth category generated less than a quarter. An average of 73% of the active permit holders generated their entire fishery gross revenue in the UCI salmon drift gillnet fishery, while another 11% generated half or more of their gross revenue in the fishery. On average, 16% of active S03H permit holders generated more fishery revenue outside of the UCI salmon drift gillnet fishery than in the fishery.

⁶³ Anderson et al. (2017) evaluated trends in revenue and diversification over time for individuals fishing commercially in Alaska from 1985 to 2014. The authors found that active S03H permit holders who also fished for halibut were among those fishermen with the lowest estimated revenue variability.

Table 4-8. Gross revenue (inflation adjusted) diversification of active S03H permit holders, 2009–2018.

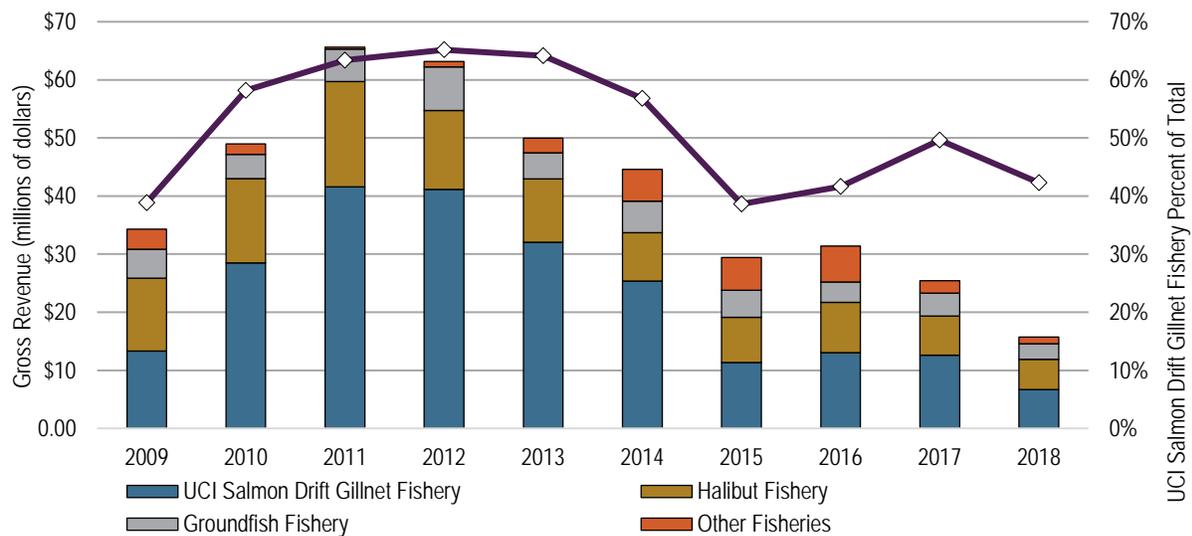
Fishery	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2009–2018 Average
Number of S03H permit holders by fishery											
UCI Salmon Drift Gillnet Fishery	411	381	465	501	501	501	496	473	424	396	455
Other Alaska Fisheries	129	115	133	139	133	125	123	121	105	98	122
<i>Halibut Fishery</i>	111	100	111	116	109	100	97	96	86	80	101
<i>Groundfish Fishery</i>	70	53	74	70	73	75	59	65	49	44	63
<i>Other Alaska Fisheries</i>	29	24	25	31	35	32	36	40	34	26	31
Gross revenue of S03H permit holders by fishery (millions of dollars)											
UCI Salmon Drift Gillnet Fishery	13.3	28.5	41.6	41.1	32.0	25.3	11.4	13.1	12.6	6.7	22.6
Other Alaska Fisheries	21.0	20.5	24.0	22.0	17.9	19.3	18.1	18.3	12.8	9.1	18.3
<i>Halibut Fishery</i>	12.5	14.5	18.1	13.6	10.9	8.4	7.7	8.7	6.7	5.2	10.6
<i>Groundfish Fishery</i>	5.0	4.2	5.6	7.5	4.5	5.4	4.7	3.5	4.0	2.7	4.7
<i>Other Alaska Fisheries</i>	3.4	1.8	0.3	0.9	2.5	5.5	5.7	6.2	2.1	1.2	3.0
Gross revenue by fishery as a percent of total gross fishery of revenue of S03H permit holders (%)											
UCI Salmon Drift Gillnet Fishery	39	58	63	65	64	57	39	42	50	42	55
Other Alaska Fisheries	61	42	37	35	36	43	61	58	50	58	45
<i>Halibut Fishery</i>	37	30	28	22	22	19	26	28	26	33	26
<i>Groundfish Fishery</i>	15	8	9	12	9	12	16	11	16	17	12
<i>Other Alaska Fisheries</i>	10	4	0	1	5	12	19	20	8	7	7
Percent of S03H permit holders in categories of UCI salmon drift gillnet fishery dependence (%)											
100% of Gross Revenue	69	70	71	72	73	75	75	74	75	75	73
50–99% of Gross Revenue	9	14	16	16	16	13	6	8	10	7	11
25–49% of Gross Revenue	10	11	9	8	7	7	11	10	8	7	9
< 25% of Gross Revenue	13	5	4	4	4	6	8	7	7	11	7

Notes: Nominal gross revenue adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted).

Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-24 summarizes the fishery gross revenue diversification of active S03H permit holders from 2009–2018.

Figure 4-24 Gross revenue (inflation adjusted) diversification of active S03H permit holders by fishery, 2009–2018.

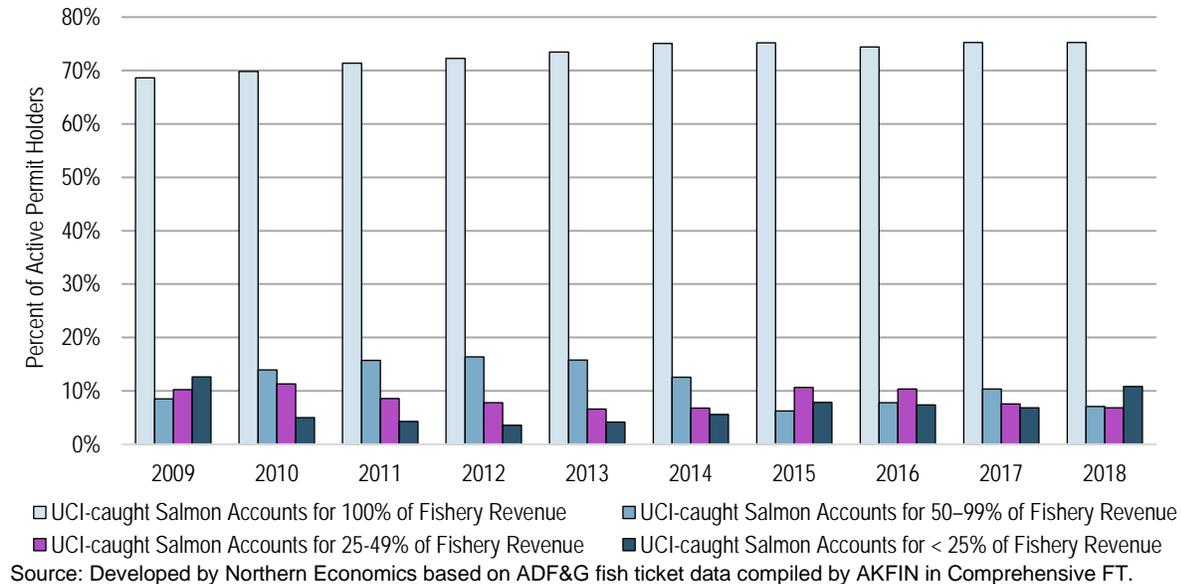


Notes: Nominal gross revenue adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted).

Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-25 shows the dependence of active S03H permit holders on the UCI salmon drift gillnet fishery in terms of their total gross revenue from all fisheries from 1999–2018. Permit holders are separated into four percentile groups based on their level of dependence: UCI-caught salmon accounts for 100% of fishery revenue; UCI-caught salmon accounts for 50–99% of fishery revenue; UCI-caught salmon accounts for 25–49% of fishery revenue; UCI-caught salmon accounts for < 25% of fishery revenue. The figure shows that the majority (73%) of active S03H permit holders were dependent on the UCI salmon drift gillnet fishery for all of their fishery revenue from 1999–2018.

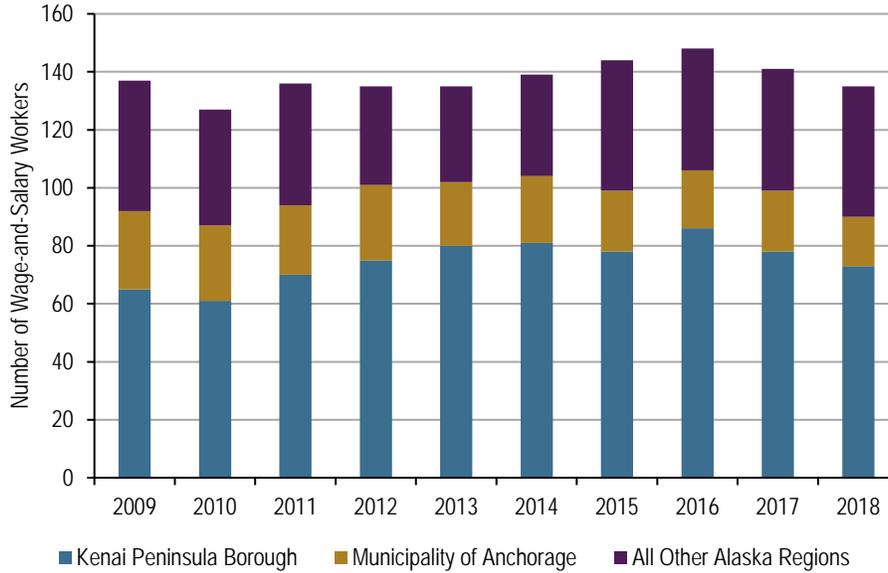
Figure 4-25 Gross revenue dependence of active S03H permit holders on the UCI salmon drift gillnet fishery by dependence percentile group, 2009–2018.



Diminishing economic incentives to participate in the UCI salmon drift gillnet fishery and commercial fishing in general have led some participants to seek secondary forms of work (Glazier et al. 2006). The number of active S03H permit holders engaged in wage-and-salary employment from 1999–2018 is shown in Figure 4-26 by place of work. On average, a total of 138 S03H permit holders had wage-and-salary jobs each year, which represents about one-third of all active permit holders. Most (54%) of these individuals worked in the Kenai Peninsula Borough. The average annual total compensation was over \$7.8 million, with an average annual salary of around \$56,800 per person.⁶⁴

⁶⁴ Self-employment is not considered wage-and-salary employment. Therefore, this analysis may underestimate the gross income earned from non-fishery activities.

Figure 4-26 Number of active S03H permit holders with wage-and-salary employment by place of work, 2009–2018.



Source: Spreadsheet supplied by Alaska Department of Labor and Workforce Development (personal communication, April 3, 2020).

Table 4-9 lists the occupations of the active S03H permit holders with wage-and-salary employment from 1999–2018. On average, 70% of the employed permit holders held jobs in the top five occupations (education, construction, transportation, management, and production).

Table 4-9 Number of active S03H permit holders with wage-and-salary employment by occupation, 2009–2018.

Occupation	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Management	7	9	9	7	10	13	8	8	8	4
Business and Financial Operations	3	2	1	1	2	1	1	2	1	1
Computer and Mathematical	0	0	0	0	0	0	0	0	0	0
Architecture and Engineering	1	0	2	1	2	1	1	3	2	2
Life, Physical, and Social Science	4	4	3	1	1	1	0	0	0	0
Community and Social Service	0	1	0	0	0	0	1	1	3	2
Legal	1	1	1	1	1	1	1	1	1	1
Educational Instruction and Library	14	13	14	16	17	20	22	26	25	22
Arts, Design, Entertainment, Sports, and Media	0	1	4	3	4	3	0	0	1	0
Healthcare Practitioners and Technical	1	1	1	1	3	2	5	3	3	2
Healthcare Support	2	4	6	4	5	3	0	2	3	7
Protective Service	4	3	3	5	5	7	5	5	4	5
Food Preparation and Serving Related	2	1	4	3	2	3	2	3	3	5
Building and Grounds Cleaning and Maintenance	2	5	3	5	1	3	3	3	3	2
Personal Care and Service	0	0	0	2	0	0	2	3	2	0
Sales and Related	2	2	2	2	3	0	1	2	0	2
Office and Administrative Support	3	5	7	7	3	7	9	7	5	5
Farming, Fishing, and Forestry	0	1	2	1	2	0	1	1	3	4
Construction and Extraction	47	25	26	24	20	23	32	35	32	32
Installation, Maintenance, and Repair	9	6	8	10	9	11	9	5	5	5
Production	13	17	18	17	19	16	17	17	13	11
Transportation and Material Moving	22	26	22	24	26	24	24	21	23	22
All Occupations	137	127	136	135	135	139	144	148	140	134

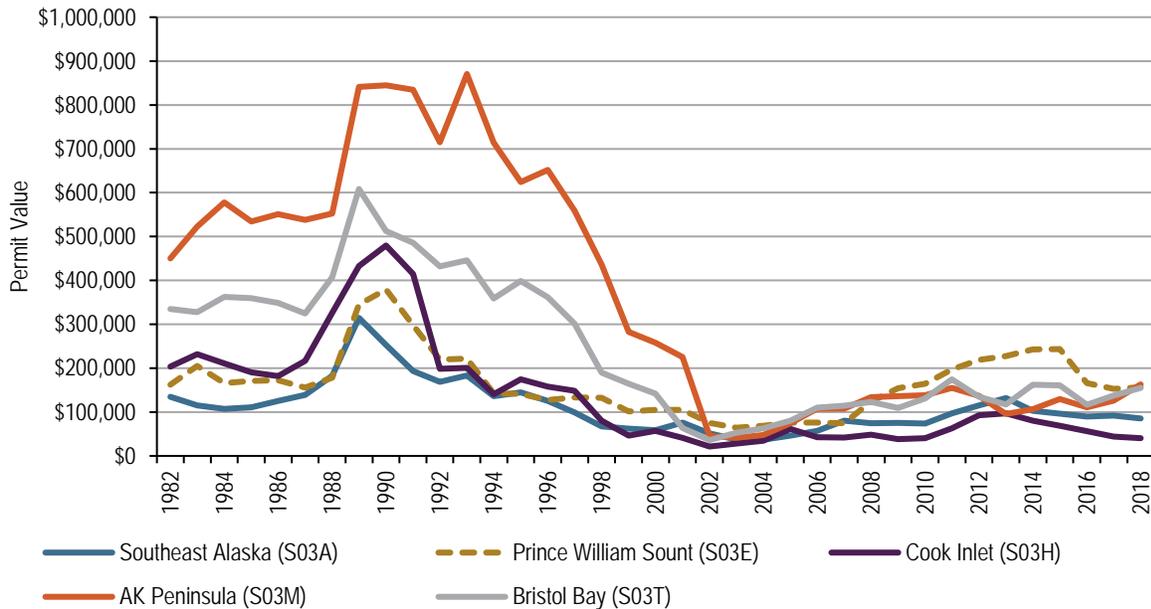
Source: Spreadsheet supplied by Alaska Department of Labor and Workforce Development (personal communication, April 3, 2020).

4.5.3.4.4. Fishing Permit Values

CFEC permits for the UCI salmon drift gillnet fishery and other Alaska salmon fisheries may be bought and sold. Changes in the market value of CFEC permits reflect differences in expected potential revenue and profits in a fishery, with permit value often lagging one to two years behind fishery performance. Because a CFEC permit, along with a vessel and fishing gear, are among a fishing operation’s primary economic assets, the effect of a decline in permit value is a financial loss to the fishing operation (Knapp et al. 2007).⁶⁵

As presented in Figure 4-27, the value of a S03H permit experienced a sharp rise in the late 1980s through the early 1990s concomitant with high salmon ex-vessel prices (Section 4.5.3.4.2) and gross revenue per active permit (Section 4.5.3.4.2.1). However, as discussed above, beginning in the mid-1990s and continuing into the early 2000s the price of salmon dropped across the State. A S03H permit had an inflation adjusted apex value of around \$479,613 in 1990, and the value reached a nadir in 2002 at about \$36,000. Figure 4-27 shows that four other drift gillnet permits showed similar price trends with respect to a high around 1990 and a low in the early 2000s.

Figure 4-27 Value (inflation adjusted) of drift gillnet permits by fishery, 1982–2018.

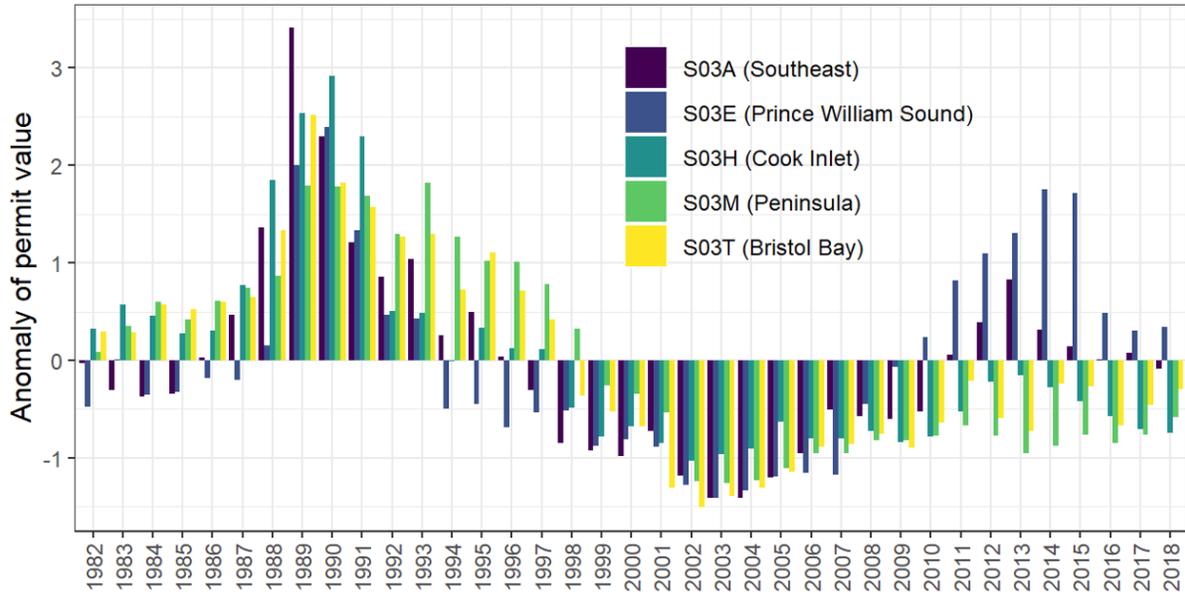


Notes:
Nominal permit value adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted).
Source: Adapted from Watson (2019).

An alternative method for comparing trends in the value of different drift gillnet permits is to standardize the value of each permit relative to that permit’s long-term average value (Figure 4-28). Starting in the late 1990s the value of all drift gillnet permits fell below their long-term average (bars below zero). Since 2010, Prince William Sound and Southeast Alaska permit prices have rebounded, while Cook Inlet, Bristol Bay, and Alaska Peninsula permits have remained below average. For the last few years, Southeast Alaska permits have hovered around their long-term average.

⁶⁵ An asset is a resource that an individual or firm owns with the expectation that it will provide a future economic benefit.

Figure 4-28 Permit value anomalies for drift gillnet fisheries, 1982–2018.

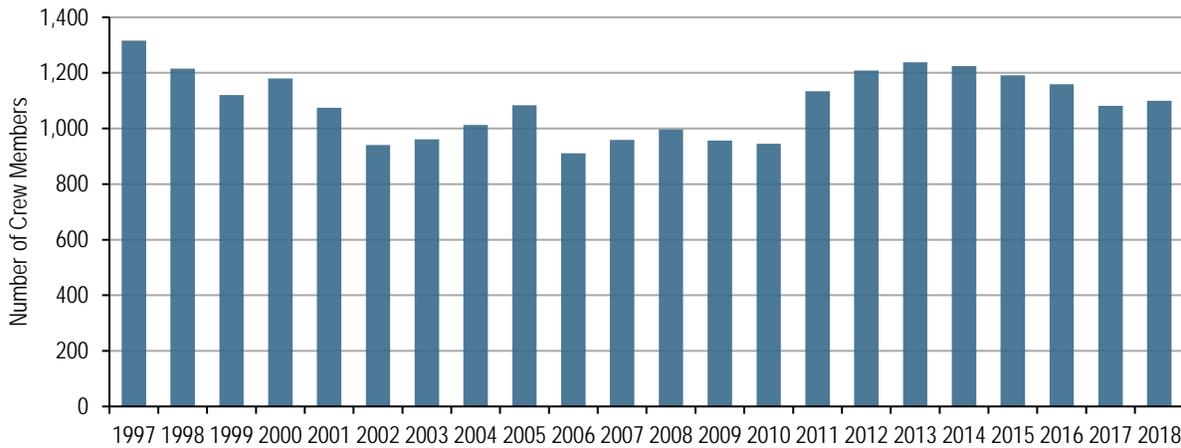


Source: Watson (2019).

4.5.3.5. Harvester Employment

The Alaska Department of Labor and Workforce Development uses surveys of CFEC permit holders to estimate crew factors in Alaska’s commercial fisheries. The crew factor is equal to the estimated average size of vessel crews in a fishery, excluding the skipper. Using crew factor estimates from the 2010 survey (adjusted to account for skippers) and assuming that each permit fished corresponds to a separate fishing operation, the annual number of harvester jobs in the UCI salmon drift gillnet fishery was estimated from 1997–2018 (Figure 4-29). The average annual number of positions in the fishery over the time period was 1,091. The number of separate persons that were active in the fishery is likely larger due to turnover in positions.

Figure 4-29 Crew employment in the UCI salmon drift gillnet fishery, 1997–2018.



Source: Adapted from Watson (2019).

4.5.4. Processors/Buyers

4.5.4.1. Processor/Buyer Participation and Dependency

The processing sector of the UCI salmon drift gillnet fishery is relatively diverse. Unlike some fisheries in other regions of Alaska, it is not dominated by one or two shorebased plants.⁶⁶ Table 4-10 shows that an average of 13 shorebased processors were active in the fishery annually from 2009–2018. The table also shows that the number of plants experienced a downward trend over this period. Facilities likely closed due to some of the same economic difficulties experienced by the harvesting sector, including variability in the scale of salmon runs.

Table 4-10 Number of shorebased processors active in the UCI salmon drift gillnet fishery, 2009–2018.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2009–2018 Average
	Number of Shorebased Processors Active in the UCI Salmon Drift Gillnet Fishery										
	16	16	13	11	14	12	12	11	12	11	13
Fishery	Number of Shorebased Processors Active in the UCI Salmon Drift Gillnet Fishery that are Also Active in Other Fisheries										
Other Salmon	15	15	12	11	13	12	12	11	12	9	12
Halibut	9	9	8	7	8	7	6	6	6	4	7
Groundfish	5	8	8	6	7	5	5	5	7	5	6
All Other Fisheries	9	11	10	7	8	6	5	6	7	6	7

Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Due to the location of many Kenai Peninsula communities on the road system and the Kenai Peninsula’s proximity to the heavily populated Anchorage/Mat-Su region, some drift gillnet fishermen are able to sell their catch directly to consumers (McDowell Group 2015). Table 4-11 summarizes the activity of catcher-sellers and direct marketing operations that participated in the UCI salmon drift gillnet fishery from 2009–2018.⁶⁷ These operations generated an average of \$0.1 million per year in total ex-vessel value. Additional information on direct marketers and catcher-sellers is provided in Section 4.5.6.

Table 4-11 Number and ex-vessel value (inflation-adjusted) of catcher-sellers and direct marketers active in the UCI salmon drift gillnet fishery, 2009–2018.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2009–2018 Average
	Number of Operations Active in the UCI Salmon Drift Gillnet Fishery										
Catcher-Sellers	NA	4	5	5	5	5	10	7	5	4	6
Direct Marketers	9	5	4	3	6	6	8	8	10	8	7
	Ex-Vessel Value from UCI Salmon Drift Gillnet Fishery (\$millions)										
Catcher-Sellers	NA	0.06	0.01	0.01	0.02	0.02	0.03	0.01	0.01	0.01	0.02
Direct Marketers	0.05	0.10	0.08	0.06	0.09	0.11	0.06	0.05	0.11	0.06	0.08

Notes: Nominal gross revenue adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted)

NA = Data are masked for confidentiality.

Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Other types of processors/buyers are also active in the UCI salmon drift gillnet fishery, including floating processors, buyer-exporters, and catcher-exporters, although only one or two of each type may be active

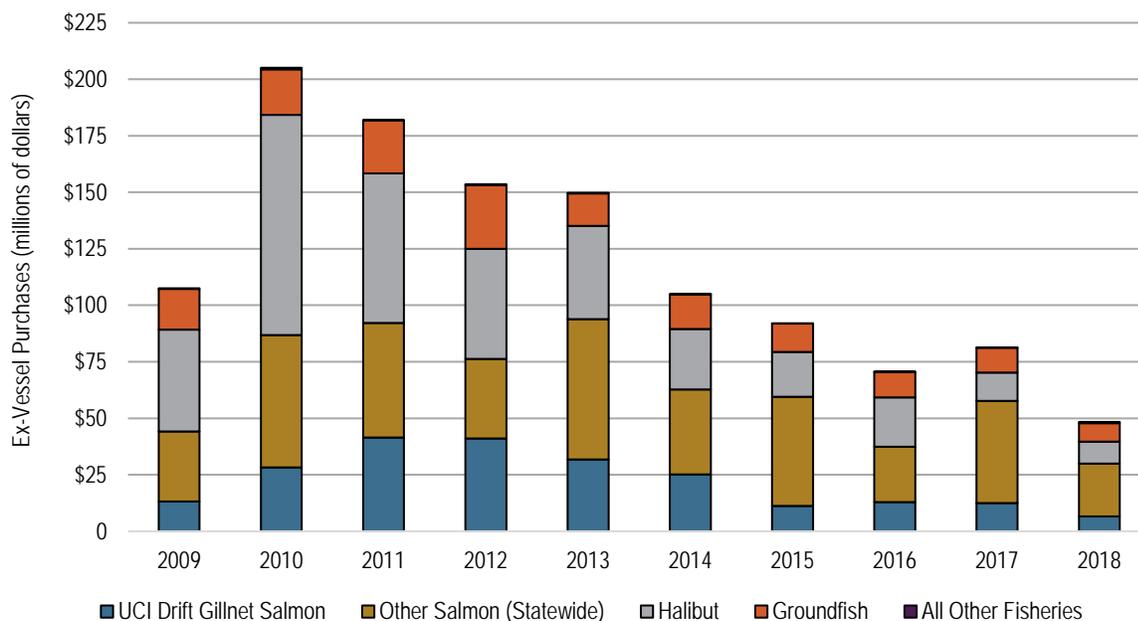
⁶⁶ Shorebased processor: Operates a facility/business located onshore that can buy fishery resources and process, export, and/or be a custom processor or has another facility process on their behalf. A cannery license is required if any canning is to be conducted (Alaska Department of Fish and Game 2020e)

⁶⁷ Direct marketer: An individual who sells or exports only their own catch. Their catch can be processed on their vessel, processed at a shore-side plant or custom-processed by a licensed vessel or facility. Fish caught by another fisherman cannot be purchased and sold with this license.

Catcher-seller: Sells unprocessed and unpackaged fishery resources at the dock directly to the public or to food establishments that have a seafood processing waiver. They are required to have code plates and complete fish tickets (Alaska Department of Fish and Game 2020e)

in a given year. Shorebased processors are by far the largest purchasers of salmon harvested in the fishery, receiving 99% of the salmon landed from 2009–2018. Table 4-10 shows that many of these shorebased processors were also active in other salmon fisheries around the State as well as halibut and groundfish fisheries. Figure 4-30 presents the ex-vessel payments made by shorebased processors to harvesters in various fisheries from 2009–2018. Over that period, shorebased processors paid out an average of \$22.4 million annually to harvesters in the UCI salmon drift gillnet fishery, with another \$41.6 million paid to harvesters in other salmon fisheries from around the State. Harvesters in halibut, groundfish, and miscellaneous fisheries received another \$55.2 million on average. Ex-vessel payments to harvesters in the UCI salmon drift gillnet fishery accounted for 19% of the total purchases of the shorebased processors.

Figure 4-30 Ex-vessel gross payment (inflation adjusted) diversification of shorebased processors accepting deliveries of UCI drift gillnet-caught salmon, 2009–2018.

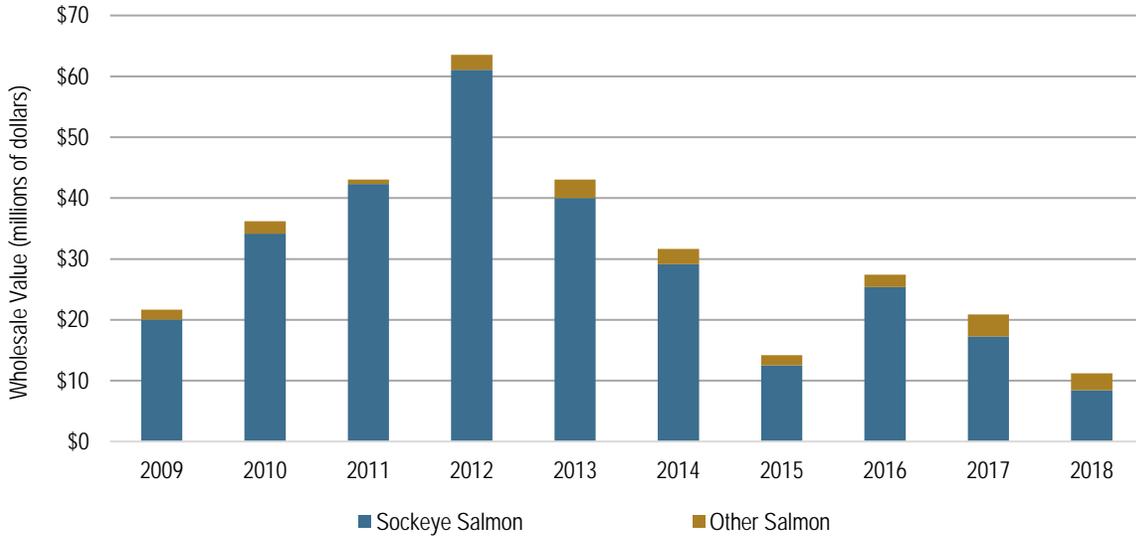


Notes: Nominal ex-vessel gross payments adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted). Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

First wholesale value is the value of seafood products when sold to buyers outside a processor’s affiliate network. This is the value of the raw fish delivered to the processor (ex-vessel value) plus the value added by the first processor (McDowell Group 2017a). The first wholesale value generated from landings in the UCI salmon drift gillnet fishery was estimated based on data reported by processors to ADF&G in the Commercial Operator Annual Reports (COAR). Because processors may buy salmon or other species from a wide range of fisheries, it is generally not possible from the COAR data to determine the precise amount of processed product and value that is generated from an individual salmon fishery. For example, processors of salmon harvested in the UCI salmon drift gillnet fishery also may have purchased significant quantities of salmon from the Prince William Sound salmon fishery and are also likely to have purchased salmon from the set gillnet or purse seine fisheries in Cook Inlet. In this assessment, COAR data reported by shorebased processors located on the Cook Inlet side of the Kenai Peninsula Borough are summarized by year. The total wholesale value for each species is divided by the total pounds purchased of each species from all salmon fisheries. This yields an estimate of the average round-weight wholesale value for each salmon species by year. This value is then applied to the pounds of UCI drift gillnet salmon

by species to generate an estimated total wholesale value. Figure 4-31 shows the estimated wholesale value generated from landings in the UCI salmon drift gillnet fishery.

Figure 4-31 Wholesale value (inflation adjusted) of landings in the UCI salmon drift gillnet fishery, 2009–2018.



Notes: Nominal values adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted).
Source: Developed by Northern Economics based on ADF&G fish ticket data and COAR data compiled by AKFIN.

In addition to adding significant value to the salmon harvested in UCI salmon drift gillnet fishery, processors/buyers contribute to the economy with the wages and salaries they pay their workers. Table 4-12 shows the employment and wages of Kenai Peninsula shorebased processors that were active in the UCI salmon drift gillnet fishery from 2009–2018. Most seafood processing jobs require relatively little on-the-job training and less than a high school diploma (Strong 2014).

Table 4-12 Employment and wages in Kenai Peninsula shorebased processors active in the UCI salmon drift gillnet fishery, 2009–2018.

	Number of Firms	Total Compensation	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Average
			Number of Employees				
2009	20	\$14,894,084	161	1,074	1,414	275	731
2010	19	\$17,003,868	287	946	1,496	316	761
2011	19	\$17,231,535	286	1,023	1,639	312	815
2012	19	\$17,171,553	317	1,031	1,622	274	811
2013	17	\$19,668,417	302	1,085	1,783	301	868
2014	17	\$16,536,979	366	1,138	1,796	513	953
2015	18	\$18,535,309	309	988	1,887	325	877
2016	16	\$12,595,524	318	662	1,458	283	680
2017	14	\$11,366,850	273	648	1,040	304	566
2018	15	\$9,192,726	156	581	845	280	466

Note: Total Compensation has been adjusted for inflation to 2019 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted).
Source: Warren (2020).

Alaska’s seafood processing industry is well known for the many nonresidents who come to the State in the summer to work the processing lines (Kreiger 2016). One reason for the heavy reliance on nonresident workers to fully staff production jobs in seafood processors is the seasonality of many Alaska fisheries,

especially salmon. As shown in the quarterly employment data in Table 4-12, this seasonality has a significant effect on the number of seafood processing jobs across the year. Employment typically increases during the summer salmon season and falls in the winter (McDowell Group 2015).

According to data compiled by the Alaska Department of Labor and Workforce Development (2020a), in 2017, 57% of the seafood processing jobs in the Kenai Peninsula Borough were held by persons who were not Alaska residents. However, this nonresident workforce is smaller than that of many other seafood processors in Alaska. For example, 88% of the workers at Bristol Bay Borough seafood processors were nonresidents in 2017. Moreover, seafood processing continues to be a career for many resident workers in Kenai Peninsula processors, with nearly 18% having worked in the industry for five consecutive years (Alaska Department of Labor and Workforce Development 2020b). As a result of this job longevity, residents are more likely to be employed in management and maintenance positions, and therefore, they earn a disproportionately high share of processing wages (McDowell Group 2017a).

4.5.5. Fishing Communities

For this fishing community assessment, a two-part approach was used. First, tables based on existing quantitative fishery information were developed to identify patterns of engagement in and dependence on the relevant sectors of the UCI salmon drift gillnet fishery (i.e., the sectors most likely to be directly affected by one or more of the alternatives).⁶⁸ This is consistent with National Standard 8 guidelines, which 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).⁶⁹

Following an overview of community engagement in the fishery from 1975 through 2018 (Section 4.5.5.1), tabular information and accompanying narrative developed under this approach are presented for the most recent ten years for which data are available (2009-2018) in Section 4.5.5.2. However, data confidentiality restrictions place limitations on the data that can be utilized for these purposes. For example, where a community is the site of one or two shorebased processors, no information can be disclosed about the volume and/or value of local landings. This severely limits a quantitative community-level analysis of the potential impacts of the proposed action and alternatives.

The second approach involved selecting a subset of Alaska communities participating in the fishery for characterization of the community context of the fishery to support analysis of the range, direction, and order of magnitude of potential social- and community-level impacts of the proposed action and alternatives. Using a subset of communities rather than all the communities in the region(s) involved in the UCI salmon drift gillnet fishery is consistent with National Standard 8 guidelines, which State:

The best available data on the history, extent, and type of participation in these fishing communities in the fishery should be incorporated into the social and economic information presented in the FMP. The analysis does not have to contain an exhaustive listing of all communities that might fit the definition; a judgment can be made as to which are primarily affected (50 CFR 600.345).

⁶⁸ Dependence on a fishery can be measured in multiple ways and is a complex concept with economic, social, and other dimensions. In the case of the referenced summary tables, the economic dimension of dependence is characterized simply as the proportional contribution of vessel gross revenue (for harvesters) or first wholesale gross revenue (for processors) resulting from engagement in the relevant fishery relative to the overall vessel gross revenue or first wholesale gross revenue generated by vessels or shorebased processors from their engagement in all species, gear, and area fisheries.

⁶⁹ National Standard 8 guidelines available at https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=6b0acea089174af8594db02314f26914&mc=true&r=SECTION&n=se50.12.600_1345.

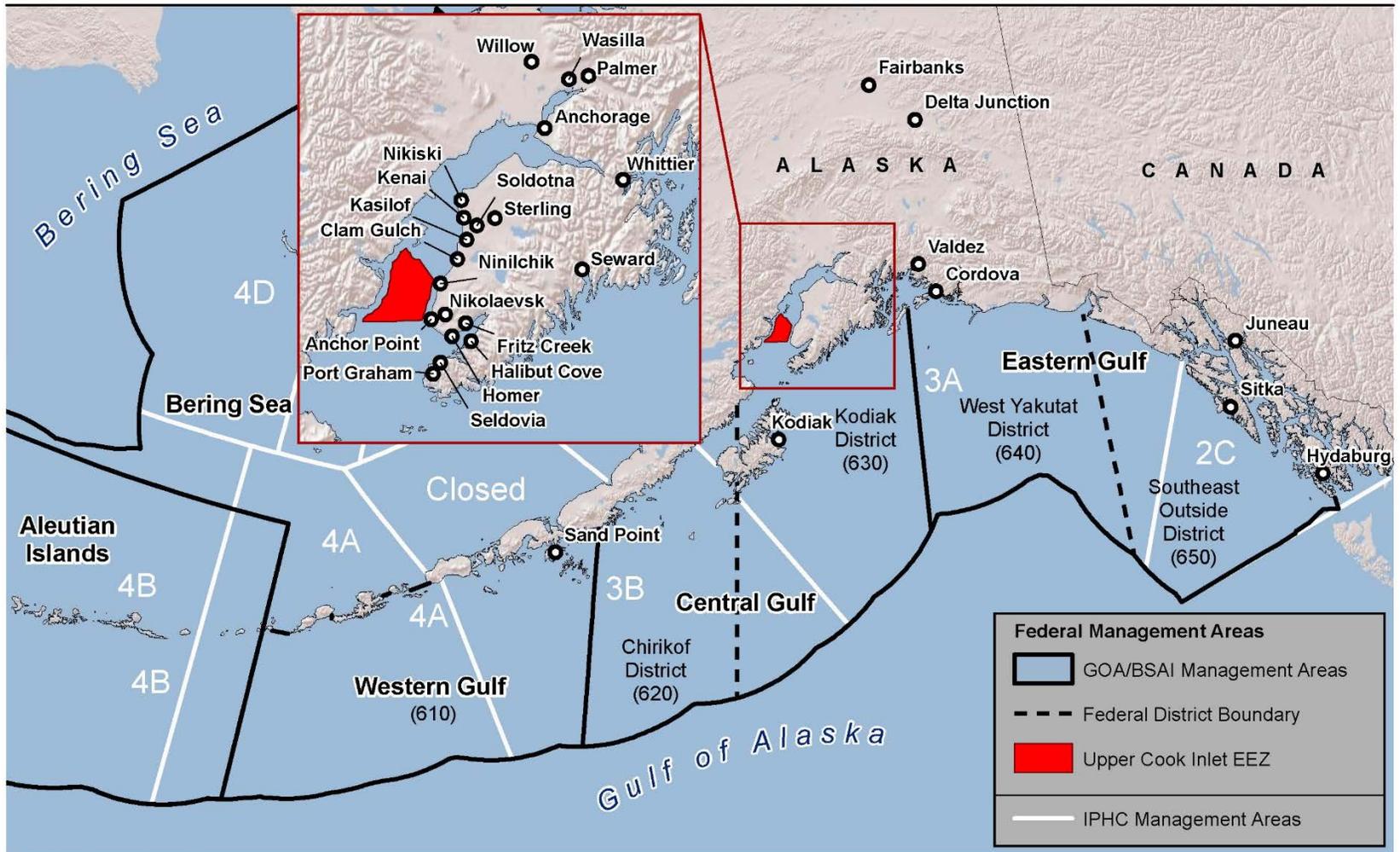
Communities (and types of potential community/social impacts) vary based upon the type of engagement of the individual community in the fishery, whether it is through being home to a portion of the UCI salmon drift gillnet fleet, the location of shorebased processing, or the location of fishery support sector businesses. In short, this second approach uses the community or region as the frame of reference or unit of analysis (as opposed to the fishery sector as used in the first approach); within the community or region, the local nature of engagement or dependence on the fishery varies in terms of the various sectors present in the community and the relationship of those sectors (in terms of size and composition, among other factors) to the rest of the local social and economic context.

This approach then qualitatively provides a context for potential community impacts that may occur because of fishery management-associated changes to the locally present sectors in combination with other community-specific attributes and socioeconomic characteristics. The characterization of the relevant communities has been largely undertaken with existing information, supplemented with phone and email contact with a limited number of individuals. Information on the community context of the fisheries is presented in Section 4.5.5.3. Finally, information on community level fishery tax related revenue is presented in Section 4.5.5.4.

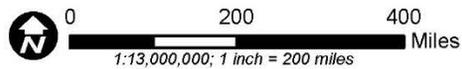
The following figures show the geographic relationship among the communities engaged in or dependent on the fishery. Also shown is the spatial relationship between the State and Federal waters and the proximity of the relevant fishing communities to those areas. Specifically:

- Figure 4-32 shows the location of Alaska communities engaged in the fishery through local ownership of one or more vessels and/or the local operation of one or more shorebased processors that participated in the fishery in any year from 2009–2018.
- Figure 4-33 shows the location of selected communities outside of Alaska that were engaged in the fishery through local ownership, on an annual average basis, of one or more vessels that participated in the fishery from 2009–2018.
- Figure 4-34 shows the overlap of the EEZ waters of Upper Cook Inlet with existing ADF&G management area districts, subdistricts, and sections. This figure also shows the location of communities in the immediate vicinity that were engaged in the UCI salmon drift gillnet fishery through local ownership of one or more vessels and/or the local operation of one or more shorebased processors that participated in the fishery one or more years from 2009–2018.
- Figure 4-35 shows the distance by water, in nautical miles, from nearby coastal communities engaged in the UCI salmon drift gillnet fishery to the closest point of the Cook Inlet EEZ. It is important to note that there are no harbors north of the Kenai River where drift gillnet salmon fishing originates and, unless a boat anchors up for the night, there are no harbors or other areas from which drift fishing originates on the western shore of Upper Cook Inlet. Further, it is important to note that the spatial pattern of fishing effort, including effort inside the Cook Inlet EEZ, is not static over the course of a run of a given salmon stock. As described elsewhere, the concentration of UCI salmon drift gillnet fishing effort generally shifts from south to north as the run of a stock of interest progresses. In other words, from early to late in the run of a given stock of interest, the distance from communities to favored fishing areas progressively increases for communities in the southern portion of the area shown and decreases for communities in the northern portion of the area shown. As detailed in Section 1, the FMP currently prohibits all commercial salmon fishing in the EEZ south of the Anchor Point Line.

Figure 4-32 Map of selected Alaska communities engaged in the UCI salmon drift gillnet fishery from 2009–2018 and adjacent North Pacific and International Pacific Halibut Commission Fisheries regulatory areas.

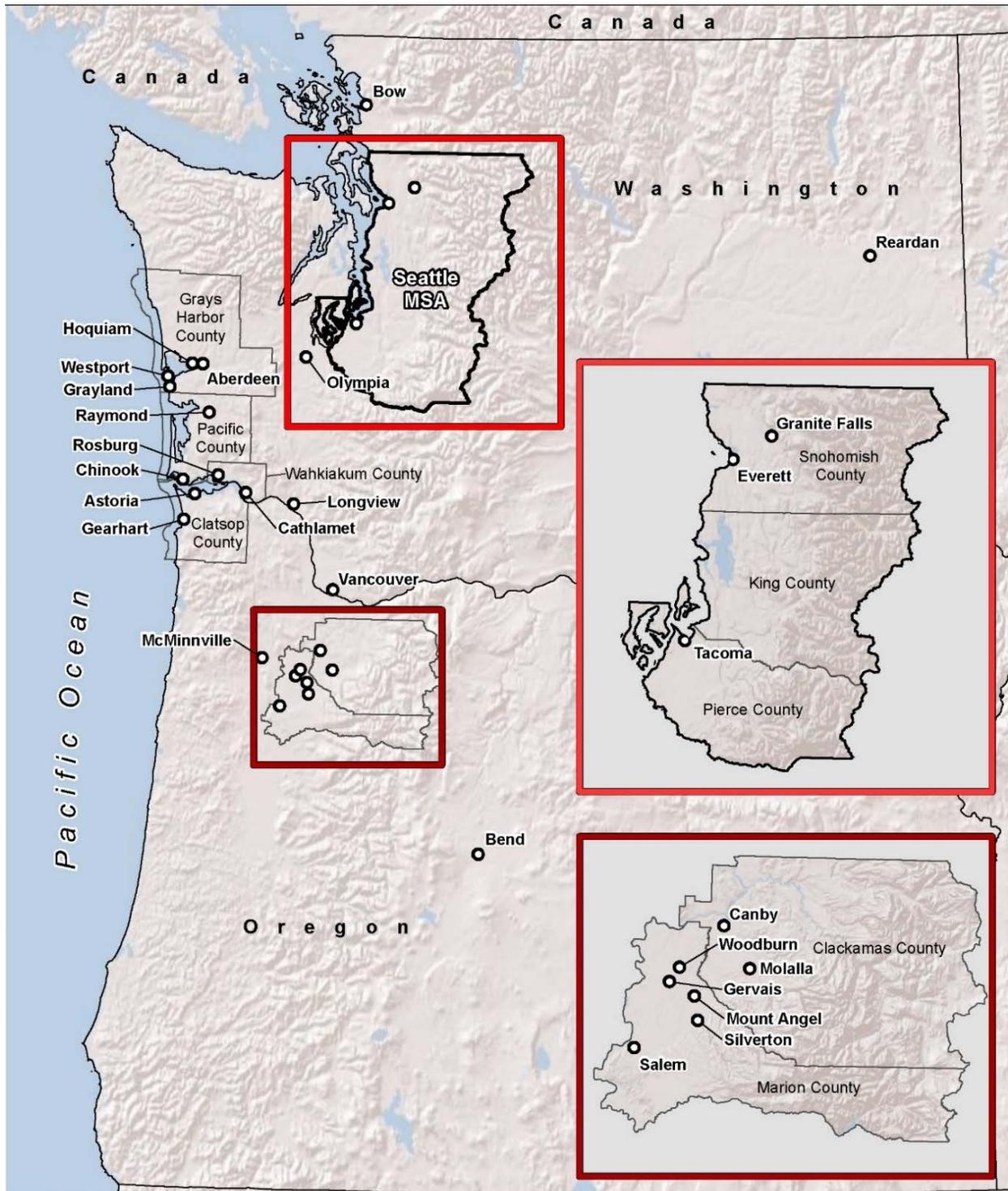


Source: esri, ADF&G, IPHC, and ADNIR



Source: Developed by Wislow Research based on NOAA-supplied boundary data and ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-33 Map of selected Washington and Oregon communities engaged in the UCI salmon drift gillnet fishery, 2009–2018.

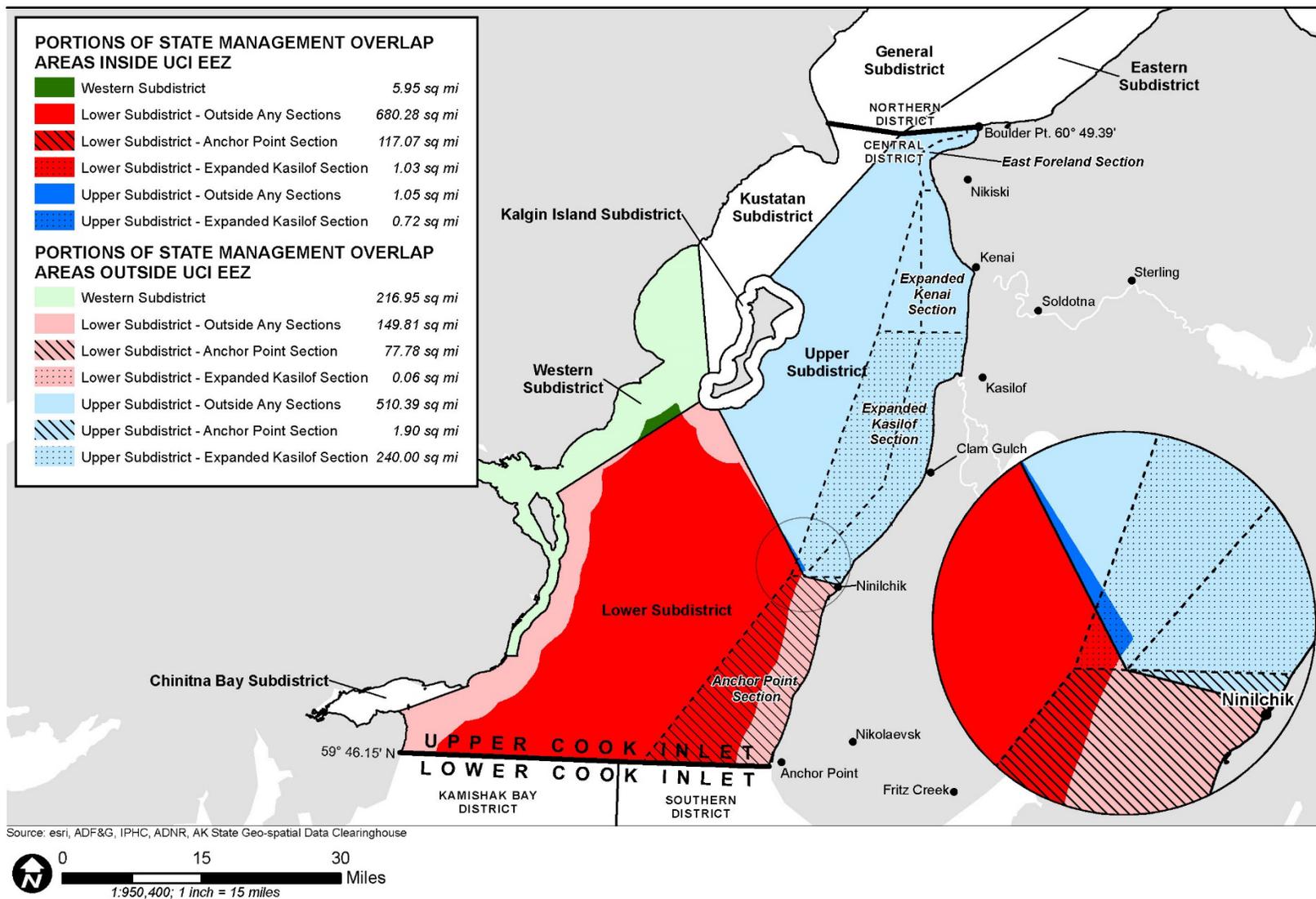


Source: U.S. Census Bureau 2011; ESRI 2014



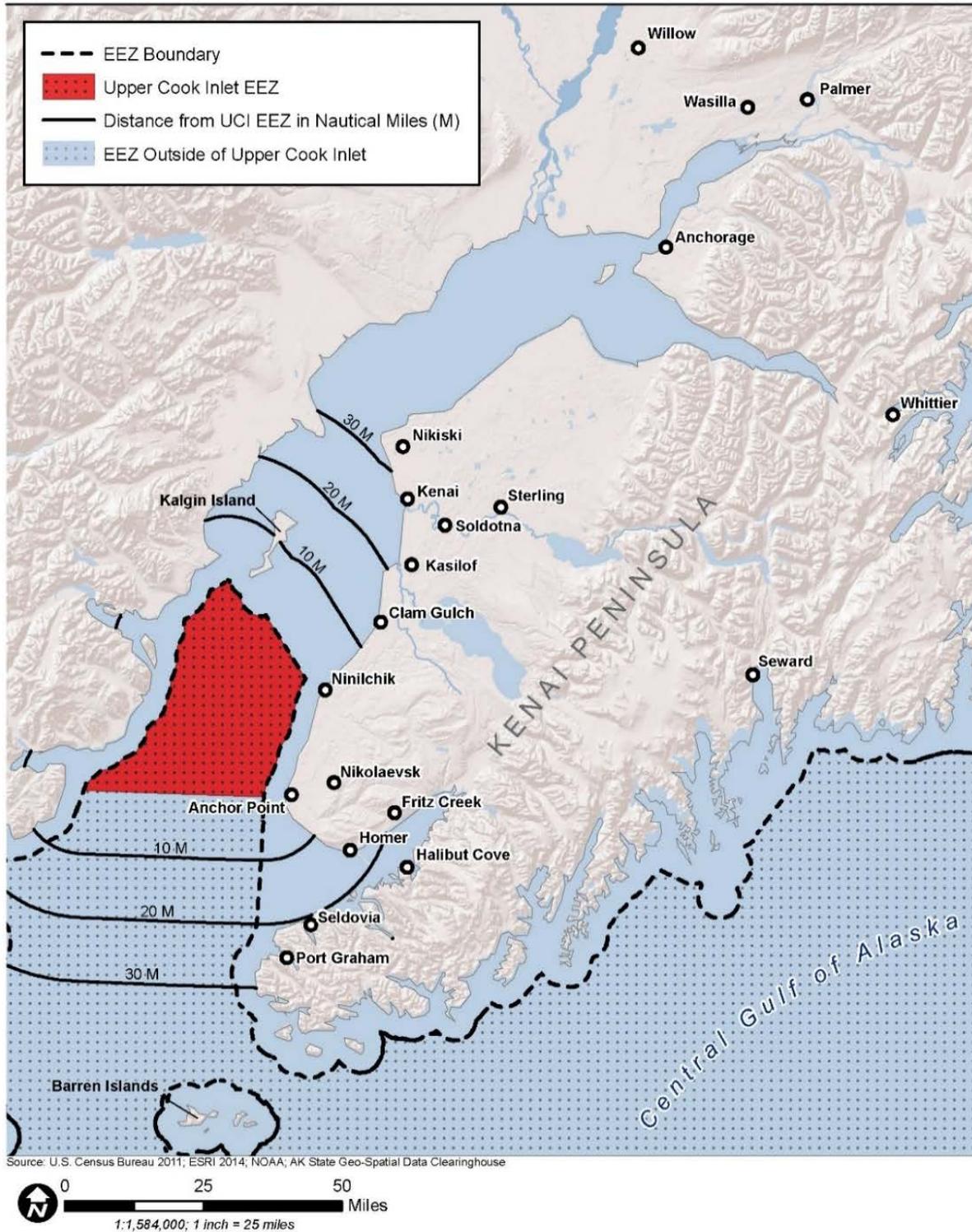
Source: Developed by Wislow Research based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-34 Map of coincidence of Cook Inlet EEZ with ADF&G management areas and nearby Alaska communities engaged in the UCI salmon drift gillnet fishery, 2009–2018.



Source: Developed by Wislow Research based on ADF&G and NOAA supplied boundary data and ADF&G base map.

Figure 4-35 Map of distance from Cook Inlet EEZ to coastal communities engaged in the UCI salmon drift gillnet fishery, 2009–2018.

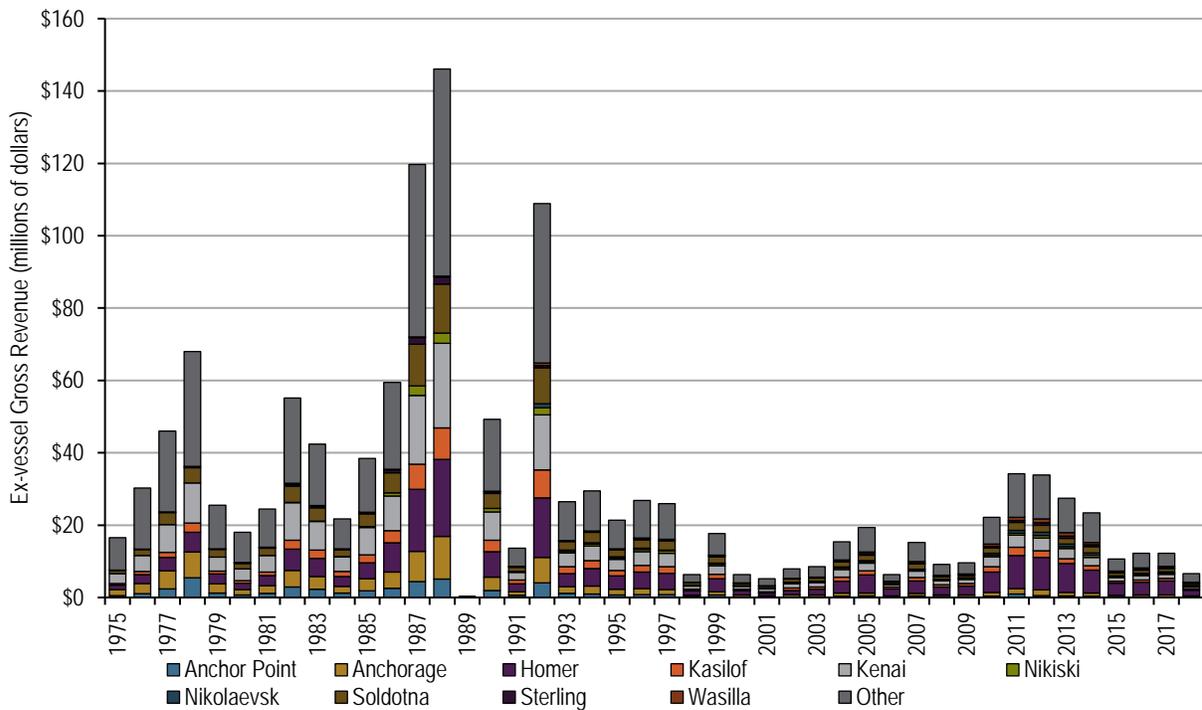


Source: Developed by Wislow Research based on NOAA boundary data and ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.5.5.1. Overview of Community Fishery Engagement 1975-2018

Figure 4-36 illustrates the distribution of vessel gross revenue across the ten communities with the greatest number of S03H permit holders from 1975–2018.⁷⁰ Eight of the top ten earning communities are located within the Kenai Peninsula Borough, with two other Alaska communities (Anchorage and Wasilla) rounding out the top ten. Communities outside of Alaska with notable concentrations of permit holders over this time span include Cathlamet, Washington and Astoria, Oregon. On average, from 1975–2018, 61% of S03H permit holders have resided in one of the top ten towns and they have accounted for an average of 62% of the annual ex-vessel value of the UCI salmon drift gillnet fishery. Homer is the most common community of residence for S03H permit holders and in recent years the proportion of Homer residents participating in the fishery has grown. From 1997–2018, the community had an average of 100 permit holders who were active in the UCI salmon drift gillnet fishery, with a combined annual average estimated gross revenue of \$3.1 million from harvests in the fishery.

Figure 4-36 Ex-vessel gross revenue (inflation adjusted) for the ten communities with the greatest number of S03H permit holders, 1975–2018.



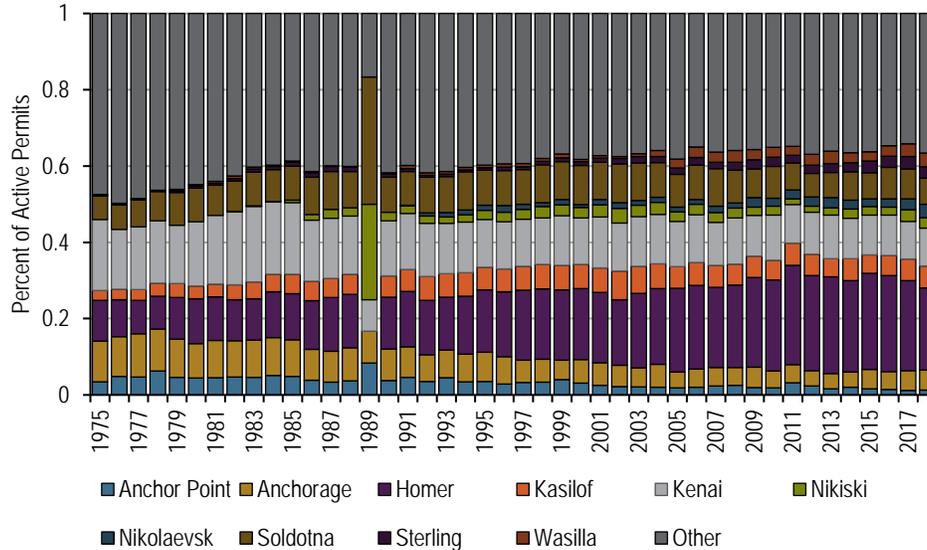
Notes:
Nominal gross revenue adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index.
The 1989 fishing season was cut short due to the Exxon Valdez oil spill that occurred in Prince William Sound that year.
Source: Adapted from Watson (2019).

Figure 4-37 shows a relatively stable participation in the UCI salmon drift gillnet fishery (based on a S03H permit being active in a season) by community. One issue previously noted by the Cook Inlet

⁷⁰ Additional information on longer term socioeconomic trends in the fishery not presented at the individual community level may be found in preceding sections including, for example, harvest trends 1966–2018 (Section 4.5.2.2).

Salmon Committee⁷¹ as a change in participation in the fishery over the years has been the “graying of the fleet.” That issue is described in detail in Section 4.5.3.2.

Figure 4-37 Percentage of S03H permits fished in a given year by the community in which the permit is registered, 1975–2018.



Notes: The 1989 fishing season was cut short due to the *Exxon Valdez* oil spill that occurred in Prince William Sound that year.
Source: Adapted from Watson (2019).

Figure 4-38 shows volume of landings and Figure 4-39 shows the value landings of UCI drift gillnet-caught salmon for the period 1978–2018. Landings differentiated by individual port are only shown for 1992–2018 (as the data from 1978–1991, shown on the figures as “all ports” combined, are not of a quality comparable to that of data available for more recent years). It is important to note that the port of landing (reflected in fish ticket data) and the community where processing takes place (reflected in COAR data) are not always be the same, as salmon landed by harvest vessels or tenders in one port may be trucked to another road-connected community for processing. For example, as noted in the Cook Inlet Salmon Committee meeting report of September 2019, while offloading occurs in Homer, Ninilchik, and Kasilof, processing occurs elsewhere, including Seward, which was specifically noted by the committee as an important processing (but not landing) location for Cook Inlet salmon.^{72,73}

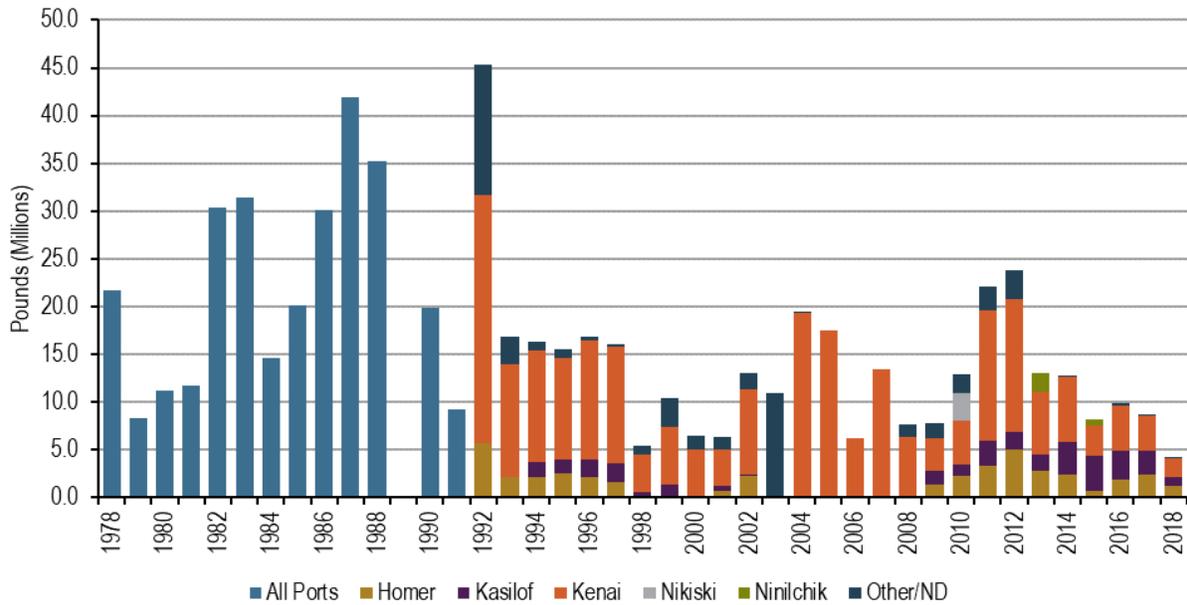
Among the top five ports of landing shown in the figures, the majority of landings were made in the port of Kenai, but the port’s dominance relative to other ports has varied over time. In the years shown, where confidentiality constraints do not allow the display of information from one or more of top five landing ports, confidential data are combined into another/not disclosed (“Other/ND”) category on the figures. The average annual amount of UCI drift gillnet-caught salmon delivered to Kenai from 1992–2018 was 9.2 million pounds, with an average estimated gross ex-vessel value of \$11.9 million.

⁷¹ <https://meetings.npfmc.org/CommentReview/DownloadFile?p=8e26e4b6-4a36-4958-93ad-ae7afabcb22f.pdf&fileName=REPORT%20Cook%20Inlet%20Salmon%20Committee%20.pdf> accessed 6/9/2020.

⁷² <https://meetings.npfmc.org/CommentReview/DownloadFile?p=8e26e4b6-4a36-4958-93ad-ae7afabcb22f.pdf&fileName=REPORT%20Cook%20Inlet%20Salmon%20Committee%20.pdf> accessed 6/8/2020.

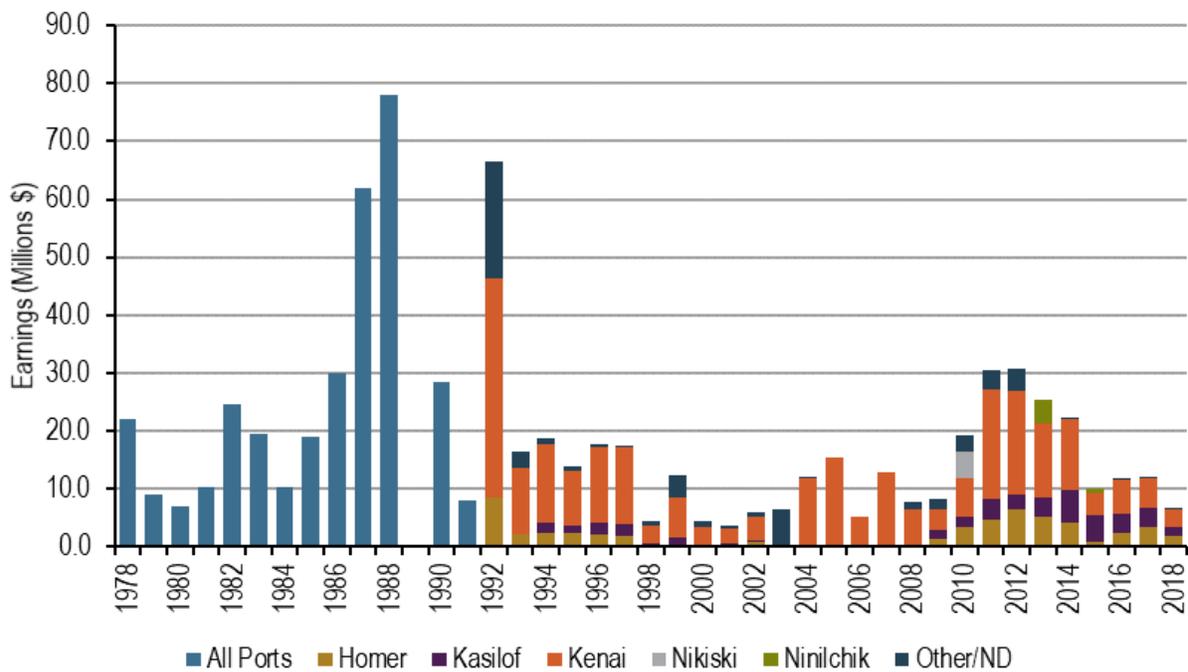
⁷³ Processing data shown in Table 4-17 show that for the period 2009–2018 at least some landings of UCI drift gillnet-caught salmon have been processed by one or more shorebased processors in Homer each year during that period and in four of the 10 years in the period by a single shorebased processor operating Ninilchik.

Figure 4-38 Volume of landings of UCI drift gillnet-caught salmon by port, 1978–2018.



Source: Adapted from Watson (2019).

Figure 4-39 Value of landings of UCI drift gillnet-caught salmon by port, 1978–2018.



Source: Adapted from Watson (2019).

4.5.5.2. Quantitative Indicators of Community Fishery Engagement and Dependency, 2009-2018

The sections below provide more detailed, quantitative participation information for the communities most directly engaged in and/or dependent upon relevant sectors in the UCI salmon drift gillnet fishery for the 10 most recent years for which data are available (2009-2018). Specifically, Sections 4.5.5.2.1 and 4.5.5.2.2 include tables containing quantitative information describing the distribution of sector-specific community engagement (or participation) in and dependency (or reliance) on the commercial UCI salmon drift gillnet fishery for the harvesting and shorebased processing sectors, respectively. Analogous tables and accompanying discussion for S03H permits are presented in Section 4.5.5.2.3.

For this analysis, assignment of vessels to a community is based upon ownership addresses listed in CFEC vessel registration files. Thus, caution in the interpretation of this information is warranted. Vessels may have complex ownership structures involving more than one entity in more than one region. Further, ownership address does not directly indicate where a vessel spends most of its time, purchases services, or hires its crew. For example, some of the Pacific Northwest-owned vessels spend a great deal of time in Alaska and hire at least some crew from these ports. However, the location of ownership address provides a rough indicator of the direction or nature of ownership ties (and a proxy for associated economic activity, as no existing datasets provide information on vessel spending patterns). Ownership location has further been chosen rather than other indicators, such as homeport information, as previous NPFMC FMP social impact assessments (e.g. AECOM (2010)) have noted the problematic nature of homeport data. For shorebased processors, community designation was based on the operating location to provide a relative indicator of the local fishery-related economic activity, which can also serve as a rough proxy for the relative level of associated employment and local government revenue. S03H permits have been assigned based on permit ownership address. These assignments are consistent with established NPFMC FMP social impact assessment practice.

4.5.5.2.1. Harvesting Vessels

The following tables provide a series of quantitative indicators of harvesting sector engagement in and dependency on the UCI salmon drift gillnet fishery by community and/or regional geography, depending on data confidentiality restrictions.

Table 4-13 provides a count of UCI salmon drift gillnet vessels by historical ownership address community from 2009–2018.⁷⁴ The table is separated into Alaska communities, Washington communities, Oregon communities, and all communities (combined) outside the States of Alaska, Washington, and Oregon. The table also shows annual average counts and percentages for community and community groups, together with the number of unique vessels participating in the UCI salmon drift gillnet fishery from 2009–2018.⁷⁵ Vessel ownership is concentrated in the Kenai Peninsula Borough, which on an average annual basis accounted for 60% to 63% of all the vessels participating in the UCI salmon drift gillnet fishery and featured ten communities with five or more vessels active in the fishery from 2009–2018. The only communities outside of the Kenai Peninsula Borough annually averaging five or more vessels active in the fishery during that time period were Anchorage and Wasilla, Alaska, and Astoria, Oregon.⁷⁶

⁷⁴ “Historical ownership address” is defined as the ownership address for a vessel during the 2009–2018 period (as opposed to the most recent year ownership address of a vessel, if different).

⁷⁵ This table is unique in this fishing communities section in providing a complete listing of communities directly engaged in the fishery as determined by ownership address of catcher vessels, in combination with the relevant map figures above, to give a sense of the geosocial scale of participation in the fishery and the myriad communities involved. All subsequent tables aggregate Alaska communities below participation thresholds noted in the text, Washington communities by status inside or outside of the Seattle MSA, Oregon communities by county, and/or otherwise as required by data confidentiality constraints.

⁷⁶ Adding communities that round to five or more vessels active per year on an average annual basis would expand the list to include Delta Junction, Alaska; the Seattle MSA (taken as a whole) and Cathlamet, Washington; and Salem, Oregon.

Table 4-13 Vessel participation in the UCI salmon drift gillnet fishery by community of vessel historical ownership address, 2009–2018.

Geography	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average 2009–2018 (number)	Annual Average 2009–2018 (percent)	Unique Vessels 2009–2018 (number)
ALASKA													
Anchor Point	10	8	13	12	7	8	8	8	4	4	8.2	1.91	23
Fritz Creek	3	4	6	6	6	7	7	6	6	5	5.6	1.30	10
Homer	90	83	103	118	121	120	116	113	96	89	104.9	24.38	197
Kasilof	25	21	24	23	25	27	26	27	27	23	24.8	5.76	48
Kenai	43	41	46	52	55	51	50	50	37	38	46.3	10.76	85
Nikiski	10	8	8	8	10	12	11	10	13	11	10.1	2.35	20
Nikolaevsk	6	6	6	9	12	12	12	10	11	11	9.5	2.21	16
Ninilchik	4	5	7	9	8	7	7	5	6	6	6.4	1.49	12
Soldotna	29	29	31	28	30	32	34	37	32	28	31.0	7.21	64
Sterling	10	9	9	11	12	13	13	12	13	12	11.4	2.65	21
Other KPB - Clam Gulch	2	2	1	1	1	1	1	1	1	2	1.3	0.30	3
Other KPB - Halibut Cove	3	2	2	2	2	2	2	2	2	2	2.1	0.49	3
Other KPB - Port Graham	0	0	0	2	2	2	2	3	2	2	1.5	0.35	3
Other KPB - Seldovia	2	2	3	3	2	4	3	4	4	3	3.0	0.70	5
Other KPB - Seward	1	1	1	1	0	0	0	0	0	0	0.4	0.09	1
Subtotal, "Other KPB"	8	7	7	9	7	9	8	10	9	9	8.3	1.93	15
Subtotal, KPB	238	221	260	285	293	298	292	288	254	236	266.5	61.95	437
Anchorage	21	20	26	27	24	27	31	29	28	24	20.5	4.77	53
Delta Junction	4	3	4	5	6	6	5	6	4	5	4.8	1.12	8
Wasilla	12	9	9	12	14	12	10	11	11	12	11.2	2.60	29
All Other Alaska - Cordova	1	0	0	0	0	1	0	1	0	0	0.3	0.07	3
All Other Alaska - Fairbanks	0	0	0	0	0	0	0	1	1	1	0.3	0.07	1
All Other Alaska - Hydaburg	0	0	0	0	0	0	0	0	0	1	0.1	0.02	1
All Other Alaska - Juneau	1	0	0	1	3	3	3	3	2	1	1.7	0.40	4
All Other Alaska - Kodiak	3	3	4	4	5	5	4	3	1	2	3.4	0.79	10
All Other Alaska - Palmer	3	2	2	3	3	3	2	3	2	2	2.5	0.58	7
All Other Alaska - Sand Point	0	0	0	1	0	0	0	0	0	0	0.1	0.02	1
All Other Alaska - Sitka	0	0	0	1	1	1	1	1	1	1	0.7	0.16	1
All Other Alaska - Valdez	1	1	1	0	0	0	0	0	0	0	0.3	0.07	1
All Other Alaska - Whittier	0	1	1	1	2	2	2	2	2	1	1.4	0.33	2
All Other Alaska - Willow	1	2	2	2	2	2	2	1	2	2	1.8	0.42	3
Subtotal, "All Other Alaska"	10	9	10	13	16	17	14	15	11	11	12.6	2.93	34
Subtotal, Non-KPB	47	41	49	57	60	62	60	61	54	52	54.3	12.62	117
Alaska Total	285	262	309	342	353	360	352	349	308	288	320.8	74.57	505
WASHINGTON													
Arlington	0	0	0	0	0	0	1	2	2	2	0.7	0.16	2
Black Diamond	0	0	0	0	0	0	0	1	1	1	0.3	0.07	1
Buckley	1	0	0	0	0	0	1	1	1	1	0.5	0.12	2
Edmonds	0	0	1	2	1	0	0	0	0	0	0.4	0.09	2
Everett	1	1	2	1	1	1	1	1	1	1	1.1	0.26	2
Gig Harbor	1	1	1	1	1	1	1	0	0	0	0.7	0.16	1
Graham	0	0	0	0	1	1	1	0	0	0	0.3	0.07	1
Granite Falls	1	1	1	1	1	1	1	1	1	1	1.0	0.23	1
Mukilteo	1	1	1	1	1	1	1	0	1	1	0.9	0.21	1
Puyallup	0	0	1	2	1	1	1	1	1	1	0.9	0.21	2
Seattle	0	0	0	0	1	1	1	1	1	2	0.7	0.16	2
Shoreline	1	1	2	1	1	0	0	0	0	0	0.6	0.14	2
Spanaway	0	0	0	0	0	0	0	0	0	1	0.1	0.02	1
Tacoma	2	1	1	1	1	1	1	1	1	2	1.2	0.28	3
University Place	0	0	0	0	0	0	0	1	1	1	0.3	0.07	1
Seattle MSA Subtotal	8	6	10	10	10	8	10	10	11	14	9.7	2.25	21
Aberdeen	1	1	2	3	3	3	3	2	3	3	2.4	0.56	3
Elma	2	2	2	0	0	0	0	0	0	0	0.6	0.14	2
Grayland	0	0	0	2	3	3	2	1	1	1	1.3	0.30	3
Hoquiam	2	2	2	1	1	1	1	1	1	1	1.3	0.30	2
McCleary	1	0	0	0	0	0	0	0	0	0	0.1	0.02	1
Westport	2	2	2	1	1	1	1	2	2	2	1.6	0.37	3

Geography	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average 2009-2018 (number)	Annual Average 2009-2018 (percent)	Unique Vessels 2009-2018 (number)
Grays Harbor Co. Subtotal	8	7	8	7	8	8	7	6	7	7	7.3	1.70	12
Chinook	1	1	1	2	2	2	2	2	0	0	1.3	0.30	3
Naselle	0	0	1	1	1	1	1	1	1	1	0.8	0.19	1
Raymond	2	4	3	3	4	4	4	4	3	3	3.4	0.79	5
Pacific County Subtotal	3	5	5	6	7	7	7	7	4	4	5.5	1.28	9
Cathamet	8	6	6	6	5	4	4	3	3	3	4.8	1.12	8
Rosburg	0	0	2	2	2	2	1	1	1	0	1.1	0.26	2
Wahkiakum County Subtotal	8	6	8	8	7	6	5	4	4	3	5.9	1.37	10
Airway Heights	0	0	0	0	0	0	1	1	0	0	0.2	0.05	1
Bow	1	1	1	1	1	1	1	1	1	1	1.0	0.23	1
Coupeville	0	0	1	1	0	0	0	0	0	0	0.2	0.05	1
Ford	0	0	0	0	0	0	0	0	1	0	0.1	0.02	1
Kennewick	0	0	0	0	1	1	1	1	1	1	0.6	0.14	1
Langley	0	0	0	0	0	1	1	1	1	1	0.5	0.12	1
Longview	2	1	1	1	1	1	1	1	1	1	1.1	0.26	2
Lynden	0	0	3	1	0	0	0	0	0	0	0.4	0.09	3
Moses Lake	1	0	0	0	0	0	0	0	0	0	0.1	0.02	1
Oak Harbor	1	1	1	1	1	1	1	1	1	0	0.9	0.21	1
Olympia	1	4	4	3	2	2	1	1	1	0	1.9	0.44	5
Port Townsend	0	0	0	0	0	0	1	1	1	1	0.4	0.09	1
Reardan	1	1	2	2	2	2	0	0	0	0	1.0	0.23	2
Riverside	0	0	0	0	0	1	0	0	0	0	0.1	0.02	1
Seabeck	1	1	1	1	1	1	1	0	0	0	0.7	0.16	1
Vancouver	1	1	1	1	1	1	1	1	1	1	1.0	0.23	1
Woodland	0	1	1	0	0	0	0	0	0	0	0.2	0.05	1
Other Washington Subtotal	9	11	16	12	10	12	10	9	9	6	10.4	2.42	24
Washington Total	36	35	47	43	42	41	39	36	35	34	38.8	9.02	67
OREGON													
Boring	0	0	0	0	0	1	1	1	1	1	0.5	0.12	1
Canby	2	2	3	2	2	3	2	2	2	2	2.2	0.51	5
Molalla	2	3	3	4	5	7	5	3	4	4	4.0	0.93	9
Mulino	0	0	1	1	1	0	0	0	0	0	0.3	0.07	1
Oregon City	1	1	0	0	0	0	0	0	0	0	0.2	0.05	1
Milwaukie	1	1	1	0	0	0	0	0	0	0	0.3	0.07	1
Clackamas County Subtotal	6	7	8	7	8	11	8	6	7	7	7.5	1.74	15
Astoria	8	4	7	10	8	8	5	7	4	3	6.4	1.49	13
Gearhart	1	1	1	1	1	1	1	1	1	1	1.0	0.23	1
Warrenton	1	1	1	1	1	1	1	0	1	1	0.9	0.21	1
Clatsop County Subtotal	10	6	9	12	10	10	7	8	6	5	8.3	1.93	15
Auroral	0	1	1	1	1	0	0	0	0	0	0.4	0.09	1
Gervais	2	2	2	2	2	1	2	1	1	0	1.5	0.35	2
Hubbard	0	0	0	1	1	1	1	1	1	1	0.7	0.16	1
Keizer	0	0	0	0	0	0	0	0	0	1	0.1	0.02	1
Mount Angel	1	1	1	1	1	1	1	1	1	1	1.0	0.23	1
Salem	4	4	5	6	6	5	4	4	4	4	4.6	1.07	6
Silverton	3	3	3	3	4	4	3	3	3	3	3.2	0.74	4
Woodburn	3	2	3	4	1	3	5	4	4	3	3.2	0.74	10
Marion County Subtotal	13	13	15	18	16	15	16	14	14	13	14.7	3.42	26
Bend	1	1	1	1	1	1	1	1	1	1	1.0	0.23	1
Grants Pass	0	0	0	0	0	0	0	0	0	1	0.1	0.02	1
McMinnville	1	1	1	1	1	1	1	1	1	1	1.0	0.23	1
Pendleton	1	0	0	0	0	0	0	0	0	0	0.1	0.02	1
Portland	1	1	1	1	1	1	1	0	1	1	0.9	0.21	1
Tualatin	1	1	0	0	0	0	0	0	0	0	0.2	0.05	1
Vale	0	0	0	0	1	0	0	0	0	0	0.1	0.02	1
Other Oregon Subtotal	5	4	3	3	4	3	3	2	3	4	3.4	0.79	7
Oregon Total	34	30	35	40	38	39	34	30	30	30	34	7.90	59
OTHER STATES	34	27	36	36	41	42	42	39	33	36	36.6	8.51	74
Grand Total	389	354	427	461	474	482	467	454	406	388	430.2	100.00	705

*Seattle MSA includes all communities in King, Pierce, and Snohomish counties.

Notes: Due to vessel ownership movement between communities over the years shown, total unique vessels per community may not sum to State or grand totals.

Source: ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Table 4-14 shows the distribution across communities of UCI salmon drift gillnet vessel gross revenue from salmon harvesting from 2009–2018. The table presents annual averages of gross revenue in terms of dollars and percentages. The gross revenue of the UCI salmon drift gillnet fleet was concentrated in Alaska (approximately 75%), with the Kenai Peninsula Borough communities of Homer and Kenai together accounting for approximately 39% of all gross revenue and over half of the Alaska total. There was a relatively even distribution of annual average gross revenue among vessels from Washington (8.5%), Oregon (7.9%), and all States other than Alaska, Washington and Oregon combined (8.1%).

Table 4-14 Gross revenue (inflation adjusted dollars) of UCI salmon drift gillnet vessels by community of vessel historical ownership address, 2009–2018.

Geography	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average 2009–2018	Annual Average 2009–2018
	(\$)										(\$)	(%)
ALASKA												
Anchor Point	285,213	463,869	918,585	627,371	465,287	294,575	178,315	209,707	116,341	46,447	360,571	1.9
Fritz Creek	77,480	233,847	435,099	420,287	352,018	291,543	136,457	142,558	241,213	95,111	242,561	1.3
Homer	2,575,794	5,843,275	9,337,735	9,637,068	8,445,414	6,672,872	3,398,581	3,549,705	3,901,992	1,688,556	5,505,099	28.6
Kasilof	693,981	1,390,246	2,129,762	1,671,443	1,343,601	1,170,295	555,666	659,207	783,868	368,714	1,076,678	5.6
Kenai	1,150,245	2,707,418	3,398,929	3,402,469	2,730,089	2,319,603	1,043,724	1,183,805	1,012,452	565,772	1,951,451	10.2
Nikiski	231,501	381,114	712,150	652,420	582,893	541,784	210,154	376,937	370,366	220,607	427,993	2.2
Nikolaevsk	142,837	427,921	577,081	837,832	665,016	698,023	292,409	280,339	387,630	222,872	453,196	2.4
Ninilchik	66,734	296,402	467,169	537,563	421,437	314,257	138,013	151,754	207,267	112,121	271,272	1.4
Soldotna	653,905	1,467,090	2,130,828	1,789,051	1,528,910	1,474,464	709,941	891,409	886,893	489,442	1,202,193	6.3
Sterling	195,058	476,117	552,194	692,395	617,360	521,178	254,723	260,383	286,472	190,926	404,681	2.1
Other KPB	192,181	476,426	681,554	615,186	506,387	530,636	217,311	277,459	286,248	178,984	396,237	2.1
Subtotal, KPB	6,264,930	14,163,726	21,341,085	20,883,085	17,658,412	14,829,231	7,135,294	7,983,263	8,480,742	4,179,552	12,291,932	64.0
Anchorage	493,120	1,145,396	1,764,624	1,800,866	1,216,430	1,145,815	496,930	663,011	670,966	387,728	978,489	5.1
Delta Junction	113,911	237,127	463,230	437,809	411,626	276,555	134,869	171,185	183,486	75,131	250,493	1.3
Wasilla	215,301	553,157	703,439	876,103	885,235	592,032	240,500	320,121	252,221	150,900	478,901	2.5
All Other AK	280,256	531,613	727,989	847,554	823,017	797,279	283,956	348,955	341,177	164,095	514,589	2.7
Subtotal, Non-KPB	1,102,588	2,467,293	3,659,283	3,962,332	3,336,307	2,811,681	1,156,254	1,503,271	1,447,850	777,854	2,222,471	11.6
Alaska Total	7,367,518	16,631,019	25,000,368	24,845,417	20,994,719	17,640,912	8,291,549	9,486,534	9,928,592	4,957,406	14,514,403	75.5
WASHINGTON												
Seattle MSA*	112,430	287,467	643,382	806,950	499,666	373,948	164,394	246,727	249,062	216,076	360,010	1.9
Grays Harbor Co.	167,133	441,150	497,781	539,815	421,358	345,507	95,431	154,136	144,890	120,371	292,757	1.5
Pacific Co.	87,500	366,854	398,956	447,424	397,724	404,734	108,253	230,577	113,843	78,023	263,389	1.4
Wahkiakum Co.	163,525	352,909	531,931	485,889	247,596	164,792	69,777	79,661	65,654	45,692	220,743	1.1
All Other WA	172,942	632,131	1,200,180	887,907	534,821	579,712	243,525	311,371	240,707	119,334	492,263	2.6
WA Total	703,531	2,080,510	3,272,229	3,167,987	2,101,165	1,868,692	681,381	1,022,472	814,156	579,494	1,629,162	8.5
OREGON												
Clackamas Co.	210,923	592,235	1,045,636	903,580	740,397	645,153	186,337		212,268	127,511		
Clatsop Co.	157,978	270,432	609,078	861,791	493,139	398,262	78,960	140,699	72,463	51,922	313,472	1.6
Marion Co.	314,795	753,809	1,191,085	1,205,782	814,682	610,608	329,484	299,759	322,380	138,680	598,106	3.1
All Other OR	99,003	255,602	200,142	195,180	168,985	130,953	53,338		60,485	59,099		
Oregon Total	782,698	1,872,077	3,045,940	3,166,335	2,217,203	1,784,976	648,119	639,500	667,595	377,212	1,520,166	7.9
Other States	706,007	1,615,641	2,908,851	2,674,709	2,133,091	2,091,268	853,147	1,093,478	783,005	655,478	1,551,467	8.1
Grand Total	9,559,753	22,199,247	34,227,388	33,854,446	27,446,178	23,385,849	10,474,195	12,241,984	12,193,349	6,569,591	19,215,198	100.0

*Seattle MSA includes all communities in King, Pierce, and Snohomish counties.

Notes:

Nominal gross revenue adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index.

Due to vessel ownership movement between communities over the years shown, total unique vessels per community may not sum to State or grand totals.

Red cells indicate confidential data or data suppressed to protect confidential data in other cells.

Source: ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Table 4-15 provides information on the dependency of UCI salmon drift gillnet vessels on the UCI salmon drift gillnet fishery compared to other fisheries in which these vessels participate. From 2009–2018, UCI drift gillnet-caught salmon accounted for approximately 53% of the total gross revenue of vessels with Alaska ownership addresses; 57% of the total gross revenue of vessels with Washington ownership addresses; and 66% of the total gross revenue of vessels with Oregon ownership addresses. The level of dependency differed widely across communities. For example, UCI drift gillnet-caught salmon accounted for 95% or greater of the total gross revenue of the UCI salmon drift gillnet vessels in the Kenai Peninsula Borough communities of Kasilof, Kenai, and Nikiski, but only 34% to 39% of the total gross revenue of the UCI salmon drift gillnet vessels in the Kenai Peninsula Borough communities of Anchor Point, Fritz Creek, Homer, and Sterling. As discussed in Section 4.5.2.3, the boundaries of EEZ waters in Cook Inlet do not align with the areas used by ADF&G fish tickets to record the location of salmon harvests. Consequently, there are insufficient data to accurately determine how much of a community’s UCI drift gillnet-caught salmon was harvested in the Cook Inlet EEZ. However, based on the methodology described in Section 4.5.2.3, it is estimated that the EEZ accounted for approximately 48% of the total UCI salmon drift gillnet fishery catch from 2009–2018. Table 4-15 applies this percent to estimate the proportion of UCI drift gillnet-caught salmon harvested in the Cook Inlet EEZ for each community.

Table 4-15 Gross revenue (inflation adjusted) diversification of UCI salmon drift gillnet vessels by community of vessel historical ownership address, 2009–2018.

Geography	Annual Average Number	Annual Average Ex-Vessel Gross Revenue from ALL UCI Drift Gillnet Salmon	Annual Average Ex-Vessel Gross Revenue from Estimated EEZ UCI Drift Gillnet-Caught Salmon Only *	Annual Average Total Ex-Vessel Gross Revenue from All Area, Gear, and Species Fisheries	Ex-Vessel Gross Revenue from ALL UCI Drift Gillnet Salmon as a Percentage of Total Ex-Vessel Gross Revenue Annual Average	Ex-Vessel Gross Revenue from Estimated EEZ UCI Drift Gillnet Salmon Only as a Percentage of Total Ex-Vessel Gross Revenue Annual Average*
		(\$)			(%)	
ALASKA						
Anchor Point	8.2	360,571	173,399	1,065,051	33.9	16.3
Fritz Creek	5.6	242,561	116,648	620,795	39.1	18.8
Homer	104.9	5,505,099	2,647,402	14,237,555	38.7	18.6
Kasilof	24.8	1,076,678	517,775	1,106,088	97.3	46.8
Kenai	46.3	1,951,451	938,453	2,064,872	94.5	45.4
Nikiski	10.1	427,993	205,822	434,206	98.6	47.4
Nikolaevsk	9.5	453,196	217,942	616,257	73.5	35.4
Ninilchik	6.4	271,272	130,455	486,368	55.8	26.8
Soldotna	31.0	1,202,193	578,135	1,415,258	84.9	40.9
Sterling	11.4	404,681	194,611	1,078,462	37.5	18.0
Other KPB Communities	8.3	396,237	190,550	1,153,071	34.4	16.5
Subtotal, KPB Communities	266.5	12,291,932	5,911,190	23,845,766	51.5	24.8
Anchorage	20.5	387,728	186,458	1,287,321	30.1	14.5
Delta Junction	4.8	75,131	36,130	843,740	8.9	4.3
Wasilla	11.2	150,900	72,568	591,735	25.5	12.3
All Other Alaska Communities	12.6	164,095	78,914	1,100,413	14.9	7.2
Subtotal, Non-KPB Communities	54.3	2,222,471	1,068,786	3,823,209	58.1	28.0
Alaska Total	320.8	14,514,403	6,979,977	27,668,976	52.5	25.2
WASHINGTON						
Seattle MSA	9.7	360,010	173,129	1,238,878	29.1	14.0
Grays Harbor County	7.3	292,757	140,787	293,201	99.8	48.0
Pacific County	5.5	263,389	126,664	402,336	65.5	31.5
Wahkiakum County	5.9	220,743	106,155	220,743	100.0	48.1
All Other Washington	10.4	492,263	236,729	713,948	68.9	33.2
Washington Total	38.8	1,629,162	783,464	2,869,105	56.8	27.3
OREGON						
Clackamas County	7.5	482,039	231,813	930,589	51.8	24.9
Clatsop County	8.3	313,472	150,749	313,472	100.0	48.1
Marion County	14.7	598,106	287,629	917,836	65.2	31.3
All Other Oregon	3.4	126,548	60,857	126,548	100.0	48.1
Oregon Total	34.0	1,520,166	731,048	2,288,445	66.4	31.9
OTHER STATES	36.6	1,551,467	746,101	35,113,727	4.4	2.1
Grand Total	430.2	19,215,198	9,240,589	65,071,148	29.5	14.2

*Estimated EEZ amount is based on an estimated average harvest split of 52% State waters/48% EEZ waters from 2009–2018.

Notes: Nominal gross revenue adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index.

Source: Developed by Wislow Research based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Table 4-16 provides information on the dependency of “community harvesting sectors” on the UCI salmon drift gillnet fishery compared to other fisheries in which these sectors participate. A community harvesting sector is defined as all the commercial fishing vessels with ownership addresses in a community that had at least one vessel active in the UCI salmon drift gillnet fishery from 2009–2018. Over that time period, UCI drift gillnet-caught salmon accounted for less than 10% of the total gross revenue of harvesting sectors in many communities. However, they accounted for between 20% and 40% of the total gross revenue of the harvesting sectors in six Kenai Peninsula Borough communities (Kasilof, Kenai, Nikolaevsk, Ninilchik, Soldotna, and Sterling), and over 60% of the total gross revenue of the Nikiski harvesting sector.

Table 4-16 Gross revenue (inflation adjusted) diversification of community harvesting sector by community of vessel historical ownership address, 2009–2018.

Geography	Annual Average Number of UCI Salmon Drift Gillnet Vessels	Annual Average Number of All Commercial Fishing Vessels	All Commercial Fishing Vessels Annual Average Ex-Vessel Gross Revenue from ALL UCI Drift Gillnet Salmon	All Commercial Fishing Vessels Annual Average Ex-Vessel Gross Revenue from Estimated EEZ UCI Drift Gillnet Salmon Only*	All Commercial Fishing Vessels Annual Average Total Ex-Vessel Gross Revenue from All Areas, Gears, and Species Fisheries	All Commercial Fishing Vessels Ex-Vessel Gross Revenue from ALL UCI Drift Gillnet Salmon as a Percentage of Total Ex-Vessel Gross Revenue Annual Average	All Commercial Fishing Vessels Ex-Vessel Gross Revenue from Estimated EEZ UCI Drift Gillnet Salmon Only as a Percentage of Total Ex-Vessel Gross Revenue Annual Average*
				(\$)		(%)	(%)
ALASKA							
Anchor Point	8.2	18.7	360,571	173,399	3,193,566	11.3	5.4
Fritz Creek	5.6	10.5	242,561	116,648	2,031,163	11.9	5.7
Homer	104.9	375.7	5,505,099	2,647,402	89,867,847	6.1	2.9
Kasilof	24.8	38.9	1,076,678	517,775	3,453,102	31.2	15.0
Kenai	46.3	62.4	1,951,451	938,453	4,855,029	40.2	19.3
Nikiski	10.1	13.9	427,993	205,822	699,537	61.2	29.4
Nikolaevsk	9.5	13.1	453,196	217,942	1,896,016	23.9	11.5
Ninilchik	6.4	12.2	271,272	130,455	852,359	31.8	15.3
Soldotna	31.0	50.4	1,202,193	578,135	3,756,218	32.0	15.4
Sterling	11.4	15.9	404,681	194,611	1,943,479	20.8	10.0
Other KPB Communities	8.3	38.9	396,237	190,550	8,870,910	4.5	2.1
Subtotal, KPB Communities	266.5	650.6	12,291,932	5,911,190	121,419,226	10.1	4.9
Anchorage	20.5	237.9	387,728	186,458	65,775,468	0.6	0.3
Delta Junction	4.8	14.8	75,131	36,130	3,485,546	2.2	1.0
Wasilla	11.2	81.4	150,900	72,568	14,760,615	1.0	0.5
All Other Alaska Communities	12.6	822.2	164,095	78,914	197,420,910	0.1	0.0
Subtotal, Non-KPB Communities	54.3	1156.3	2,222,471	1,068,786	281,442,539	0.8	0.4
Alaska Total	320.8	1806.9	14,514,403	6,979,977	402,861,765	3.6	1.7
Washington							
Seattle MSA	9.7	247.5	360,010	173,129	227,862,291	0.2	0.1
Grays Harbor County	7.3	31	292,757	140,787	3,825,882	7.7	3.7
Pacific County	5.5	26.2	263,389	126,664	6,011,852	4.4	2.1
Wahkiakum County	5.9	17.4	220,743	106,155	1,307,785	16.9	8.1
All Other Washington	10.4	65.7	492,263	236,729	11,580,978	4.3	2.0
Washington Total	38.8	387.8	1,629,162	783,464	250,588,788	0.7	0.3
Oregon							
Clackamas County	7.5	22.3	482,039	231,813	2,821,397	17.1	8.2
Clatsop County	8.3	42.6	313,472	150,749	5,101,644	6.1	3.0
Marion County	14.7	31	598,106	287,629	2,925,134	20.4	9.8
All Other Oregon	3.4	16.2	126,548	60,857	5,077,036	2.5	1.2
Oregon Total	34.0	112.1	1,520,166	731,048	15,925,210	9.5	4.6
OTHER STATES	36.6	43.4	1,551,467	746,101	2,560,214	60.6	29.1
Grand Total	430.2	2350.2	19,215,198	9,240,589	671,935,977	2.9	1.4

*Estimated EEZ amount is based on an estimated average harvest split of 52% State waters/48% EEZ waters from 2009–2018.

Notes: Nominal gross revenue adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index.

Source: Developed by Wislow Research based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.5.5.2.2. Shorebased Processors

The following tables provide a series of quantitative indicators of processing sector engagement in and dependency on the UCI salmon drift gillnet fishery by community and/or regional geography, depending on data confidentiality restrictions.

Table 4-17 shows the distribution across communities of Alaska shorebased processors⁷⁷ that accepted deliveries of UCI drift gillnet-caught salmon from 2009–2018. The table also shows annual average counts and percentages for communities, together with the number of unique processors participating in the UCI salmon drift gillnet fishery from 2009–2018. Seven Alaska communities had shorebased processors active in the UCI salmon drift gillnet fishery, but three of those communities (Nikiski, Ninilchik, and Soldotna) averaged less than one processor active in the fishery on an annual average basis from 2009–2018. Of the other four communities, one (Seward) had a processor active in the fishery each year, and one (Anchorage) had a processor active in eight of the ten years. Homer had multiple processors active in the fishery each year except 2018, when only one processor was active. Kenai had multiple processors active in the fishery all years. Except for Anchorage, all communities with shorebased processors active in the fishery were located within the Kenai Peninsula Borough.

Table 4-17 Number of Alaska shorebased processors accepting deliveries of UCI drift gillnet-caught salmon by community of operation, 2009–2018.

Community	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average (number)	Annual Average (percent)	Unique Processors (number)
Anchorage	1	1	1	1	1	1	1	1	2	3	1.3	11.02	5
Homer	3	5	4	3	4	3	2	3	3	1	3.1	26.27	7
Kenai	7	6	5	5	5	5	7	4	4	3	5.1	43.22	11
Nikiski	1	1	0	0	0	0	0	0	0	0	0.2	1.69	1
Ninilchik	1	0	0	0	1	0	0	1	0	1	0.4	3.39	2
Seward	1	1	1	1	1	1	1	1	1	1	1.0	8.47	1
Soldotna	1	1	1	0	1	1	0	0	1	1	0.7	5.93	2
Grand Total	15	15	12	10	13	11	11	10	11	10	11.8	100.00	29

Source: ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Table 4-18 shows the distribution across communities of ex-vessel gross payments for UCI drift gillnet-caught salmon deliveries to shorebased processors from 2009–2018. Due to data confidentiality restrictions, information can be provided each year for only one community (Kenai) and for one other community (Homer) for some years. It is apparent, however, that processing of UCI drift gillnet-caught salmon is concentrated in Kenai, which accounted for about 63% of all ex-vessel gross payments on an annual average basis from 2009–2018. While no community-specific information can be disclosed for Anchorage, Nikiski, Ninilchik, Seward, and Soldotna (with the potential exception of Anchorage in 2018), combined these communities accounted for about 63% of ex-vessel gross payments. Although Homer had multiple shorebased processors participating in the UCI salmon drift gillnet fishery in all but one year (2018), it accounted for less than 2% of annual average ex-vessel gross payments for UCI drift gillnet-caught salmon.

⁷⁷ Defined for the purposes of this analysis as those identified by F_ID (intent to operate) and SBPR (shorebased processor) codes in AKFIN data. The data also contained one entity that was flagged as operating in Oregon, however, additional research suggests that it is likely that operations actually took place in Kenai. The operation in question is or was of modest scale and its exclusion from the data does not materially change the analysis.

Table 4-18 Shorebased processor ex-vessel gross payments (inflation adjusted) for UCI drift gillnet-caught salmon by community of operation, 2009–2018.

Community	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average	Annual Average (percent)
	(\$)											
Homer	35,512	412,315	595,466		423,352	339,432		174,500	280,186		323,585	1.69
Kenai	4,605,367	11,959,556	22,582,837	21,367,665	17,408,096	15,638,845	6,976,748	8,123,207	7,942,530	3,028,913	11,963,377	62.58
All Others	4,854,524	9,688,618	10,976,333		9,463,196	7,281,655		3,869,069	3,841,557		6,828,918	35.72
Grand Total	9,495,403	22,060,490	34,154,636	33,791,213	27,294,644	23,259,932	10,387,419	12,166,776	12,064,272	6,484,012	19,115,880	100.00

Notes:

Nominal ex-vessel gross payments adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index.

Red cells indicate confidential data or data suppressed to protect confidential data in other cells.

Source: ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Table 4-19 provides information on the dependency of shorebased processors on the UCI salmon drift gillnet fishery compared to other fisheries in which these processors participate. From 2009–2018, deliveries of UCI drift gillnet-caught salmon accounted for approximately 35% of the total ex-vessel gross payments by Kenai processors, and about 2% of the total ex-vessel gross payments by Homer processors. Deliveries of UCI drift gillnet-caught salmon accounted for around 13% of the total ex-vessel gross payments in all other communities combined. In addition, the table shows processor dependency on UCI drift gillnet-caught salmon harvested in the Cook Inlet EEZ which, based on the estimation methodology described in Section 4.5.2.3, accounted for approximately 48% of the total UCI salmon drift gillnet fishery catch from 2009–2018.

Table 4-19 Ex-vessel gross payment (inflation adjusted) diversification of shorebased processors accepting deliveries of UCI drift gillnet-caught salmon by community of operation, 2009–2018.

Community	Annual Average Number of UCI Drift Gillnet Salmon Processors	UCI Drift Gillnet Salmon Processors Annual Average Ex-Vessel Gross Payments for ALL UCI Drift Gillnet Salmon	UCI Drift Gillnet Salmon Processors Annual Average Ex-Vessel Gross Payments for Estimated EEZ UCI Drift Gillnet Salmon Only *	UCI Drift Gillnet Salmon Processors Annual Average Ex-Vessel Gross Payments for All Area, Gear, and Species Fisheries	UCI Drift Gillnet Salmon Processors Ex-Vessel Gross Payments for ALL UCI Drift Gillnet Salmon as a Percentage of Total Ex-Vessel Gross Payments Annual Average	UCI Drift Gillnet Salmon Processors Ex-Vessel Gross Payments for Estimated EEZ UCI Drift Gillnet Salmon Only as a Percentage of Total Ex-Vessel Gross Payments Annual Average*
		Millions of Dollars (\$)			(%)	
Homer	3.1	0.32	0.16	16.10	2.0	1.0
Kenai	5.1	11.96	5.75	34.19	35.0	16.8
All Others	3.6	6.83	3.28	51.29	13.3	6.4
Grand Total	11.8	19.12	9.19	101.58	18.8	9.0

* *Estimated EEZ amount is based on an estimated average harvest split of 52% State waters/48% EEZ waters from 2009–2018.

Notes: Nominal ex-vessel gross payments adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index.

Source: Developed by Wislow Research based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Table 4-20 provides information on the dependency of “community processing sectors” on the UCI salmon drift gillnet fishery compared to other fisheries in which these sectors participate. A community processing sector is defined as all the shorebased processors in a community that had at least one UCI drift gillnet-caught salmon processor from 2009–2018. Over that time period, UCI drift gillnet-caught salmon accounted for about 34% of total ex-vessel gross payments by Kenai’s community processing sector; 2% of total ex-vessel gross payments by Homer’s community processing sector; and 6% of total ex-vessel gross payments by all other community processing sectors combined. In addition, the table shows the dependency of community processing sectors on UCI drift gillnet-caught salmon harvested in the Cook Inlet EEZ, which, based on the estimation methodology described in Section 4.5.2.3, accounted for approximately 48% of the total UCI salmon drift gillnet fishery catch from 2009–2018.

Table 4-20 Ex-vessel gross payment (inflation adjusted) diversification of community processing sectors by community of operation, 2009–2018.

Community	Annual Average Number of UCI Drift Gillnet Salmon Processors	Annual Average Number of All Processors in those Same Communities	All Community Processors Annual Average Ex-Vessel Payments for ALL UCI Drift Gillnet Salmon	All Community Processors Annual Average Ex-Vessel Gross Payments for Estimated EEZ UCI Drift Gillnet Salmon Only*	All Community Processors Annual Average Total Ex-Vessel Gross Payments for All Area, Gear, and Species Fisheries	All Community Processors Average Annual Ex-Vessel Gross Payments for ALL UCI Drift Gillnet Salmon as a Percentage of Total Annual Average Ex-Vessel Gross Payments for All Area, Gear, and Species Fisheries	All Community Processors Average Annual Ex-Vessel Gross Payments for Estimated EEZ UCI Drift Gillnet Salmon Only as a Percentage of Total Annual Average Ex-Vessel Gross Payments for All Area, Gear, and Species Fisheries*
			Millions of Dollars (\$)			All Community Processors Average Annual Ex-Vessel Gross Payments for ALL UCI Drift Gillnet Salmon as a Percentage of Total Annual Average Ex-Vessel Gross Payments for All Area, Gear, and Species Fisheries (%)	
Homer	3.1	3.9	0.32	0.16	16.46	2.0	0.9
Kenai	5.1	6.9	11.96	5.75	34.88	34.3	16.5
All Others	3.6	18.0	6.83	3.28	113.89	6.0	2.9
Grand Total	11.8	28.8	19.12	9.19	165.22	11.6	5.6

*Estimated EEZ amount is based on an estimated average harvest split of 52% State waters/48% EEZ waters from 2009–2018. Notes: Nominal ex-vessel gross payments adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index. Source: Developed by Wislow Research based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.5.5.2.3. S03H Permit Holders

Table 4-21 provides a count of S03H permits by historical ownership address community from 2009–2018. The table is separated into Alaska communities, Washington communities, Oregon communities, and all communities outside the States of Alaska, Washington, and Oregon. The table also shows annual average counts and percentages for community and community groups, together with the number of unique permits from 2009–2018. Similar to what was seen for UCI salmon drift gillnet vessel ownership (Table 4-13), permit ownership is concentrated in the Kenai Peninsula Borough, which on an average annual basis accounted for 58% to 62% of all S03H permits and featured ten communities with five or more permits active annually in the fishery from 2009–2018. The only communities outside of the Kenai Peninsula Borough annually averaging five or more permits active in the fishery during that time period were Anchorage, Delta Junction, and Wasilla, Alaska; and Astoria and Molalla, Oregon.⁷⁸

Table 4-21 S03H permit participation in the UCI salmon drift gillnet fishery by community of permit historical ownership address, 2009–2018.

Geography	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average 2009–2018 (number)	Annual Average 2009–2018 (percent)	Unique Permits 2009–2018 (number)
ALASKA													
Anchor Point	2	2	8	8	5	9	6	6	4	4	5.4	1.19	18
Clam Gulch	2	2	1	2	2	1	1	1	1	2	1.5	0.33	3
Fritz Creek	4	5	5	5	6	6	9	8	4	4	5.6	1.23	11
Halibut Cove	2	2	4	3	3	4	4	3	3	4	3.2	0.70	4
Homer	90	86	116	123	127	115	117	115	98	84	107.1	23.55	216
Kasilof	23	20	26	27	26	29	24	24	24	22	24.5	5.39	48
Kenai	43	44	45	55	52	49	49	47	40	39	46.3	10.18	83
Nikiski	8	8	8	9	11	11	12	11	12	11	10.1	2.22	21
Nikolaevsk	10	8	11	10	10	10	9	10	12	14	10.4	2.29	25
Ninilchik	5	6	8	6	5	7	6	5	6	5	5.9	1.30	13
Port Graham	0	0	0	2	2	2	2	2	2	2	1.4	0.31	2
Seldovia	3	3	3	3	2	2	3	4	4	3	3.0	0.66	4
Seward	1	1	1	1	0	0	0	0	0	0	0.4	0.09	1
Soldotna	31	32	34	32	37	42	38	40	34	28	34.8	7.65	63
Sterling	15	13	15	15	17	16	18	16	14	12	15.1	3.32	23

⁷⁸ Adding communities that round to five or more vessels active per year on an average annual basis would expand the list to include the Seattle MSA (taken as a whole) and Cathlamet, Washington and Silverton and Woodburn, Oregon.

Geography	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average 2009–2018 (number)	Annual Average 2009–2018 (percent)	Unique Permits 2009–2018 (number)
Subtotal, KPB	239	232	285	301	305	303	298	292	258	234	274.7	60.40	535
Anchorage	26	20	28	24	24	22	27	25	27	28	25.1	5.52	49
Delta Junction	5	3	3	6	5	5	6	6	6	5	5.0	1.10	14
Fairbanks	0	0	0	0	1	1	1	1	1	1	0.6	0.13	1
Hydaburg	1	1	1	1	1	1	1	1	1	1	1.0	0.22	1
Juneau	1	1	1	2	4	4	4	3	2	3	2.5	0.55	4
Kodiak	3	2	2	2	2	2	2	2	1	2	2.0	0.44	3
Palmer	2	1	3	3	3	2	2	2	3	2	2.3	0.51	6
Sitka	0	0	0	1	1	1	1	1	1	1	0.7	0.15	1
Valdez	2	2	2	2	2	1	1	1	0	0	1.3	0.29	2
Wasilla	15	13	15	16	18	23	19	17	15	14	16.5	3.63	31
Whittier	0	1	1	1	1	1	1	1	1	1	0.9	0.20	1
Willow	1	1	1	2	2	2	3	2	2	2	1.8	0.40	4
Subtotal, Non-KPB	56	45	57	60	64	65	68	62	60	60	59.7	13.13	117
Alaska Total	295	277	342	361	369	368	366	354	318	294	334.4	73.53	652
WASHINGTON													
Seattle MSA Subtotal	8	7	11	12	12	8	13	10	10	10	10.1	2.22	25
Grays Harbor Co. Subtotal	6	6	8	9	10	9	8	7	7	6	7.6	1.67	13
Pacific County Subtotal	5	5	6	6	6	6	6	6	5	5	5.6	1.23	7
Wahkiakum County Subtotal	6	6	8	8	7	6	5	4	5	4	5.9	1.30	8
All Other WA Subtotal	14	15	11	11	12	13	11	12	9	9	11.7	2.57	21
Washington Total	39	39	44	46	47	42	43	39	36	34	40.9	8.99	74
OREGON													
Clackamas County Subtotal	11	11	10	12	12	13	10	6	8	7	10.0	2.20	22
Clatsop County Subtotal	9	5	10	11	10	10	6	9	4	4	7.8	1.72	16
Marion County Subtotal	15	15	19	21	20	21	19	14	12	13	16.9	3.72	31
All Other Oregon Subtotal	5	4	4	4	4	4	4	5	6	5	4.5	0.99	8
Oregon Total	40	35	43	48	46	48	39	34	30	29	39.2	8.62	77
OTHER STATES													
Grand Total	411	381	465	500	501	501	496	473	424	396	454.8	100.00	888

*Seattle MSA includes all communities in King, Pierce, and Snohomish counties.

Notes: Due to permit ownership movement between communities over the years shown, total unique permits per community may not sum to State or grand totals.

Source: ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

The pattern of distribution of ownership address for S03H permits is similar to that of distribution of ownership address for UCI salmon drift gillnet harvest vessels. Among Alaska communities, the only communities that appear as ownership addresses for one but not the other during the period 2009–2018 are Cordova and Sand Point. Both had relatively modest participation of vessels with local ownership addresses in the fishery. Cordova had three unique vessels participate in the fishery one year each (2009, 2014, and 2016) and Sand Point had one unique vessel participate in the fishery in one year (2012). Neither community appears in the data as an ownership address of any S03H permits in any year 2009–2018. As a whole, Alaska ownership addresses accounted for roughly three-quarters of all S03H permits held on an annual average basis 2009–2018, with the remainder almost evenly split between ownership addresses in Washington, Oregon, and all States other than Alaska, Washington, and Oregon combined.

Table 4-22 provides information on the dependency of S03H Alaska ownership address permit holders on their S03H permits compared to other commercial fishery permits held by those individuals, as measured in gross revenue on an annual average basis for the years 2009 through 2018. As shown, S03H permits accounted for roughly half of the total gross revenue deriving from the portfolio of all permits held by S03H permit holders for Alaska as a whole as well as for S03H permit holders in the Kenai Peninsula Borough. It is important to note, however, that there is considerable variation between communities as, for example, the S03H permit holders in the Kenai Peninsula Borough communities of Kasilof, Kenai, Nikiski, and Seldovia derived over 80 percent of their total gross revenues (from all permits in all fisheries combined) from their S03H permits alone over this period.

Table 4-22 Annual average gross revenue (inflation adjusted) diversification of S03H permit holders by community of permit ownership address, Alaska communities only, 2009-2018.

Geography	Number of S03H Permit Holders Annual Average 2009-2018,	Ex-Vessel Gross Revenues from S03H Permits Only, Annual Average 2009-2018	Ex-Vessel Gross Revenues from All Permits in All Fisheries Held by S03H Permit Holders, Annual Average 2009-2018 (\$)	Ex-Vessel Gross Revenues from S03H Permits as a Percentage of Ex-Vessel Gross Revenues from Permits in All Fisheries Held by S03H Permit Holders, Annual Average 2009-2018 (%)
Anchor Point	5.4	166,495	302,052	55.1
Clam Gulch	1.5	88,912	188,105	47.3
Fritz Creek	5.6	227,237	422,745	53.8
Halibut Cove	3.2	152,186	296,579	51.3
Homer	107.1	5,229,854	12,431,369	42.1
Kasilof	24.5	1,089,442	1,218,971	89.4
Kenai	46.3	1,877,504	2,273,045	82.6
Nikiski	10.1	431,835	532,193	81.1
Nikolaevsk	10.4	444,892	833,778	53.4
Ninilchik	5.9	245,306	427,684	57.4
Port Graham	1.4			
Seldovia	3.0	101,851	111,214	91.6
Seward	0.4			
Soldotna	34.8	1,383,304	2,899,407	47.7
Sterling	15.1	549,090	1,012,379	54.2
Subtotal, KPB Communities	274.7	12,044,634	23,006,246	52.4
Anchorage	25.1	963,937	1,502,223	64.2
Delta Junction	5.0	236,091	700,040	33.7
Wasilla	16.5	650,910	1,211,503	53.7
All Other Alaska Communities	13.1	493,274	7,215,005	6.8
Subtotal, Non-KPB Communities	59.7	2,344,213	4,135,266	56.7
Alaska Total	334.4	14,388,847	27,141,513	53.0

Notes:

Nominal gross revenue adjusted for inflation to 2018 dollars using Federal Reserve Bank of St. Louis Gross Domestic Product: Chain-type Price Index.

Red cells indicate confidential data or data suppressed to protect confidential data in other cells.

Source: ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.5.5.3. Community Context of the UCI Salmon Drift Gillnet Fishery

4.5.5.3.1. Community Demographic and Institutional Indicators

Table 4-23 presents selected demographic indicators for the Kenai Peninsula Borough communities identified as engaged in and/or dependent upon the UCI salmon drift gillnet fishery in one or more years from 2009–2018. The table also shows comparative data for Anchorage and the State of Alaska as a whole. For these same communities, Table 4-24 presents information on the types of municipal governments, relationships to Alaska Native Claims Settlement Act (ANCSA) regional and village corporations, and the presence (or absence) of a Federally recognized tribe. As shown, considerable variation among these indices occurs across the communities.

Table 4-23 Demographic indicators for selected Alaska communities engaged in the UCI salmon driftnet fishery.

Community	Total Population	Alaska Native Residents*	Minority Residents**	Residents Living in Group Quarters***	Per Capita Income	Median Household Income	Number of Family Households	Median Family Income (\$)	Low-Income Residents† (% of total population)
		(% of total population)			(\$)				
Kenai Peninsula Communities									
Anchor Point	2,093	11.1	12.8	0.0	30,212	58,594	487	75,179	8.8
Clam Gulch	197	2.5	7.6	0.0	32,869	41,833	39	NA	13.2
Fritz Creek	1,956	2.8	13.0	0.0	36,092	69,750	482	84,167	12.1
Halibut Cove	71	7.0	7.0	0.0	40,731	72,969	25	73,594	12.7
Homer	5,607	9.5	17.9	0.8	34,176	59,837	1,411	79,960	8.9
Kasilof	531	0.0	0.0	0.0	17,375	49,946	74	71,296	5.1
Kenai	7,687	18.9	28.2	0.7	36,236	61,007	1,719	82,083	13.4
Nikiski	4,575	17.5	20.0	0.1	28,018	55,043	1,111	74,464	16.5
Nikolaevsk	261	4.2	5.4	0.0	22,561	36,786	67	54,375	8.4
Ninilchik	749	19.2	26.6	0.0	31,010	50,938	203	74,375	11.5
Port Graham	192	87.5	87.5	0.0	18,853	29,375	45	42,813	26.6
Seldovia	229	16.6	18.3	0.0	32,409	63,000	67	78,125	7.6
Seward	2,770	14.2	39.1	4.6	28,552	76,410	489	100,254	11.9
Soldotna	4,589	6.8	10.5	0.4	36,626	61,723	1,110	72,391	6.9
Sterling	5,321	7.0	12.1	0.1	39,122	82,292	1,325	100,924	8.8
Anchorage, Delta Junction, Wasilla, and the State of Alaska									
Anchorage	296,112	12.8	41.5	0.9	39,839	83,280	70,176	119,992	9.2
Delta Junction	1,053	3.5	12.7	0.0	31,789	75,833	191	83,750	8.9
Wasilla	9,675	10.8	23.9	0.6	28,272	62,982	2,040	70,000	11.6
State of Alaska	738,516	19.7	39.0	1.8%	35,874	76,715	167,633	108,301	10.8

* Includes individuals self-identified in the census as American Indian or Alaska Native exclusively or in combination with some other category.

** Includes all individuals except those self-identified as both White and of non-Hispanic origin.

*** Includes "Other Noninstitutional" group quarters only (e.g., the type of group housing facilities provided for employees at some seafood processing plants as well as group homes; this category excludes adult correctional facilities, such as the Spring Creek Correctional Center in Seward, nursing homes, and hospice facilities).

† Defined as those persons living below the poverty threshold by the U.S. Census Bureau in the 2014–2018 American Community Survey. As a point of reference, a family of four (two adults and two children) had a poverty threshold of \$25,926 in 2019.

NA = Data not available.

Source: U.S. Census Bureau (2020).

Table 4-24 Institutional indicators for selected Alaska communities engaged in the UCI salmon driftnet fishery

Community	Traditional Community Name and Translation	Borough	Municipal Government (Incorporation Status, Date)	ANCSA Regional Corporation*	ANCSA Village Corporation	Federally Recognized Tribe and Tribal Government
Anchor Point	K'kaq' (Dena'ina) "River Mouth"	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Clam Gulch	Information unavailable	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Fritz Creek	Information unavailable	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Halibut Cove	Information unavailable	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Homer	Information unavailable	KPB	City of Homer (1st Class City, 1964)	--	None (not an ANCSA village)	None
Kasilof	Ggasilat (Dena'ina)	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Kenai	Shk'ituk't (Dena'ina) "Where We Slide Down"	KPB	City of Kenai (Home Rule City, 1960)	Cook Inlet Region, Inc.	Kenai Natives Association, Inc.	Kenaitze Indian Tribe Kenaitze Tribal Council
Nikiski	Information unavailable	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Nikolaevsk	Information unavailable	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Ninilchik	Niqnilchint (Dena'ina) "Lodge is Built Place"	KPB	None (Unincorporated CDP)	Cook Inlet Region, Inc.	Ninilchik Natives Association, Inc.	Ninilchik Village Tribe Ninilchik Traditional Council
Port Graham	Paluwik (Sugt'stun) "Place of Sadness"	KPB	None (Unincorporated CDP)	Chugach Alaska Corporation	Port Graham Corporation	Native Village of Port Graham Port Graham Tribal Council
Seldovia	Angagkitaqnuuq (Sugt'stun and Dena'ina)	KPB	City of Seldovia (1st Class City, 1945)**	Cook Inlet Region, Inc.	Seldovia Native Association, Inc.	Seldovia Village Tribe Seldovia Tribal Council
Seward	Qutalleq (Sugt'stun)	KPB	City of Seward (Home Rule City, 1912)	--	None (not an ANCSA village)	None
Soldotna	Ts'eldat'nu (Dena'ina) "Trickling Down Creek"	KPB	City of Soldotna (Home Rule City, 1967)	--	None (not an ANCSA village)	None
Sterling	Information unavailable	KPB	None (Unincorporated CDP)	--	None (not an ANCSA village)	None
Anchorage	Dgheyaytnu; Dgheyay Kaq' (Dena'ina) "Needlefish River;" "Mouth of Needlefish River"	see next cell	Unified Home Rule Borough (Incorp.1920 [City], 1964 [Borough], 1975 [Unified Municipality])	Cook Inlet Region, Inc.***	Eklutna, Inc.***	Native Village of Eklutna*** Eklutna Traditional Tribal Council
Delta Junction	Information unavailable	None****	City of Delta Junction (2nd Class City, 1960)	--	None (not an ANCSA village)	None
Wasilla	Information unavailable	Mat-Su	City of Wasilla (1st Class City, 1974)	--	None (not an ANCSA village)	None

* Regional ANCSA corporations are listed only for those communities where they are affiliated with an ANCSA village corporation, but they also serve shareholders in other communities. All of the KPB communities listed as "not an ANCSA community" are within the regional boundaries of Cook Inlet Region, Inc., except Seward, which is within the regional boundaries of the Chugach Alaska Corporation.

** Seldovia Village, an unincorporated CDP first appearing in the U.S. Census in 2000, is adjacent to, but outside of, the city limits of the City of Seldovia.

*** Eklutna is a small ANCSA village located within the much larger boundaries of the Unified Home Rule Municipality of Anchorage and is one of the villages within the Cook Inlet Region, Inc. family of villages; Anchorage itself is not an ANCSA village.

****Delta Junction is located within the Southeast Fairbanks Census Area and is not located within an organized borough.

Source: Alaska Department of Commerce, Community, and Economic Development (2020a).

4.5.5.3.2. Determining Communities for Further Characterization

In selecting communities for further characterization, consideration was given to the large number of communities participating in the UCI salmon drift gillnet fishery; the desire to focus on the communities most clearly substantially engaged in and/or substantially dependent on the fishery (and therefore most

likely to be directly affected by the proposed action and alternatives); and a recognition that communities with multi-sector activity may be more or less vulnerable to potential adverse impacts related to the proposed action and alternatives based on the particular sectors present in specific communities. Table 4-25 provides information on engagement level from 1991–2018, as determined by a principal components factor analysis (PCFA), which appears as an appendix to this EA/RIR (Section 13).

Table 4-25 Selected UCI salmon drift gillnet fishery community harvesting and processing level of engagement indicators for selected Kenai Peninsula Borough and other Alaska communities, 1991–2018.

Community	Number of Years 1991–2018 by Harvesting Engagement Level Greater than "Low" (as determined by PCFA)			Number of Years 1991–2018 by Processing Engagement Level Greater than "Low" (as determined by PCFA)		
	Medium	Medium-High	High	Medium	Medium-High	High
Kenai Peninsula Borough Communities						
Anchor Point	15	10	0	0	0	0
Clam Gulch	0	0	0	0	0	0
Fritz Creek	1	0	0	0	0	0
Halibut Cove	0	0	0	0	0	0
Homer	0	0	28	1	10	10
Kasilof	0	4	24	9	9	5
Kenai	0	0	28	0	0	28
Nikiski	27	0	0	1	1	2
Nikolaevsk	8	0	0	0	0	0
Ninilchik	18	0	0	5	1	1
Port Graham	0	0	0	0	0	0
Seldovia	0	0	0	0	0	0
Seward	1	0	0	1	2	0
Soldotna	0	0	28	0	1	0
Sterling	16	0	0	0	0	0
Other Alaska Communities						
Anchorage	0	7	21	3	0	1
Delta Junction	1	0	0	0	0	0
Kodiak	5	0	0	1	0	0
Wasilla	15	0	0	0	0	0

Source: Kasperski (2020).

The PCFA adapts a framework developed by NMFS to create quantitative indices of fisheries engagement to explore the degree to which communities have been engaged in Cook Inlet salmon drift gillnet harvesting and processing during the years 1991–2018 and how their participation has changed over that time. The PCFA considers two somewhat distinct aspects of community engagement in commercial fisheries in Alaska: a) commercial processing engagement reflects activities associated with vessel landings and actual fish deliveries in the community and associated processing employment, municipal tax revenues, demand for supplies, and profits; b) commercial harvesting engagement reflects activities associated with the community of residence of the vessel owners engaged in this fishery because that community also benefits from the fisheries activity and associated income, and some portion of crew and other supplies will also be procured in this location. One of the advantages of using a PCFA approach is that it takes into account multiple dimensions of community engagement in a single indicator and thereby allows for a portrayal of relative levels of engagement across communities, including smaller communities where data confidentiality considerations would otherwise preclude such analyses.

The engagement level data resulting from the PCFA summarized in Table 4-25 were used to select the individual communities⁷⁹ to be carried forward for more detailed characterization. Specifically:

Communities listed with no level of engagement indicators in either the harvesting or processing category higher than the “low” category for any year 1991–2018 included Clam Gulch, Halibut Cove, Port Graham, and Seldovia, all in the KPB. Fritz Creek (KPB) and Delta Junction (Interior) each had a single year out of the 28 in the 1991–2018 period in the “medium” harvest engagement category. These six communities were not carried forward for further characterization.

A total of eight communities in the KPB had multiple years of “medium-high” or “high” harvesting and/or processing engagement (Anchor Point, Homer, Kasilof, Kenai, Nikiski, Ninilchik, Seward, and Soldotna). These communities are further characterized below.

- Anchorage also had multiple years of “medium-high” and “high” harvesting engagement. However, unlike the other communities in this category, the total ex-vessel gross revenues generated by Anchorage ownership address UCI salmon drift gillnet vessels accounted for relatively little (less than 1%) of the combined ex-vessel gross revenues of the community commercial fishing fleet vessels (participating in all area, species, and gear fisheries) on an annual average basis from 2009–2018 (Table 4-16). Given this low level of dependency on the UCI salmon drift gillnet fishery over the past decade, Anchorage was not carried forward for further characterization.

Two other communities, Nikolaevsk and Sterling (both in the KPB), had multiple years of “medium” level harvest engagement, but no “medium-high” or “high” engagement years (and no years with processing engagement above a “low” level). These communities are also carried forward for further characterization below as they averaged approximately 10 and 11 local ownership address vessels, respectively, participating in the fishery from 2009–2018 (Table 4-13) and the annual average gross ex-vessel revenue from the UCI salmon drift gillnet fishery accounted for approximately 24 and 21 percent of the annual average combined ex-vessel gross revenues for the entire community commercial fishing fleet vessels (participating in all area, species, and gear fisheries) for Nikolaevsk and Sterling, respectively, over those same years (Table 4-16).

- Wasilla (Matanuska-Susitna Borough) also had multiple years of “medium” level harvest engagement, but no “medium-high” or “high” engagement years (and no years with processing engagement above a “low” level), and an annual average of 11 local ownership address vessels participating in the UCI salmon drift gillnet fishery from 2009–2018. However, unlike Nikolaevsk and Sterling, the total ex-vessel gross revenues generated by Wasilla ownership address UCI salmon drift gillnet vessels accounted for relatively little (about 1%) of the total ex-vessel gross revenues of the community commercial fishing fleet vessels on an annual average basis from 2009–2018 (Table 4-16). Given this low level of dependency on the UCI salmon drift gillnet fishery over the past decade, Wasilla was not carried forward for further characterization.
- Kodiak (Kodiak Island Borough) also had multiple years of “medium” level harvest engagement, but no “medium-high” or “high” engagement years. Unlike the Nikolaevsk, Sterling, and Wasilla, Kodiak did have one year of processing engagement above a “low” level. However, an annual average of 3.4 local ownership address vessels participated in the UCI salmon drift gillnet fishery 2009-2018 with a range of one to five vessels participating in any given year (Table 4-13) and 2.0 individual S03H permits with Kodiak addresses were active in the fishery on an annual average basis 2009-2018 with a range of one to three permits active in any given year (Table 4-21). No Kodiak shorebased processors accepted deliveries of UCI drift gillnet-caught

⁷⁹ The PCFA also analyzed four larger groups of communities as wholes (Other Washington, Oregon, California, and Other US) for which engagement indices were calculated (see Table 7-5). These groupings of communities are not described in this section.

salmon during the years 2009-2018 (Table 4-17). Given this low level of participation in the UCI salmon drift gillnet fishery over the past decade, Kodiak was not carried forward for further characterization.

4.5.5.3.3. Community Characterizations

The communities selected for additional characterization are all located in the Kenai Peninsula Borough. The community background information presented in this section is from *Community Profiles for North Pacific Fisheries—Alaska* (Himes-Cornell et al. 2013), unless otherwise indicated.

The contemporary economy of the Kenai Peninsula is dependent on a few key industries, including oil and gas, commercial fishing, tourism, and retail. As with other areas of Alaska outside of urban centers, government, utility, education, and health service sectors also provide employment opportunities for residents. The Kenai Peninsula can arguably lay claim to being the place of origin of the modern Alaska oil and gas industry, with the first commercially viable oil field discovered in 1957 in the Cook Inlet Basin. Oil production has waned in recent years, but natural gas extraction, timber, coal mining, and commercial ranching continue to be present in the Kenai Peninsula and provide employment opportunities for area residents.

The commercial harvest of salmon within Cook Inlet began in 1882 with the establishment of a cannery near the mouth of the Kasilof River. Commercial halibut and groundfish fishing began in the 1920s with this diversification fueled in part by the development of diesel-powered vessels. The herring and crab fisheries developed in the 1920s and 1930s; however, these fisheries have experienced closures due to low biomass. The proximity of the region to some of the State's most productive commercial fisheries in combination with road connectivity to Anchorage and beyond has continued to make the region an important area for commercial fleets and seafood processing operations, as well as an area with concentration of commercial fisheries support service providers. The Kenai, Kasilof, Russian, Anchor, and Ninilchik rivers support Chinook and sockeye salmon runs, while other drainages in the Kenai Peninsula support coho, steelhead, and Dolly Varden. In recent decades, the tourism industry in the region has grown, with Seward and Whittier as cruise line transfer ports, as has the sport fishing industry. Recreational fishing and charter operations are located throughout the Kenai Peninsula Borough, with marked concentrations in Soldotna, Homer, and Kenai.

Anchor Point

Anchor Point is located approximately 14 miles northwest of Homer and 112 miles southwest of Anchorage. Archaeological evidence suggests that the area was originally settled at least 3,000 years ago by the Kachemak tradition of Tanaina Athabascans. Captain James Cook documented the area and its people in 1778 and, according to legend, gave Anchor Point its name after losing a kedge anchor to tidal currents nearby. The goldrush of the late 1800s brought prospectors into the area and homesteaders began to settle more of Anchor Point throughout the 1900s. The community's current economy is focused on the commercial fishing industry and tourism, as its location provides easy access to saltwater and freshwater marine habitats. Commercial fisheries active in Anchor Point include salmon, halibut, groundfish, scallop, sablefish, cod, pollock, and other species. The community was once home to a more robust herring fishery but that has since been closed to allow for stock rebuilding. Anchor Point does not have highly developed fishery support service sector, with most services present in nearby Homer.

Homer

Homer is located 227 road miles south of Anchorage, at the end of the Sterling Highway, on the north shore of Kachemak Bay. Archaeological evidence suggests that the area around Kachemak Bay, including the area that would eventually become Homer, was an important gathering site for Dena'ina Athabascans

and may have also been an important settlement for Alutiiq peoples as long as 4,500 years ago. Archaeological sites near what is now Homer suggest that the area was inhabited for many centuries before European contact. The community of Homer in its contemporary form traces its roots to 1896 when Homer Pennock arrived with 50 miners in a search for coal and gold. Coal mining remained the primary economic driver for the community into the early twentieth century. Other industries, including fur farming and commercial fishing, increased as a result of early homesteaders settling in or near the community.

Before the 1960s, however, the commercial fishing industry in communities around Kachemak Bay was centered on Seldovia, with Homer playing a relatively small, supporting role within the region. However, the Good Friday Earthquake in 1964 destroyed much of Seldovia's fishing infrastructure and Homer filled the vacuum of a local fishing center. Currently, commercial fishing underpins much of Homer's economy, although tourism, sportfishing, and hunting are also large components. Homer is a major regional hub for fishery landing and processing activities, with residents involved in the salmon, halibut, crab, groundfish, herring, and other fisheries.

As a key community for the commercial fleet in the region, Homer has a wide array of supporting infrastructure and support service businesses that draw business from many nearby communities, including multiple yard options for storage and repair services. According to industry participants, the gear shed in Homer does a large volume of gillnets for all regions of Alaska, including Cook Inlet, although there are also numerous independent net hangers that provide services up and down the Kenai Peninsula for those fishers who do not utilize services in Homer or prefer to do it all in house. Also according to industry participants, communities on the south side of Kachemak Bay have tie-ups/buoys that are utilized by the commercial fleet during salmon fishing, with tie-ups used by specific vessels varying based in part on the processor to whom the vessel is delivering, as the processors use service provision one of a set of incentives to stay competitive in retaining a delivery fleet, and in part on the movement of stocks (and therefore the location of fishing effort) during the course of a particular run.

Kasilof

Kasilof is located approximately 15 miles south of Kenai, 13 miles southwest of Soldotna, and 70 miles southwest of Anchorage, along the Sterling Highway. European explorers documented a Dena'ina settlement in what would become Kasilof and other seasonal camps located along the Kasilof River. Russian fur traders established a trading station at the mouth of the Kasilof River in the late 1700s. Commercial fisheries began in the area when a salmon cannery was established at the mouth of the Kasilof River in 1882. Fox farming was a large component of the Kasilof economy in the early twentieth century, but that sector waned in importance through the 1930s, leaving commercial salmon fishing as the key component of the community's economy. Currently, the economy of Kasilof is focused on oil and gas processing, commercial and sportfishing, government services, healthcare, retail, and tourism.

Those residents of Kasilof who are involved in the commercial fishery are engaged in the salmon, herring, halibut, groundfish, sablefish, crab, and other fisheries. Kasilof is home to a few small-scale fish processing and/or buying facilities and the community's relatively diverse economy includes some fishery support service businesses including fabrication and an icehouse (Alaska Department of Commerce, Community, and Economic Development 2020a). According to industry participants, some of the processors in the area will offer buoys at the mouth of the Kasilof River and tie-ups near the processor during the season, as well as haul-out services to the fleet. The area is also served by a few mobile repair companies offer limited repair/refreshing services, often at local processor storage yards.

Kenai

Kenai is located approximately 65 miles southwest of Anchorage and 11 miles off the Sterling Highway, on the eastern shore of Cook Inlet at the mouth of the Kenai River. When Russian fur traders arrived in the area, they documented approximately 1,000 Dena'ina people in a village of *Shk'itk't*, which was located on the same site as the contemporary community of Kenai is now. Following the population losses to epidemics of the late nineteenth and early twentieth centuries described above, the remaining Dena'ina maintained ties to their historical village camps through the 1930s and 1940s. The overall population of the community continued to grow in the following decades with the discovery of oil 20 miles northeast of Kenai, in 1957, and the discovery of offshore oil in 1965. Kenai's contemporary economy is focused on the oil and gas industry, with many of the support businesses in town providing services to Cook Inlet's oil and gas drilling platforms. Kenai's economy also includes substantial tourism, commercial fishing, and fish processing sectors.

Those residents of Kenai involved in the commercial fishery are generally engaged in the salmon and halibut fisheries, with others involved in the herring, groundfish, sablefish, crab, and other fisheries. The City of Kenai operates a dock and boat ramp and there are other moorage opportunities present along the Kenai River. Other commercial fishery support service businesses are also present in Kenai and nearby communities. According to industry participants, similar to what was described for the Kasilof area, some of the processors in the area will offer buoys at the mouth of the Kenai River and tie-ups near the processor during the season as well as haul-out services to the fleet. Like the Kasilof area, the Kenai area is also served by a few mobile repair companies offer limited repair/refreshing services, often at local processor storage yards.

Nikiski

Nikiski is located approximately nine miles north of Kenai, along the Sterling Highway. The modern contemporary community of Nikiski was originally established to support the first cannery in the area, which was established in 1888. As was the case with Kenai, the area experienced an increase in population as a result of homesteading in the 1940s and additional settlement in support of the oil and gas discoveries of the 1950s and 1960s. Due to its proximity to Kenai, the economy of Nikiski is closely linked with that of its larger neighbor and is focused primarily on supporting the oil and gas sector with a large proportion of residents also involved in commercial fishing. Those residents of Nikiski involved in the commercial fishery are generally engaged in the salmon fishery, particularly drift and set gillnet fisheries. The docks in Nikiski are utilized by the oil and gas sector exclusively and Nikiski does not have a highly developed fishery support service sector, with most services present in nearby Kenai.

Nikolaevsk

Nikolaevsk is located approximately 115 miles southwest of Anchorage and ten miles north of Homer, several miles inland from Anchor Point. Nikolaevsk is unique among the communities included in this analysis because it is a settlement of *Staroveri*, or "Russian Old Believers" who fled religious persecution in Russia and ultimately settled on the Kenai Peninsula. Russian Old Believers are originally from a remote part of Siberia and left when the head of the Russian Orthodox Church changed a number of prayer books and traditions in 1666. A small sect within the Church resisted these changes and the conflict eventually became violent, with many imprisoned or burned at the stake due to their adherence to the older customs. Many fled Russia and found refuge in China; however, after World War II, the Chinese government forced the Russian Old Believers out and the various families found refuge in other countries around the world, including Turkey, Argentina, Australia, and Brazil. During the Cold War, then-Attorney General Robert F. Kennedy offered the Russian Old Believers asylum and many families settled in New Jersey and Oregon. While the families in Oregon generally found economic success, elders of the

community believed that the younger generation was becoming too Americanized in Oregon and five families migrated to the current community of Nikolaevsk (Jonassen and Loughlin 2013). Ultimately, Nikolaevsk was one of four villages established in the 1960s in the area for Russian families who were eager to maintain their traditional way of life.⁸⁰

Upon arrival to the region, many Nikolaevsk residents became engaged in the commercial fishery and it is not uncommon for Russian Old Believer fishermen to be engaged in commercial fishing throughout the year, in contrast to a substantial portion of other salmon drift gillnet fishers in Cook Inlet (Loring and Harrison 2013). The Russian families in Nikolaevsk generally lead a family-oriented, self-sufficient lifestyle of small-scale farming, gardening, fishing, and hunting. Nikolaevsk has a small tourism sector but is generally not engaged in any other major industry in the region aside from commercial fishing; no commercial fishery support service sector exists in the community, with needed services present in nearby Homer.

Ninilchik

Ninilchik is located approximately 38 miles southwest of Kenai and 188 road miles from Anchorage, along the Sterling Highway. The Ninilchik area was once used as a fishing and fur-farming location for Dena'ina Athabascan peoples. During the days of early Russian settlement (when Alaska was still a part of Russian America), Ninilchik was established as a retirement community for pensioners of the Russian American Company and became the permanent home for those too sick or infirm to travel back to Russia after their retirement. The original Russian residents of Ninilchik came from five families and through the early 1900s the community retained a largely Russian-speaking population with a Russian village school and a Russian Orthodox church. Non-Russian homesteaders began to arrive in Ninilchik in the 1930s and 1940s and the Sterling Highway was constructed through the community in 1950. The first commercial fishing cannery was established in the community in 1949. The contemporary economy of Ninilchik is based primarily on fishing, retail businesses, and tourism. Those residents of Ninilchik involved in the commercial fishery are engaged in the salmon, halibut, groundfish, herring, and crab fisheries. The harbor in Ninilchik is oriented toward smaller boats and the community does not have a highly developed fishery support service sector, with more services present in the relatively nearby communities of Kenai to the north and Homer to the south. While shorebased processing has occurred in Ninilchik over the years, as shown in Table 4-17, shorebased processing UCI drift gillnet-caught salmon has occurred in only four of the 10 years 2009-2018, and never two years in a row during that period.⁸¹

Seward

Seward is located approximately 125 highway miles south of Anchorage, along Resurrection Bay on the east coast of the Kenai Peninsula. The original inhabitants of the area were the Unegkurmiut, who are a subgroup of the Chugach who lived elsewhere on the Kenai Peninsula. Russian explorer Alexander Baranof traveled into the bay on his way from Kodiak to Yakutat on the “Sunday of Resurrection” in the

⁸⁰ The other communities include Voznesenka, Razdolna, and Kachemak Selo.

⁸¹ As noted in Section 1.4 (under “Socio-economic issues” within the “Stakeholder Perspectives” discussion), the closing of two shorebased processors in Ninilchik resulted in a local loss of jobs. One of the local plants, owned by a firm with facilities in multiple communities, was destroyed by fire in 1979 (with local landings otherwise destined for delivery to this plant temporarily trucked to Homer for processing, according to a contemporaneous employee newsletter). According to present-day company management, the Ninilchik plant was not rebuilt post-fire because of restrictive tide access at the site, with the result being that since 1979, their remaining Ninilchik facilities have been used as a buying station only. With the loss of the Ninilchik plant, the firm started buying on tenders offshore and, in a pattern that has continued to the present, the tenders would then run to Homer to deliver the fish, which would subsequently be trucked to Seward for processing. While processing of UCI drift gillnet-caught salmon had also previously occurred at another plant owned by the same firm in Homer, that plant was destroyed by fire in 1998 and was not rebuilt, except for a 90-ton ice house; the site today functions as a buying station with a large gear storage yard, with all fish going to Seward for processing (Hoyt, personal communication, 2020). A second shorebased processor in Ninilchik that accepted deliveries of UCI drift gillnet-caught salmon, which was a relatively small, independent custom packing plant, began operating in community in the 1960s but closed 2011, according to a former plant manager (Berger, personal communication, 2020).

Russian Orthodox church and established a camp close to the site of the contemporary community of Seward. The contemporary city of Seward traces its origins to the late 1800s when it was founded as a railroad terminus following the discovery of gold. Construction of the railroad completed in 1923 and the community became a major rail link from the lower 48 to the interior of the State. The Good Friday Earthquake of 1964 destroyed an estimated 90% of the town's infrastructure. However, Seward was able to rebuild and has remained a major hub for trade and transportation. The contemporary economy of the community is focused on commercial fishing, fishing support service industries, coal transportation, education and research, and tourism, and also benefits from the local presence of a correctional facility. Seward is broadly engaged in the commercial fishery as a base of operations for numerous vessels and home to a local fleet and multiple locally operating shorebased processors. Those residents of Seward involved in the commercial fishery are engaged in the crab, halibut, herring, sablefish, groundfish, and salmon fisheries. While Seward has had little or no participation in the harvest sector of the UCI drift gillnet salmon fishery in recent years, as measured by the activity of vessels with local ownership addresses, shorebased processing in Seward, as noted earlier, benefits from landings by vessels and tenders to ports on the west side of the Kenai Peninsula that are then trucked to Seward for processing. The commercial fishing support service industry is relatively highly developed in Seward and the infrastructure present includes ample dock space, fuel, haul-out services, and emergency response services, among others.

Soldotna

Soldotna is located approximately 150 highway miles south of Anchorage and ten miles inland from Cook Inlet along the Kenai River. The area was and remains home to the Kenaitze people. The community is relatively young for the region and was established by homesteaders in the years immediately following World War II. The community became a stopping point along the Sterling Highway as it is the location of the highway bridge crossing for the Kenai River, with the retail sector forming the cornerstone of its early economy. The oil and gas discoveries of the late 1950s brought additional services and families to the community. The contemporary economy of Soldotna is focused on providing services to the oil and gas industry with other important sectors including commercial fishing, fish processing, government, agriculture, transportation, construction, and retail trade. Historically, residents of Soldotna have been involved in the primary commercial fisheries of the region, including salmon and herring throughout the twentieth century. Those current residents of Soldotna involved in the commercial fishery are engaged in the salmon, halibut, herring, sablefish, groundfish, shellfish, and other fisheries. As Soldotna is not adjacent to the coast, the community does not have a highly developed fishery support service sector, with more services present in nearby Kenai.

Sterling

Sterling is located approximately 18 miles east of Kenai along the Sterling Highway, near the junction of the Moose and Kenai rivers. Sterling is close to Soldotna and was (and remains) home to the Kenaitze people, who as previously noted, had summer fish camps along many of the rivers and along the shores of Cook Inlet, harvesting all five salmon species through a variety of means. Sterling developed in similar manner to Soldotna, with the settlement of homesteaders marking the origin of the community in its contemporary form in the years immediately following World War II. The community also became involved in providing services and support to the oil and gas sector in that time, with other residents involved in the predominant commercial fisheries in the area, including salmon and herring. The contemporary economy of Sterling is focused on oil and gas processing, timber, commercial fishing, government, retail, and tourism. Those current residents of Sterling involved in the commercial fishery are engaged in halibut, herring, and salmon. As Sterling is not adjacent to the coast, the community does not have a highly developed fishery support service sector, with more services present in nearby Kenai.

4.5.5.4. Fishery Tax Related Revenue

4.5.5.4.1. Tax Revenue Directly Generated by the UCI Salmon Drift Gillnet Fishery

Salmon harvested in the UCI salmon drift gillnet fishery are subject to three State of Alaska fisheries taxes listed below. The descriptions of these taxes are taken from Alaska Department of Revenue (2020b), which provides additional information about resource taxes in Alaska. The first two fisheries taxes are levied as a percentage of ex-vessel value, while the third is based on first wholesale value.

- **Fisheries Business Tax:** The fisheries business tax is generally paid by the first processor of processed fish, or the exporter of unprocessed fish, based on the ex-vessel price of unprocessed fish. The rates vary depending on the type of processor, and on whether the species of fish is considered a “developing” species. Salmon species are considered established species. The key applicable rates for the species of salmon considered here are those for shorebased processors and direct marketers (3%), floating processors (5%), or salmon canneries (4.5%).
- **Seafood Marketing Assessment:** Any person processing or exporting more than \$50,000 of seafood products in a calendar year is responsible for paying 0.5% of the ex-vessel value of the fish to support marketing efforts.
- **Salmon Enhancement Tax.** Salmon harvesters in a region may vote to assess themselves to support salmon enhancement programs in their regions. Assessments may vary from program to program. Assessments are collected by licensed fish buyers from CFEC permit holders when they sell their salmon. CFEC permit holders who sell to unlicensed buyers or export their fish from the aquaculture region where they were caught must pay the assessment themselves. These revenues support salmon enhancement activity in the regions within which they are collected.

Unlike many communities in the Western Gulf of Alaska and Aleutian Islands that are substantially engaged in and/or dependent on Federally managed commercial fisheries, the communities in the Kenai Peninsula Borough do not have their own city fish taxes. Nor does the Kenai Peninsula Borough have its own borough fish tax that would generate landings related revenue in addition to the shared revenue received by these entities from State fishery taxes.

Although not a tax, harvesters also pay 2.0% of the ex-vessel value of the fish to support the Cook Inlet Aquaculture Association, a non-profit organization based in Kenai, and one of eight regional aquaculture associations in Alaska (Cook Inlet Aquaculture Association 2020). The Association's programs include hatcheries that produce salmon fry, which are released in streams and lakes; construction and maintenance of salmon migration routes, referred to as “fishways;” and scientific research into salmon breeding and behavior patterns.⁸²

4.5.5.4.2. Fishery Tax Revenue Received by Communities Engaged in the UCI Salmon Drift Gillnet Fishery

Communities engaged in the UCI salmon drift gillnet fishery receive shared fishery tax revenues under programs administered by the Alaska Department of Revenue (ADOR) and the Alaska Department of Commerce, Community, and Economic Development (DCCED). These shared revenues derive from all commercial fisheries that include landings or product transfers that occur within the State.

Table 4-26 provides an overview of the fishery tax revenue sharing program administered by ADOR. In addition, item 4 in the Fisheries Business tax program describes the fishery tax revenue sharing program

⁸² Currently, there is a single private hatchery that is fully operational in Upper Cook Inlet, the Trail Lakes facility operated by Cook Inlet Aquaculture Association. The Trail Lakes hatchery is in the upper Kenai River drainage near Moose Pass (Marston and Frothingham 2019).

administered by DCCED. As noted, the shared revenue from both the State’s Fisheries Business Tax (applied to ex-vessel value of landings from vessels to processors) and Fishery Resource Landing Tax (applied to processed products from catcher/processors and motherships, as calculated on the estimated ex-vessel value of the resources that were input for the processed products, at the point of landing/transfer) under the program administered by ADOR are directly proportional to the total fishery tax revenue generated from landings/transfers that occur in a given community or borough.

Table 4-26 Overview of shared State fishery tax revenue received by Kenai Peninsula Borough communities engaged in the UCI salmon drift gillnet fishery and Anchorage.

Tax Program	Share Provision	Share Cycle	
		Disbursal Date	Period
Fisheries Business AS 43.75.130	50% of fisheries business taxes are shared with the municipalities where fishery resources were processed. Taxes are shared as follows: 1) If processing occurred within an incorporated city which is not located within an organized borough, 50% of the tax collected is shared with the city. 2) If processing occurred within an incorporated city which is located within an organized borough, 25% of the tax collected is shared with the city and 25% of the tax is shared with the borough. 3) If processing occurred at a location within an organized borough but not within an incorporated city, 50% of the tax is shared with the borough. 4) If processing occurred in the unorganized borough, 50% of the tax is shared with municipalities Statewide through an allocation program administered by DCCED.	August (FY2009) September (FY2010–2014) December (FY2015–2016) October (FY2017–2018)	Preceding Fiscal Year
Fishery Resource Landing AS 43.77.060	50% of fishery resource landing taxes are shared with the municipality where fishery resources were landed. The mechanics for sharing landing taxes are the same as fisheries business taxes, except that the proration applies to boroughs incorporated after January 1, 1994.	September (FY2009–2014) December (FY2015–2016) October (FY2017–2018)	Preceding Fiscal Year

Source: Alaska Dept of Revenue, Shared Taxes and Fees Annual Reports, FY 2009–2018. <http://tax.alaska.gov/programs/sourcebook/index.aspx> accessed 2/16/2020.

Table 4-27 provides eligibility and funding information for the fishery tax revenue sharing program administered by DCCED.⁸³ As noted, the revenue received from the program by any given community is not directly proportion to commercial fishing landings/transfers made in that community. Revenue received under both ADOR and DCCED programs is not differentiated by fishery. Consequently, it is not possible from existing data to determine the tax revenue generated specifically by the UCI salmon drift gillnet fishery (although it is known that all shared tax revenue associated with that fishery occurs in the form of Fisheries Business Tax revenue). Further, aggregate tax contributions from all fisheries include salmon (and other species) caught in both Federal and State waters.

⁸³ As with the ADOR fishery tax revenue sharing program, there is a lag time in the DCCED program between collection of the taxes and the distribution of revenue to the municipalities. For example, tax revenue collected in the 2017 calendar year was distributed in March 2019.

Table 4-27 Description, eligibility, and funding specifications of the DCCED fishery tax revenue sharing program.

Program Description	The purpose of the Shared Fisheries Business Tax Program is to provide for an annual sharing of fish tax collected outside municipal boundaries to municipalities that can demonstrate they suffered significant effects from fisheries business activities. This program is administered separately from the State fish tax sharing program administered by ADOR, which shares fish tax revenue collected inside municipal boundaries.
Program Eligibility	To be eligible for an allocation under this program, applicants must: 1. Be a municipality (city or borough); and 2. Demonstrate the municipality suffered significant effects as a result of fisheries business activity that occurred within its respective fisheries management area(s).
Program Funding	The funding available for the program this year is equal to half the amount of State fisheries business tax revenue collected outside of municipal boundaries during calendar year 2018. Program funding is allocated in two stages:
	1st Stage: Nineteen Fisheries Management Areas (FMAs) were established using existing commercial fishing area boundaries. The available funding is allocated among these 19 FMAs based on the pounds of fish and shellfish processed in the whole State during the 2018 calendar year. For example, if an area processed 10% of all the fish and shellfish processed in the whole State during 2018, then that area would receive 10% of the funding available for the program this year. These allocations are calculated based on Fisheries Business Tax Return information for calendar year 2018.
	2nd Stage: The funding available within each FMA will be allocated among the municipalities in that area based on the level of fishing industry significant effects suffered by each municipality compared to the level of effects experienced by the other municipalities in that FMA.
	Some boroughs, because of their extensive area, are included in more than one FMA. In these cases, the borough must submit a separate program application for each area.

Source: Text supplied by DCCED (personal communication, K. Phillips, October 14, 2019).

Table 4-28 shows the Fishery Business Tax revenue received from ADOR by Kenai Peninsula Borough communities engaged in the UCI salmon drift gillnet fishery from FY 2009 through FY 2018. In addition, the revenue received by the Kenai Peninsula Borough itself and Anchorage is shown. Revenue from the program varied widely across Kenai Peninsula Borough communities. Table 4-29 provides parallel information for the Fishery Business Tax program administered by DCCED. Revenue from this program was relatively evenly distributed across communities.

Table 4-28 State Fishery Business Tax shared revenue received from ADOR by Kenai Peninsula Borough communities engaged in the UCI salmon drift gillnet fishery, the Kenai Peninsula Borough, and Anchorage, FY 2009–FY 2018.

Geography	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average
	(\$)										
Homer	93,132	73,801	117,556	64,617	37,136	54,283	21,004	20,456	43,242	59,449	58,468
Kenai	208,989	148,581	276,547	291,597	197,541	289,411	195,703	161,515	115,821	126,185	201,189
Seldovia	845	5,249	2,367	150	0	0	0	0	0	0	861
Seward	417,356	298,316	596,097	519,689	480,290	482,543	334,691	280,935	440,958	456,144	430,702
Soldotna	1,151	1,049	2,020	1,594	685	1,969	2,841	586	1,765	2,775	1,644
Kenai Peninsula Borough	740,339	621,786	1,004,361	952,078	774,646	919,123	629,725	541,757	771,171	860,097	781,508
Anchorage	157,650	143,049	119,063	170,617	221,337	181,607	202,096	122,012	92,250	53,269	146,295

Source: Alaska Department of Revenue (2020a).

Table 4-29 State Fishery Business Tax shared revenue received from DCCED by Kenai Peninsula Borough communities engaged in the UCI salmon drift gillnet fishery, the Kenai Peninsula Borough, and Anchorage, FY 2009–FY 2018.

Geography	2009*	2010	2011	2012	2013	2014	2015	2016	2017	2018	Annual Average 2010-2018
	(\$)										
Homer	not available	2,144	3,547	5,791	4,206	4,016	3,086	2,800	3,450	2,454	3,499
Kenai	not available	4,199	3,655	6,029	4,374	4,169	3,211	2,910	3,572	2,549	3,852
Seldovia	not available	3,645	3,180	5,250	3,814	3,638	2,798	2,539	0	2,193	3,006
Seward	not available	3,834	3,342	5,528	4,017	3,831	2,930	2,675	3,309	2,320	3,532
Soldotna	not available	3,950	3,440	5,695	4,143	3,950	3,036	2,757	3,402	2,409	3,643
Kenai Peninsula Borough	not available	7,913	6,883	11,528	8,388	7,993	6,135	5,588	6,530	5,188	7,349
Anchorage	not available	26,689	23,340	38,442	27,934	26,651	20,531	18,607	20,644	17,663	24,500

*Notes: Information for FY2009 was entered prior to the institution of DCCED's current database program and the previous database program is no longer accessible (personal communication, K. Phillips, 2/18/20).
Source: Spreadsheet supplied by DCCED (personal communication, K. Phillips, October 8, 2019).

Table 4-30 provides information on annual average revenue from FY 2009–FY 2018 from shared Fishery Business Tax and Fishery Resource Landing Tax sources. The revenue received by the jurisdictions of interest from Fishery Resource Landing Tax sources is modest, ranging from less than 1% of the total shared fisheries tax revenue for Homer, Kenai, the Kenai Peninsula Borough, and Anchorage, to roughly 1, 2, and 3% of the total shared fisheries tax revenue for Seward, Soldotna, and Seldovia, respectively.

Table 4-30 Average annual State shared fisheries tax revenue received by Kenai Peninsula Borough communities engaged in the UCI salmon drift gillnet fishery, the Kenai Peninsula Borough, and Anchorage, FY 2009–FY 2018.

Geography	Fisheries Business Tax			Fishery Resource Landing Tax			Grand Total
	DOR	DCCED*	Subtotal	DOR	DCCED*	Subtotal	
	(\$)						
Homer	58,468	3,499	61,967	110	112	222	62,188
Kenai	201,189	3,852	205,041	0	130	130	205,171
Seldovia	861	3,006	3,867	0	113	113	3,980
Seward	430,702	3,532	434,234	6,204	119	6,323	440,556
Soldotna	1,644	3,643	5,286	0	123	123	5,409
Kenai Peninsula Borough	781,508	7,349	788,858	6,752	250	7,003	795,860
Anchorage	146,295	24,500	170,795	0	839	839	171,634

Notes: DCCED data represent the annual average for 2010–2018; data from 2009 are not available (see note on previous table).
Source: Alaska Department of Revenue (2020a) and spreadsheet supplied by DCCED (personal communication, K. Phillips, October 8, 2019).

Table 4-31 shows average annual shared fisheries tax revenue from FY 2009–FY 2018 as a percentage of annual average general fund revenue from FY 2009–FY 2018 in the jurisdictions of interest. While shared fisheries taxes represent a small portion of total revenue, these taxes may benefit local economies in a number of ways, including through smaller community sales tax or property tax assessments, among others (North Pacific Fishery Management Council 2018). Additionally, communities benefit from revenues generated by other taxes on transactions associated with other UCI salmon drift gillnet fishery related activities, including taxes applied to expenditures across a wide range of goods and services including, but not limited to, gear, fuel, provisions, vessel maintenance and repair, and the like. Beyond general fund revenues, communities may benefit from a range of special fund revenues associated with taxes or fees related to fisheries infrastructure use, such as moorage and wharfage fees, among others. Communities also benefit from tax revenues associated with the activities of fishery support service sector entities themselves, as well local spending of earnings by individuals whose incomes in whole or in part are directly or indirectly attributable to the fishing industry.

Table 4-31 Average annual shared fisheries tax revenue from FY 2010–FY 2018 as a percentage of total FY 2018 general fund revenue in Kenai Peninsula Borough communities engaged in the UCI salmon drift gillnet fishery and Anchorage.

Geography	2009–2018 Annual Average Shared Fishery Tax Revenue (\$)	2009–2018 Annual Average General Fund Revenue (\$)	2009–2018 Annual Average Shared Fishery Tax Revenue as a Percent of 2009–2018 Annual Average General Fund Revenue (%)
Homer	62,188	12,164,759*	0.5
Kenai	205,171	14,122,621	1.5
Seldovia	3,980	555,543	0.7
Seward	440,556	11,166,508	3.9
Soldotna	5,409	9,401,875	0.1
Kenai Peninsula Borough	795,860	73,717,546**	1.1
Anchorage	171,634	633,315,741	0.03

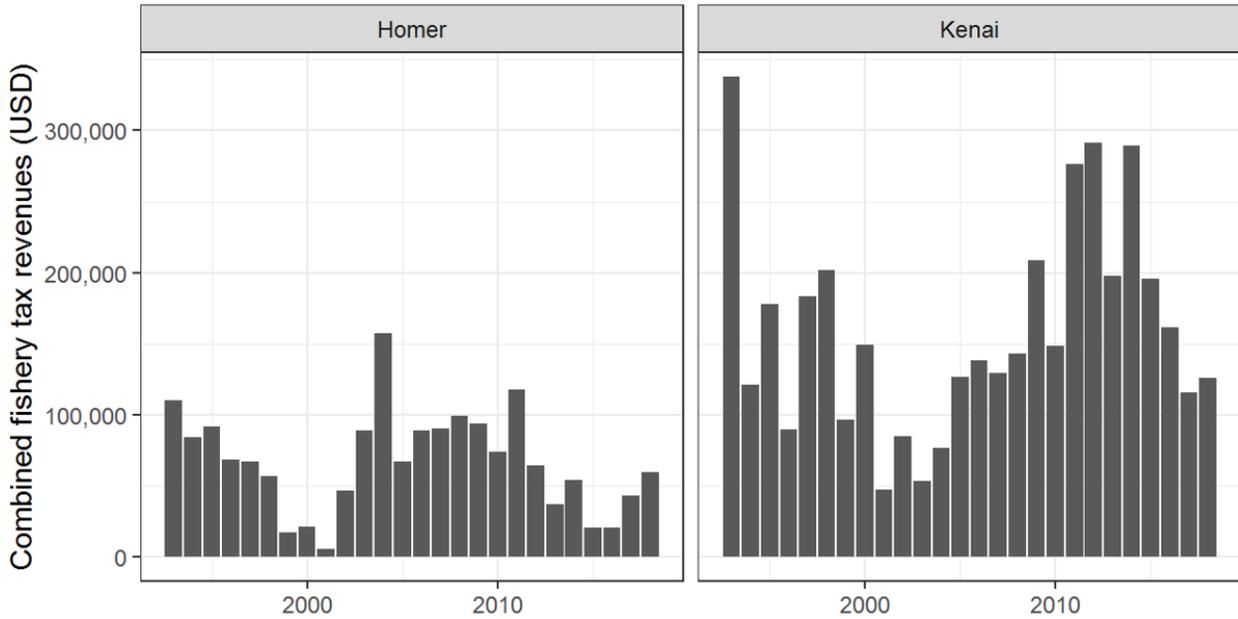
*Data not available for 2011 and 2016; annual average shown is for available years only.

**Data not available for 2017; annual average shown is for available years only.

Source: Alaska Department of Revenue (2020a); DCCED (2020c).

Figure 4-40 illustrates long-term trends in the shared fisheries tax revenue received by Homer and Kenai.

Figure 4-40 Shared fishery tax revenue received by Homer and Kenai, 1993–2018.



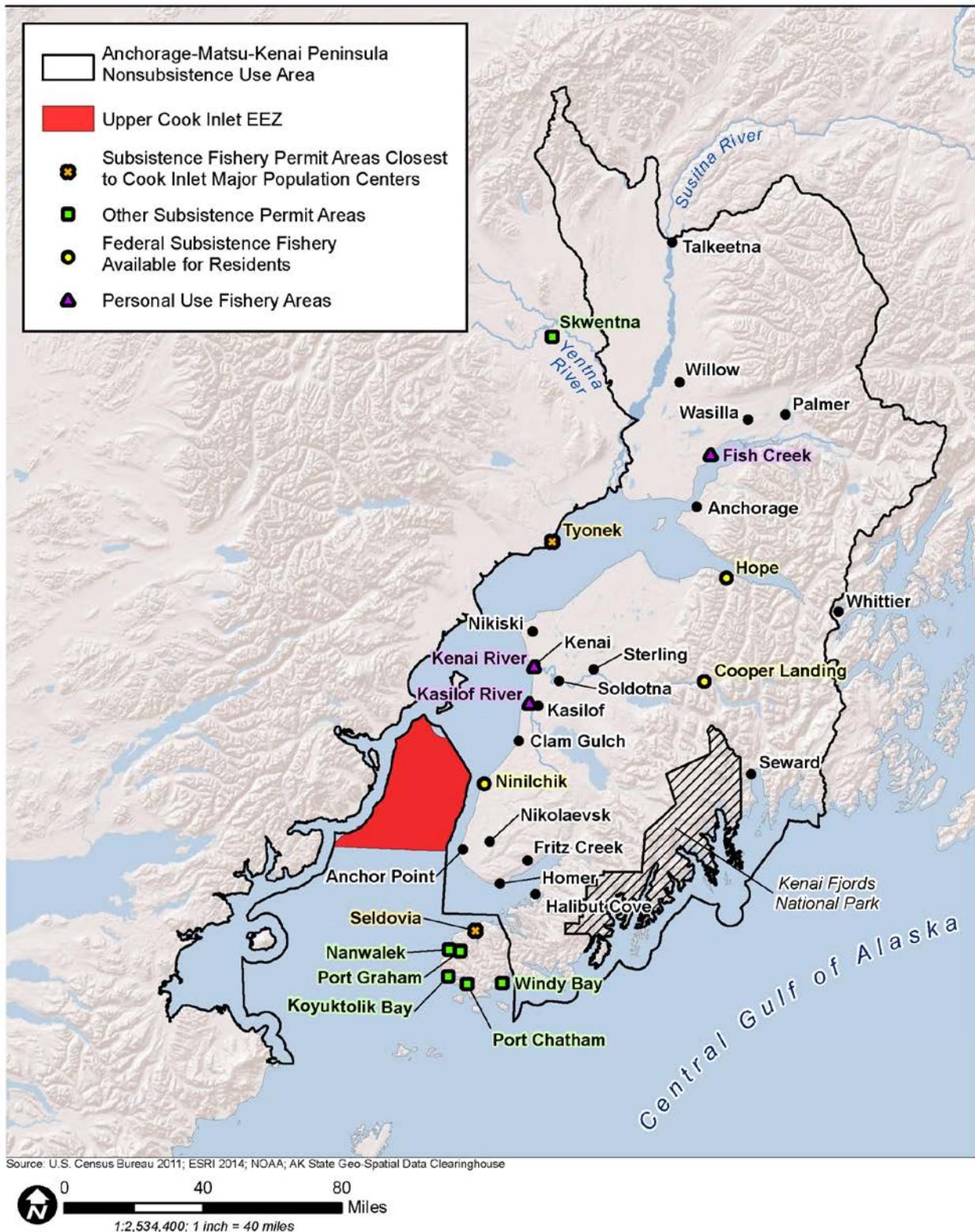
Source: Watson (2019).

4.5.5.5. Community Engagement in Subsistence and Personal Use Salmon Fisheries in or near Upper Cook Inlet

Most of the waters of the ADF&G Cook Inlet Management Area are within the Anchorage-Matsu-Kenai Peninsula Nonsubsistence Use Area as established by the Alaska Joint Board of Fisheries and Game (5 AAC 99.015 (3)). Because subsistence fisheries are not permitted within nonsubsistence use areas, noncommercial harvesting opportunities occur under State sport, personal use, and educational fishing regulations (as well as limited opportunity under Federal regulations). Commercial harvesters may retain finfish from their lawfully taken commercial catch for home use (“home pack”). These fish are required to be reported on commercial fish tickets rather than on the subsistence salmon permit or personal use permit (Fall 2019).

Figure 4-41 shows the location of the Anchorage-Matsu-Kenai Peninsula Nonsubsistence Use Area relative to the location of the Cook Inlet EEZ. The Cook Inlet EEZ is outside of, but adjacent to, the nonsubsistence use area. Also shown in the figure are communities that were engaged in and/or dependent on the commercial UCI salmon drift gillnet fishery from 2009–2018; communities that are otherwise in or near subsistence salmon fishery permit areas and/or personal use fishery areas; and communities where Federal subsistence salmon permits are available to residents.

Figure 4-41 Map of the subsistence and personal use salmon fishery areas in or near Upper Cook Inlet.



Source: Adapted from https://www.adfg.alaska.gov/index.cfm?adfg=subsistence.nonsub_detail&area=Anchorage.

In two instances (Seldovia and Port Graham), communities identified as engaged in and/or dependent on the commercial UCI salmon drift gillnet fishery from 2009–2018 are immediately adjacent to State subsistence salmon fishery permit areas.⁸⁴ Both of these communities are located to the southeast of the Cook Inlet EEZ, near the southwestern tip of the Kenai Peninsula and outside of the Anchorage-Matsu-Kenai Peninsula Nonsubsistence Use Area.⁸⁵ Additional subsistence salmon fishery permit areas shown on Figure 4-41 (but farther removed from the Cook Inlet EEZ) include the Tyonek permit area, which is located in waters adjacent to lands owned by the Native Village of Tyonek, and the Yentna fish wheel fishery permit area, located on the Yentna River upstream of the nonsubsistence use area boundary in the vicinity of the community of Skwentna.⁸⁶ Neither Tyonek nor Skwentna was identified as a community engaged in and/or dependent on the UCI salmon drift gillnet fishery from 2009–2018. Additional information on State permitted subsistence fisheries in the region (as well as educational fisheries in the region, which include permits held by Alaska Native entities in Upper Cook Inlet, such as those held by Kenaitze Tribal Group, Ninilchik Traditional Council, and Ninilchik Native Descendants) is provided in Section 4.6.4.1.

Federal subsistence salmon permits are available to the residents of one community (Ninilchik) identified as engaged in and/or dependent on the commercial UCI salmon drift gillnet fishery from 2009–2018 that is located within the Anchorage-Matsu-Kenai Peninsula Nonsubsistence Use Area. Federal subsistence fishery permits are also available to residents of two other communities located within the same nonsubsistence use area (Hope and Cooper Landing), but neither was identified as engaged in and/or dependent on the UCI salmon drift gillnet fishery from 2009–2018.⁸⁷ Additional information on Federal subsistence fisheries in the region is provided in Section 4.6.4.2.

Two other communities (Kenai and Kasilof) identified as engaged in and/or dependent on the commercial UCI salmon drift gillnet fishery from 2009–2018 are adjacent to personal use salmon fishery areas encompassing three personal use fisheries (the Kenai River dip net fishery, the Kasilof River dip net fishery, and the Kasilof River set gillnet fishery). A fourth personal use salmon fishery area in the region, at Fish Creek on the northwestern shore of Knik Arm (the Fish Creek dip net fishery), is located roughly equidistant (approximately 15 miles) from two communities (Anchorage and Wasilla) identified as engaged in and/or dependent on the commercial UCI salmon drift gillnet fishery. All four of these communities are located within the Anchorage-Matsu-Kenai Peninsula Nonsubsistence Use Area.⁸⁸ Additional information on personal use fisheries is provided in Section 4.6.3.

4.5.6. Target Products and Markets

One of the most important fisheries that helped shape the history of Alaska is the Cook Inlet commercial salmon fishery (Sechrist and Rutz 2014). Since the end of the nineteenth century, the Kenai Peninsula has seen a history of salmon canneries and buying stations. During the early 1900s thousands of salmon were harvested primarily by fish traps, sent off to the canneries, packed, and shipped to the Lower 48 States.⁸⁹

⁸⁴ The predominantly Alaska Native community of Nanwalek, which was not identified as engaged in and/or dependent on the UCI salmon drift gillnet fishery from 2009-2018, is in the Port Graham subdistrict subsistence permit area.

⁸⁵ There are three other subdistrict subsistence fishery permit areas near the southwestern tip of the Kenai Peninsula, outside of the Anchorage-Matsu-Kenai Peninsula Nonsubsistence Use Area. The Koyuktolik (Dogfish) Bay, Port Chatham, and Windy Bay subsistence permit areas, unlike the Port Graham subsistence permit area, are not adjacent to contemporary communities. The fisheries for the Port Graham, Koyuktolik Bay, Port Chatham, and Windy Bay subdistricts are all under one permit issued by ADF&G; the fishery in the Seldovia area is under a separate permit, also issued by ADF&G.

⁸⁶ Specifically, it is located in the mainstem of the Yentna River from its confluence with Martin Creek upstream to its confluence with the Skwentna River. The subsistence fish wheel fishery began in 1996 as a personal use fishery and was reclassified as a subsistence fishery by the Joint Board of Fisheries and Game in 1998 (Fall 2019).

⁸⁷ Since 2007, Federal regulations allow for the harvest of salmon, trout, and Dolly Varden by residents of Cooper Landing, Hope, and Ninilchik in the Kenai National Wildlife Refuge and Chugach National Forest (Fall 2019).

⁸⁸ A fifth personal use fishery, the Beluga River Personal Use Salmon Fishery, occurs within the Beluga River upstream from the northwestern shore of Cook Inlet, roughly ten miles northeast of Tyonek. As it is limited to Alaska residents 60 years or older, it is not further considered in this section.

⁸⁹ A number of gear types were used during the early decades of the fishery, including drift gillnets, but fish traps were the favored gear because they allowed canneries to maximize yield while minimizing labor and equipment costs (Pettersen and Glazier 2004).

Cook Inlet salmon harvests plummeted in the 1940s due to overfishing, but the stocks gradually recovered after the State of Alaska took management control of its salmon resources soon after Statehood in 1959. By the 1980s commercial harvests were at or near record levels (Sechrist and Rutz 2014).

However, during the late 1990s rapid and sustained growth in world farmed salmon production fundamentally transformed world salmon markets with respect to total supply, prices, products, timing of production, quality standards, and organization of the industry (Knapp et al. 2007). These factors led to a marked reduction in the prices paid for wild-caught salmon (Figure 4-21), forcing many fishermen in Cook Inlet commercial salmon fisheries to both search for markets where they could receive higher prices for their catches and to change the way they handled their fish at the time of catch (Shields and Dupuis 2012).

In the early 2000s a brand marketing program for Cook Inlet sockeye salmon was implemented as a way to add value and name recognition to the salmon, and thereby spur demand for the product in the face of domestic market gluts caused by farm-raised salmon. Under this regional branding effort, sockeye salmon caught in Cook Inlet that met quality standards were marketed with the “Kenai Wild” brand. Third party quality assurance inspectors were contracted for the purpose of maintaining defined quality standards for the program (Knapp et al. 2007). Within a few years the program was supported by about 250 fisherman and four processors. To fund the program, participating processors assessed a per-pound tax on fish certified under program standards. In addition, support from the State came via the salmon revitalization program, which funded purchases of ice machines and insulated totes (Roeske 2007).

The regional marketing effort was eventually terminated for a number of reasons, the major one being harvesters and processors did not necessarily receive—or perceive—any immediate benefits in higher prices to compensate for the additional operational costs the program imposed (Knapp et al. 2007). However, the commercial salmon fishing industry in Cook Inlet has continued to emphasize quality of the final product. According to United Cook Inlet Drift Association (2015), salmon commercially harvested in Cook Inlet occupy a unique and preferred market status due to their larger size and high quality. Fishermen handle the fish utilizing bleeding techniques, icing and slush icing, refrigerated sea water, and smaller brailer bags. After being delivered promptly to processors/buyers, most of the fish are quickly processed and shipped to markets.

Currently, the majority of salmon products originating from the UCI drift gillnet fishery are transported to markets in the lower 48 States by sea, air, and road (United Cook Inlet Drift Association 2015).⁹⁰ Fresh salmon is available during harvest and shipped as fillets or head-and-gutted product, while frozen salmon is available year-round in a variety of packaging and product forms. Fresh and smoked fillets add the most value to Alaska salmon products (McDowell Group 2015). Some processors also produce salted salmon roe prepared in skeins (*sujiko*) and salted salmon roe separated from skeins (*ikura*). Japan is the primary market for these roe products, although they are also consumed in South Korea and other niche markets (McDowell Group 2017b).

Marketing of these products has been bolstered by Marine Stewardship Council (MSC) certification of the UCI salmon drift gillnet fishery and other Alaska salmon fisheries as “well managed and sustainable” (Marine Stewardship Council 2020).⁹¹ The State’s salmon fisheries originally received the MSC label in 2000, when they were the first U.S. fisheries to achieve MSC certification (Marine Stewardship Council 2014). The Alaska salmon fishing industry’s early commitment to third-party certification has reaped

⁹⁰ Seafood can be trucked from Alaska communities directly to wholesale and retail customers in the lower 48 States. Driving around-the-clock with two drivers allows a shipment of seafood to arrive in Seattle in approximately two days or Chicago in less than three days (McDowell Group 2015).

⁹¹ The London-based MSC is a non-profit, non-governmental, international organization established to promote sustainable fisheries and responsible fishing practices worldwide. The MSC has developed a globally-recognized sustainability label for seafood products from certified fisheries.

benefits in the form of price premiums and a secure position in the rapidly expanding market for “eco-labeled” seafood products. With more than 360 MSC-labeled Alaska salmon products on the market, the Alaska salmon fisheries produce more products bearing the MSC label than any other MSC-certified fishery. Moreover, Alaska salmon products are the most widely distributed products certified under the MSC program, with markets in 21 countries (Marine Stewardship Council 2014).

The emphasis on quality and sustainability has played an important role in an increase in the price that Cook Inlet commercial salmon fishermen receive from marketing their own catch as well as from selling to shorebased processors (Shields and Dupuis 2012). Direct marketing emerged in Cook Inlet commercial salmon fisheries on a significant scale in the 2000s. With direct marketing, fishermen sell their product directly to the consumer either at the dock, over the Internet, or by subscription. It also includes fishermen selling their product to food service operators and retailers, who in turn sell it to the ultimate consumer (UC Santa Barbara 2014).

The early efforts of Cook Inlet commercial salmon fishermen to market their own catch were supported by the concurrent rise of independent (non-processor-owned) docks providing services to any fisherman requesting them. Prior to the development of these docks it was difficult for fishermen to be independent of the processors to whom they sold their fish (Anonymous 2005).⁹² In addition, beginning in 2005, ADOR initiated a specific fisheries business license type, called a direct marketing license, that allowed fishermen to sell their fish to anyone without restriction (Hutter 2016a).⁹³

However, a direct marketing license itself does not allow a fisherman to process fish themselves—to do that they have to apply to the Alaska Department of Environmental Conservation for a seafood processor permit. Otherwise, to process their fish they must have it custom-processed in a permitted processing facility (Alaska Department of Environmental Conservation 2020). Another option for fishermen is to obtain a catcher-seller permit from ADF&G that allows them to sell their catch directly off their vessel without processing (Hutter 2016b).⁹⁴

A major benefit of marketing one's own catch is the ability to bypass middlemen (processors, wholesalers, etc.). Fishermen with a direct marketing license or catcher-seller permit can cater to niche markets with their small-scale operations, high value product, and compelling stories (Alaska Department of Commerce, Community, and Economic Development 2020b). However, as shown in Table 4-11, the number of harvesters in the UCI salmon drift gillnet fishery who obtained and used a direct marketing license or catch-seller permit fluctuated from 2009–2018, with the combined total peaking at 18 in 2015 before falling to 12 in 2018. Johnson (2018) notes that fishermen potentially face a number of impediments when trying to market their own fish, including remote fishing locations that lack transportation access; lack of refrigeration and other product handling facilities; lack of willing, skilled, and affordable help; lack of experience in, or dislike of, business management and bookkeeping; and a shortage of startup and operating capital.

⁹² As discussed in Section 4.5.4.1, the ability of Cook Inlet commercial salmon fishermen to market their own catch is also facilitated by the Kenai Peninsula's extensive road system and its proximity to the Anchorage/Mat-Su region. Harvesters in the Cook Inlet salmon set gillnet fishery may be more likely to sell their own catch than those in the drift gillnet fishery because they operate closer to shore and have greater road access (Berger 2020).

⁹³ The minimum qualifications for a fisherman to become a direct marketer are that the vessel responsible for the harvesting must not exceed 65 ft in length; the boat must be U.S. Coast Guard registered; the fisherman must operate as a sole-proprietorship; and the fisherman must have a CFEC permit (Hutter 2016a). Fishermen who sell their catch in the Kenai Peninsula Borough must register with the borough to charge a sales tax.

⁹⁴ A “catcher-seller” is defined in 5 AAC 39.130(k) as a “commercial fisherman who sells or attempts to sell unprocessed fish that were legally harvested by the catcher-seller.” These fish may be sold 1) to the general public for use for noncommercial purposes; 2) for use as bait for commercial or noncommercial purposes; 3) to restaurants, grocery stores, and established fish markets; or 4) by shipping the fish to a licensed buyer, processor, or exporter within the State.

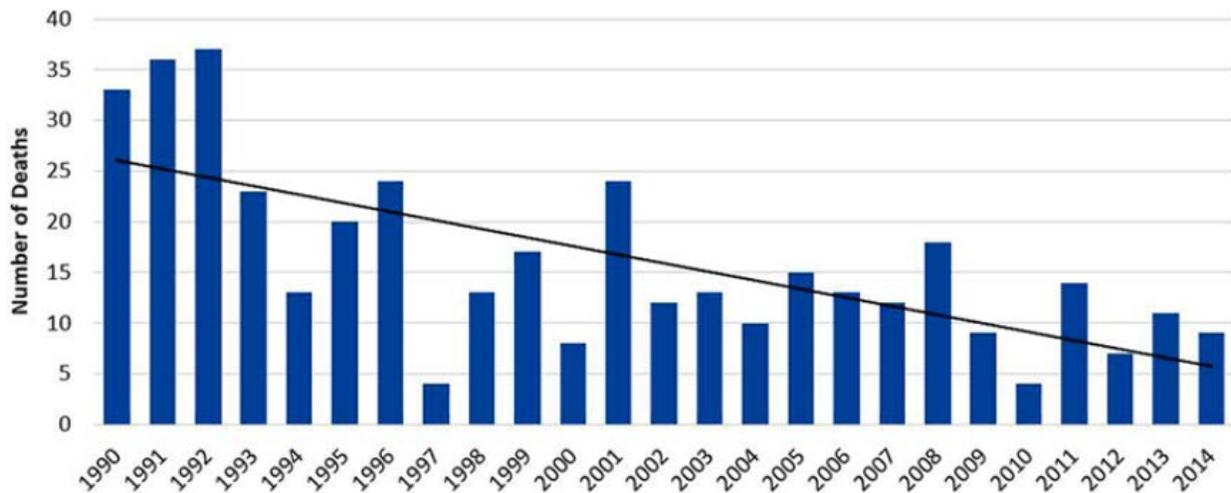
A catcher-seller permit is associated with the individual, and not a particular vessel or fishery, meaning one catcher-seller permit covers all activities for that fisherman, provided that they have a CFEC permit. Crewmembers are not eligible for a catcher-seller permit (Hutter 2016b).

4.5.7. Safety Considerations

Alaska’s commercial fishermen work in one of the world’s harshest environments and experience conditions that have a strong impact on their safety. One-third (399) of all work-related deaths that took place in Alaska during 1990–2014 occurred in the fishing industry (Centers for Disease Control and Prevention 2017). The turbulent rip tides of Cook Inlet discussed in Section 4.5.2.1 can create especially challenging fishing conditions. Cook Inlet has one of the world's largest tidal ranges, sometimes reaching 35 ft. Currents can reach seven and eight knots, and wind waves are characteristically steep (Glazier et al. 2006).

While commercial fishing remains a high-risk occupation, the number of fishing fatalities due to traumatic injury in Alaska has decreased by 73% since the early 1990s (Figure 4-42).⁹⁵ Safety improvements in Alaska occurred as a result of a combination of activities, including safety regulations and fishery-specific interventions focusing on unique hazards of each fishery (Centers for Disease Control and Prevention 2017).

Figure 4-42 Alaska commercial fishing fatalities, 1990–2014.

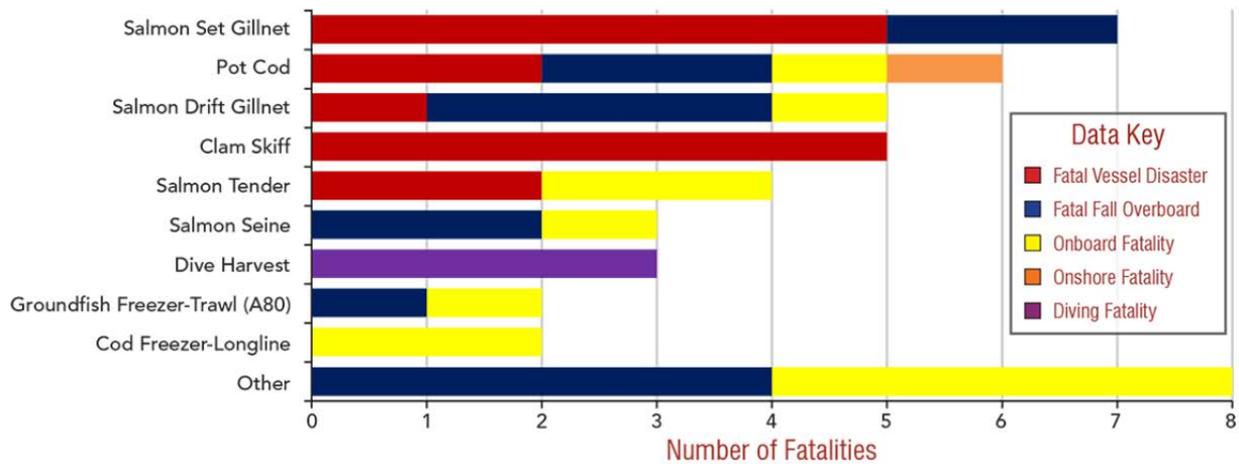


Source: Centers for Disease Control and Prevention (2017).

From 2010–2014, the fatality rates in Alaska’s salmon set gillnet fleets and salmon drift gillnet fleets were among the highest of any of the State’s commercial fishing fleets (Figure 4-43). Salmon drift gillnet fleets experienced five deaths from 2000–2014; one crewmember died during a vessel disaster, one fatality occurred on board, and three crewmembers died after falling overboard. None of the crewmembers were wearing a personal flotation device when they drowned (National Institute for Occupational Safety and Health 2017). As shown in Figure 4-44, however, the fatality rate in Alaska’s salmon drift gillnet fleets from 2005–2014 was lower than that of several other U.S. commercial fishing fleets whose fatality rates were calculated for that time period.

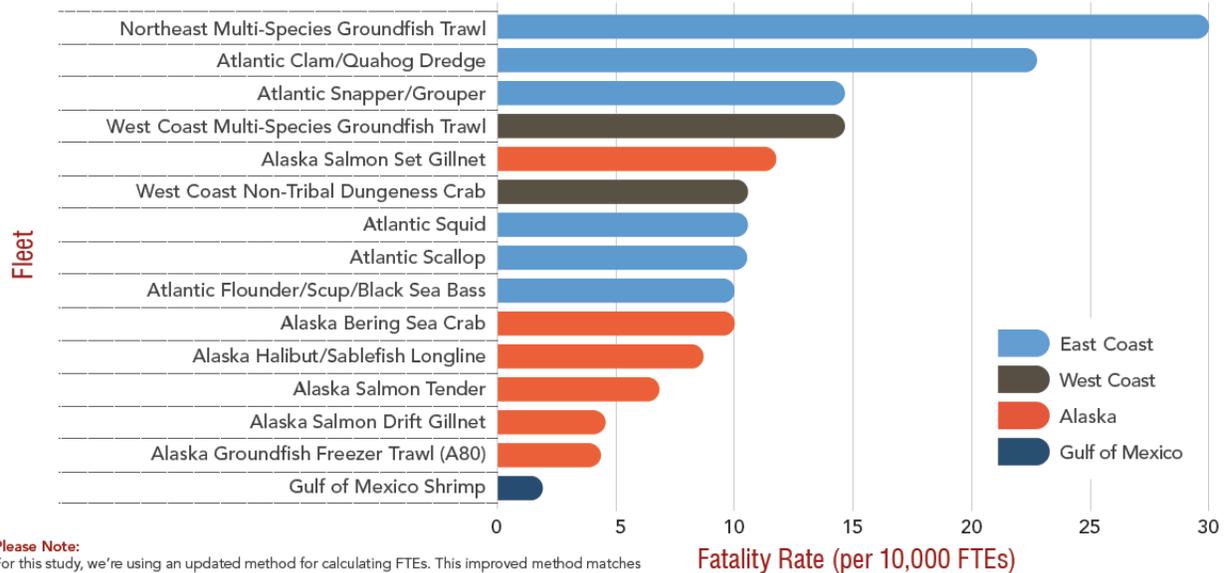
⁹⁵ From 2000–2014, there were no overall trends in fatality rates for most Alaska fleets, except for the halibut/sablefish longline and Bering Sea crab fleets, which experienced significant decreases in their fatality rates (National Institute for Occupational Safety and Health 2017).

Figure 4-43 Alaska commercial fishing fatalities in Alaska by fleet, 2010–2014.



Source: National Institute for Occupational Safety and Health (2017).

Figure 4-44 U.S. commercial fishing fatality rates by fleet, 2005–2014.



Please Note: For this study, we're using an updated method for calculating FTEs. This improved method matches what is used by other agencies and academic institutions, and allows the fatality rates to be compared to other occupations. As a result of the change in our calculation methods, the fishing fatality rates published in this report cannot be compared to rates published in previous NIOSH studies.

Source: National Institute for Occupational Safety and Health (2017).

As described in North Pacific Fishery Management Council (2018), the BOF addresses specific fishery safety issues disclosed through its public process. The Board modifies its regulations, as necessary, in order to increase safety and minimize risk of injury or death for all fishery participants. In addition, ADF&G promotes safety whenever possible in its salmon fisheries through management practices, support in the regulation formation process, and through assistance to enforcement agencies. Examples of safety supported through management practices include: daytime openings, when possible, of salmon fisheries by emergency order allowing fishermen to harvest and deliver fish during daylight hours; and delays in opening weekly fishing periods when severe weather is forecast and extending fishing time after severe weather thereby encouraging fishermen to seek shelter and still be able to fish when the weather moderates. An example of safety supported through regulation includes limits on salmon net length and size, which moderate harvest levels to manageable quantities that are safer for fishermen to handle.

Additionally, ADF&G promotes safety through direct assistance to enforcement agencies. ADF&G provides information on harvest patterns, fishing effort, and lists of registered vessels to NMFS, the U.S. Coast Guard, and the Alaska Department of Public Safety, Division of Alaska Wildlife Troopers. This allows these enforcement agencies to focus efforts in areas where the fishing fleets are concentrated, thus providing on-scene presence of enforcement personnel, vessels, and aircraft, which provides expedited reaction times when accidents occur (North Pacific Fishery Management Council 2018).

4.6. Description of Other Potentially Affected Salmon Fisheries

Figure 4-6 compares the salmon harvest in the UCI salmon drift gillnet fishery to salmon harvests in other Upper Cook Inlet fisheries, both commercial and non-commercial. The other commercial salmon fishery occurring in Upper Cook Inlet besides the drift gillnet fishery is the set gillnet fishery. The non-commercial salmon fisheries include the sport, personal use, and subsistence/educational fisheries. From 1999–2018, the UCI salmon drift gillnet fishery accounted for 42% of the total sockeye salmon harvest in all Upper Cook Inlet salmon fisheries; 1% of the total Chinook salmon harvest; 26% of the total coho salmon harvest; 52% of the total pink salmon harvest; and 89% of the total chum salmon harvest. Over all species combined, the UCI salmon drift gillnet fishery accounted for 55% of the total harvest. As shown in Figure 4-6, from 1999–2018, the UCI salmon drift gillnet fleet harvested an overall increasing percentage of the total salmon catch and catch of each species, with the exception of sockeye salmon—the fleet accounted for a relatively flat proportion of the Upper Cook Inlet sockeye harvest.

The following sections describe the Upper Cook Inlet set gillnet, sport, personal use, and subsistence/educational fisheries in more detail.

4.6.1. Commercial Set Gillnet Fishery

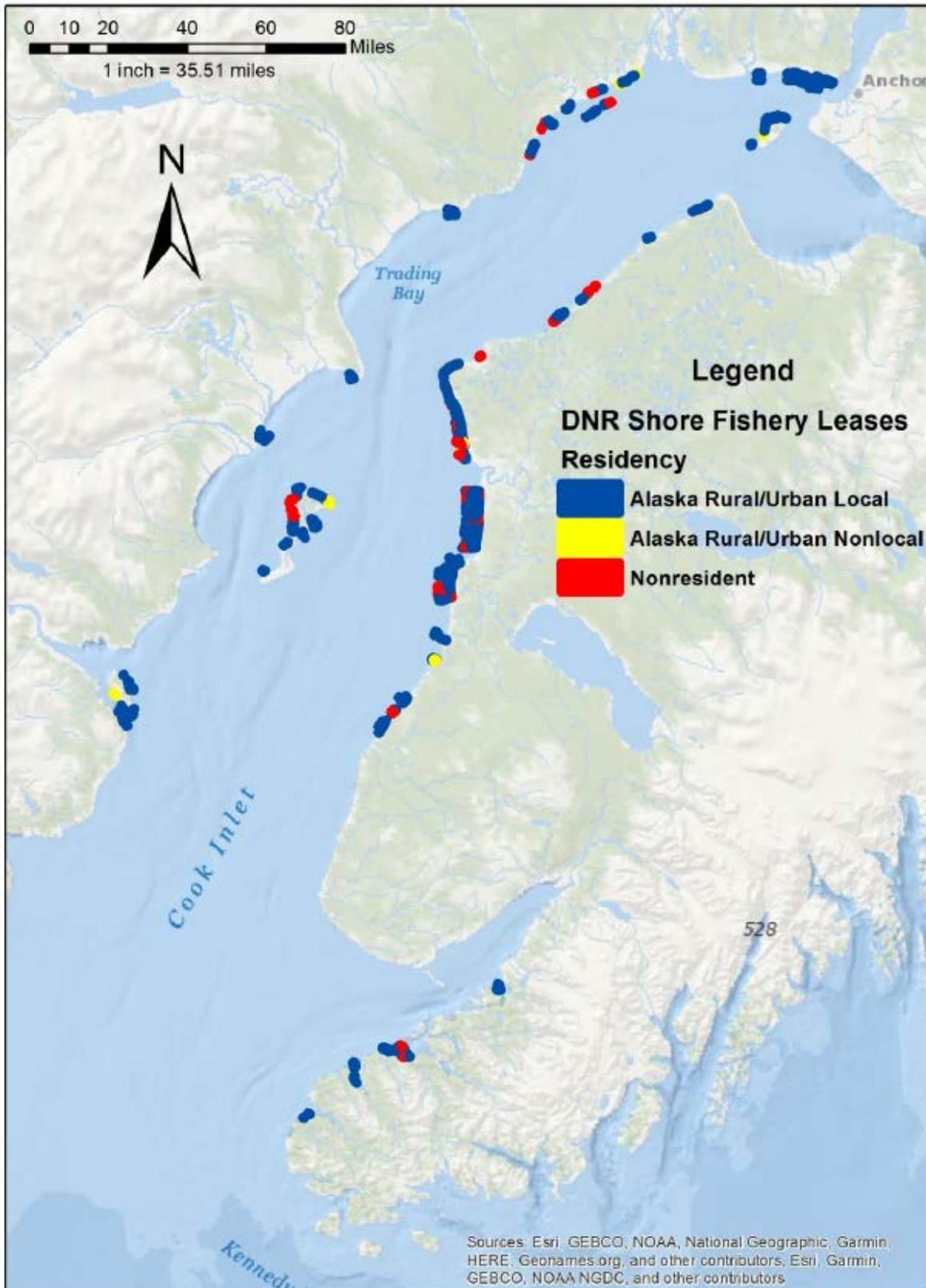
In the Cook Inlet salmon set gillnet fishery, nylon gillnets are placed in rivers, tidelands and near shore in submerged lands. Typically, a large anchor is used to secure one end of the gillnet, while the other end is fixed near the tide line. As salmon move along the shore, fish will be entangled or caught by the gills in the net (Gho et al. 2012). In Upper Cook Inlet, the catch is picked from the net each day during a slack tide (National Marine Fisheries Service 2019a). Set gillnets are allowed out to 1.5 miles of the mean high tide mark south of the Kenai River, and one mile of the mean high tide mark north of the Kenai River. The time and length of the fishing season in the Cook Inlet salmon set gillnet fishery varies depending upon management requirements. In general, the fishery operates from June through September. As with the salmon drift gillnet fishery, salmon may only be harvested in the salmon set gillnet fishery during openers established by ADF&G inseason (National Marine Fisheries Service 2019a).

The permits for the Cook Inlet salmon set gillnet fishery are designated as S04H permits. From 1975–2018, the annual number of S04H permits (both interim-entry permits and permanent permits) with landings averaged around 580 (Alaska Commercial Fisheries Entry Commission 2019). Stacked permit operations were granted by the BOF for the fishery in 2011.

The Cook Inlet salmon set gillnet fishery is characterized by a high concentration of permit holders who fish in small, defined areas, especially along the eastern shore of Upper Cook Inlet north of Anchor Point. Other places in Cook Inlet have less fishing effort, which is likely related to site accessibility and relative salmon abundance (Gho et al. 2012). In 1964, DNR began a program to lease tide and submerged lands for the purposes of set gillnet fishing, thereby resolving conflicts over prime salmon sites. Although a set gillnet permit owner does not need a lease in order to fish, leaseholders have the ability to exclude other individuals from fishing on established sites, subject to a varied number of provisions and restrictions (Gho et al. 2012). Individuals who hold a DNR shore fishery lease are required by regulation to fish at least four openings in years when they hold a lease, unless they refrain for no more than one year from using the site (11 AAC 64.180).

Figure 4-45 shows that many set gillnet fishermen have established leases along the eastern shore of Upper Cook Inlet near the productive Kenai and Kasilof Rivers. On average, from 2006–2015, 63% of the active S04H permit owners had leases during a given year (Alaska Commercial Fisheries Entry Commission 2019).

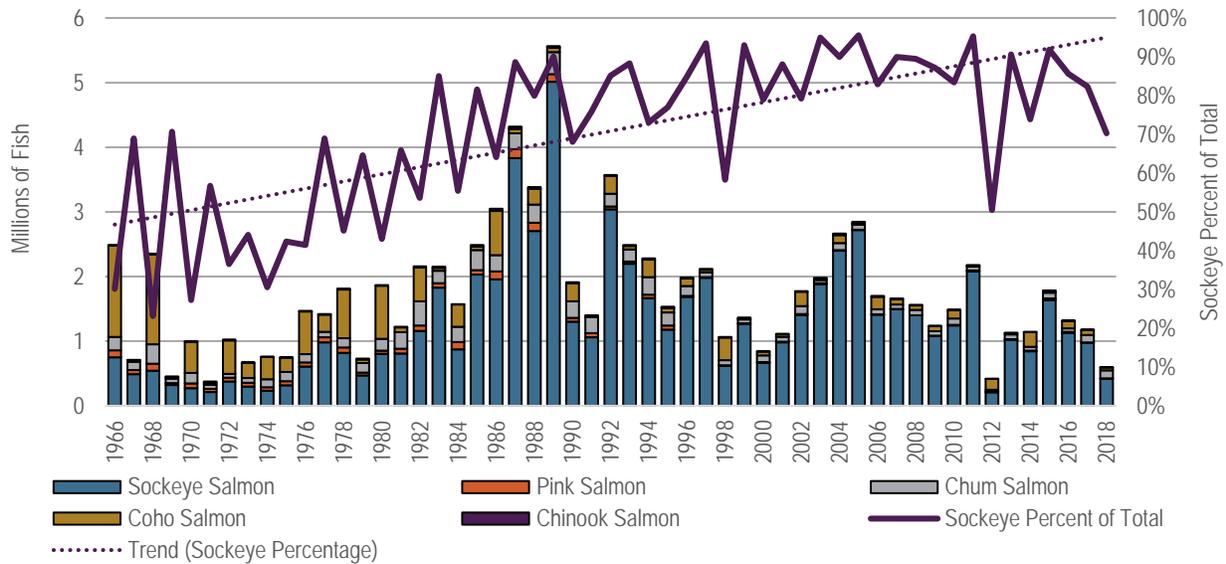
Figure 4-45 Map of Alaska Department of Natural Resources shore fishery leases by resident type, 2019.



Notes: "Local" means residing in the ADF&G Cook Inlet Management Area, including Anchorage.
Source: Alaska Commercial Fisheries Entry Commission (2019).

From 1966–2018, an average of 1.74 million salmon were harvested annually in the Cook Inlet salmon set gillnet fishery north of Anchor Point (Figure 4-46). Although all five species of Pacific salmon are caught in the fishery, sockeye salmon accounted for 75% of the salmon harvest north of Anchor Point from 1966–2018. As in the UCI salmon drift gillnet fishery (Section 4.5.2.2), the sockeye harvest percentage has increased due to State fishery management regulations and policies implemented in the late 1980s.

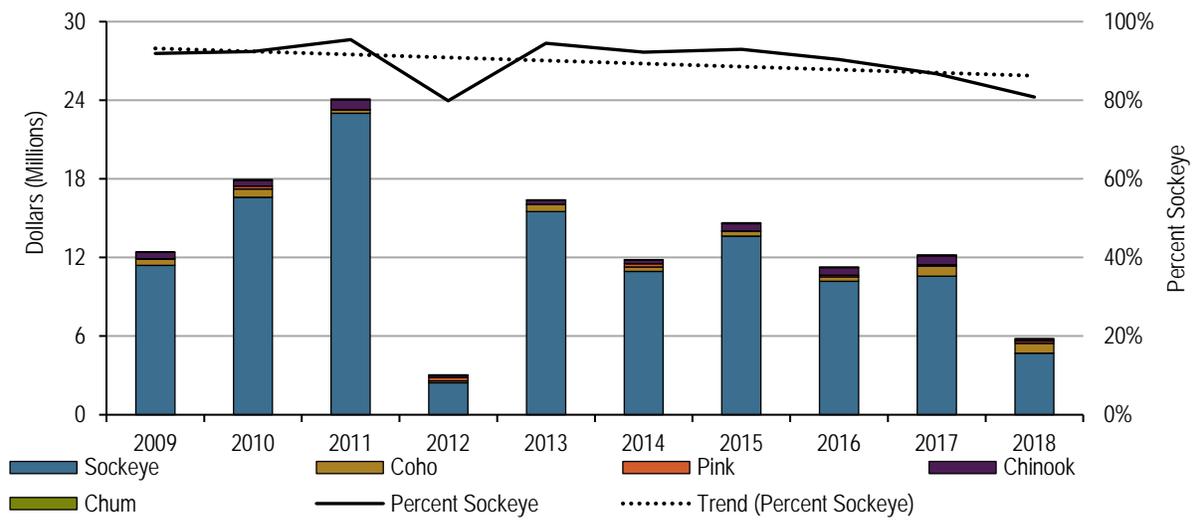
Figure 4-46 Harvest (in numbers of fish) in the Cook Inlet salmon set gillnet fishery north of Anchor Point by species, 1966–2018.



Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Figure 4-47 shows the gross revenue from salmon harvests in the UCI salmon set gillnet fishery from 2009–2018. During this period, sockeye salmon accounted for 89.7% of the gross revenue in the fishery. In recent years salmon ex-vessel prices have increased (Figure 4-21). Since 2015, however, this price increase has not been sufficient to offset the decrease in landings (Figure 4-46), and gross revenue in the fishery has declined as a result.

Figure 4-47 Gross revenue (inflation adjusted) from salmon harvests in the UCI salmon set gillnet fishery, 2009–2018.



Notes: Nominal gross revenue adjusted for inflation to 2018 dollars using U.S. Bureau of Labor Statistics Producer Price Index by Commodity for Processed Foods and Feeds: Unprocessed and Prepared Seafood (Not Seasonally adjusted).
Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

4.6.2. Sport Fisheries

The ADF&G Division of Sport Fisheries manages the State’s sport fisheries. Alaska statute defines sport fishing as the taking of or attempting to take for personal use, and not for sale or barter, any fresh water, marine, or anadromous fish, by hook-and-line held in the hand, or by hook-and-line with the line attached to a pole or rod that is held in the hand or closely attended, or by other means defined by the BOF (AS 16.05. 940(31)). The Division’s mission is to protect and improve the State’s recreational fisheries resources. An ADF&G sport fishing license is required for all resident anglers 18 and older and nonresident anglers 16 and older to fish in all fresh- and saltwaters of Alaska. Chinook salmon are a prized fish in Alaska’s sport fisheries, and most anglers fishing for sea-run Chinook salmon must have purchased (and have in their possession) a current year’s Chinook salmon stamp. Further information on State management of sport fisheries can be found on the ADF&G website:

www.adfg.alaska.gov/index.cfm?adfg=fishingSport.main.

Per Alaska Fish and Game Law and Regulations (5 AAC 75.075(c)), the ADF&G Division of Sport Fish is also responsible for overseeing the annual registration of sport fish businesses and guides. A “sport fishing guide” means a person who provides sport fishing guide services to persons who are engaged in sport fishing (5 AAC 75.995(41)). “Sport fishing guide services” means assistance, for compensation or with the intent to receive compensation, to a sport fisherman to take or to attempt to take fish by accompanying or physically directing the sport fisherman in sport fishing activities during any part of a sport fishing trip. Salmon is one of the primary fish targeted in the State’s sport fishing guide industry. For further information, refer to the ADF&G website:

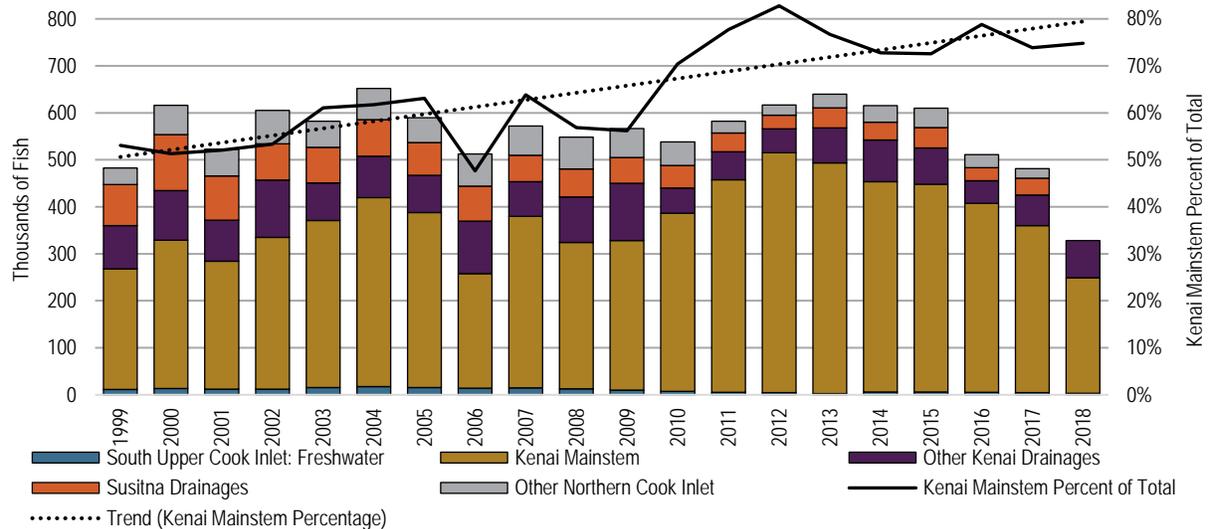
www.adfg.alaska.gov/index.cfm?adfg=prolicenses.sportfishguides.

4.6.2.1. Freshwater Sport Fisheries

The freshwater drainages of Upper Cook Inlet support extensive sport fisheries for five species of Pacific salmon. The Kenai River, which drains the central Kenai Peninsula, is one of the State’s primary rivers for sport salmon fishing, with the mainstream of the river accounting on average for more than half of the annual harvest in Upper Cook Inlet freshwater sport salmon fisheries from 1999–2018 (Figure 4-48). The Russian River, a tributary of the Kenai River, is also one of the most popular fishing destinations in the

State. Part of the attraction of Upper Cook Inlet’s freshwater sport salmon fisheries is their proximity to major population centers and the relative ease of access. Upper Cook Inlet is located in the southcentral region of Alaska, which accounts for more than half of the State’s population and contains most of the State’s public roads, offering more easily reached, relatively inexpensive highway access to sport fishing than any other region of Alaska (Alaska Department of Fish and Game 2020d).

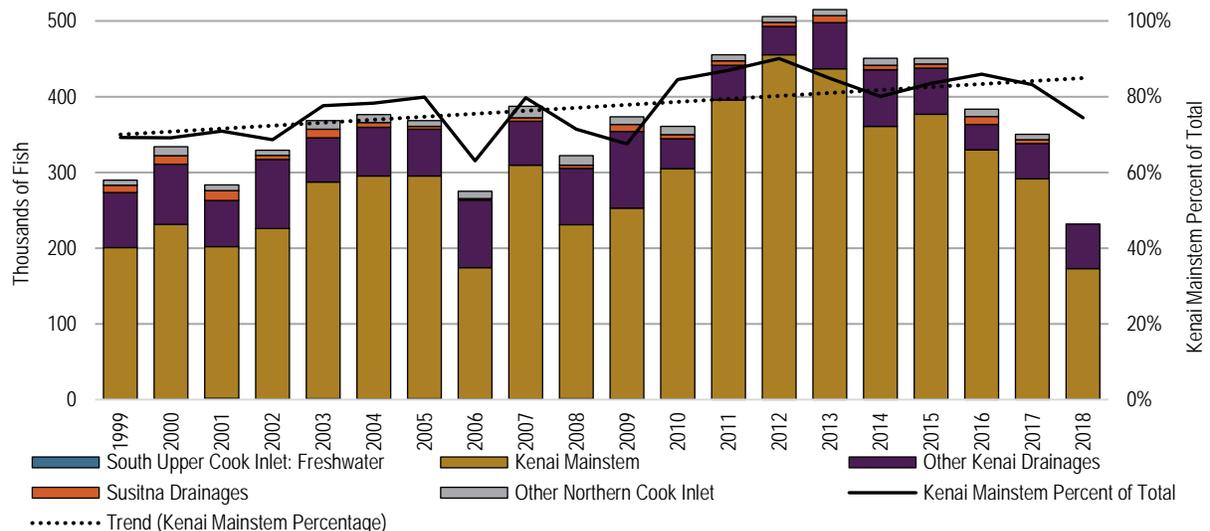
Figure 4-48 Salmon harvest (in numbers of fish) in Upper Cook Inlet freshwater sport salmon fisheries by area fished, 1999–2018.



Source: Developed by Northern Economics based on data from Baumer and Blain-Roth (2020), Booz et al. (2019), Lipka et al. (2020), Marston and Frothingham (2019), and Oslund et al. (2020)

Figure 4-49 shows that the Kenai River has been the primary source of the sockeye salmon catch, which accounted for more than half of the total harvest in Upper Cook Inlet freshwater sport salmon fisheries from 1999–2018.

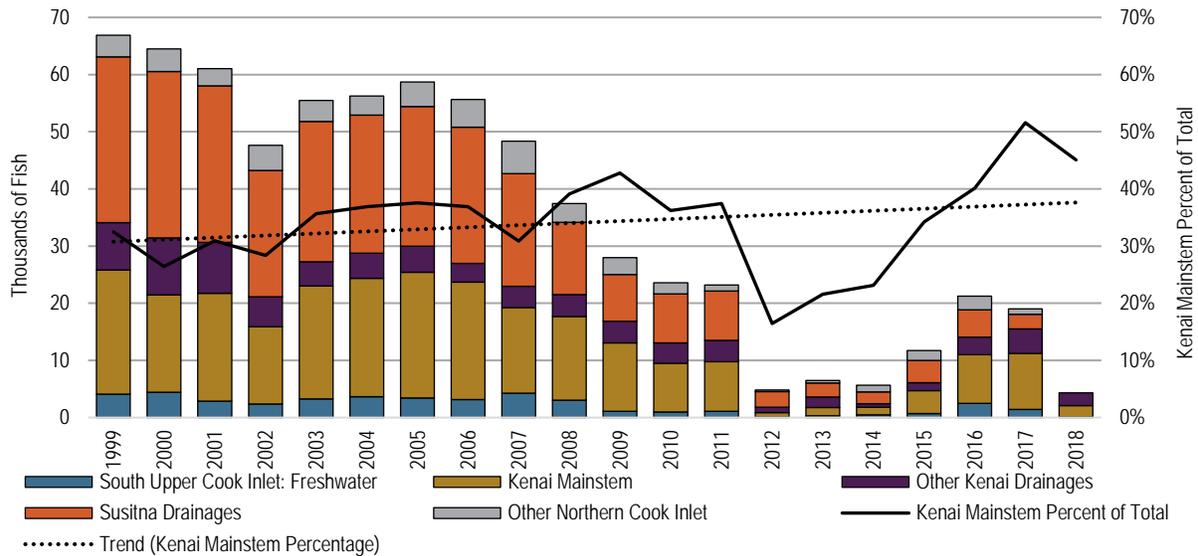
Figure 4-49 Sockeye harvest (in numbers of fish) in Upper Cook Inlet freshwater sport salmon fisheries by area fished, 1999–2018.



Source: Developed by Northern Economics based on data from Baumer and Blain-Roth (2020), Booz et al. (2019), Lipka et al. (2020), Marston and Frothingham (2019), and Oslund et al. (2020)

While sockeye is the predominant species caught in the Kenai River, the river is especially famous for its large Chinook salmon, with the world record caught in 1985. As shown in Figure 4-50, recent years have seen a sharp downturn in the Chinook salmon harvest, but the Kenai River continues to be the most heavily fished river in Alaska. Because of the high level of participation in relation to the total number of Chinook salmon in the runs, the fishery is strictly regulated (Lipka et al. 2020).⁹⁶

Figure 4-50 Chinook harvest (in numbers of fish) in Upper Cook Inlet freshwater sport salmon fisheries by area fished, 1999–2018.



Source: Developed by Northern Economics based on data from Baumer and Blain-Roth (2020), Booz et al. (2019), Lipka et al. (2020), Marston and Frothingham (2019), and Oslund et al. (2020).

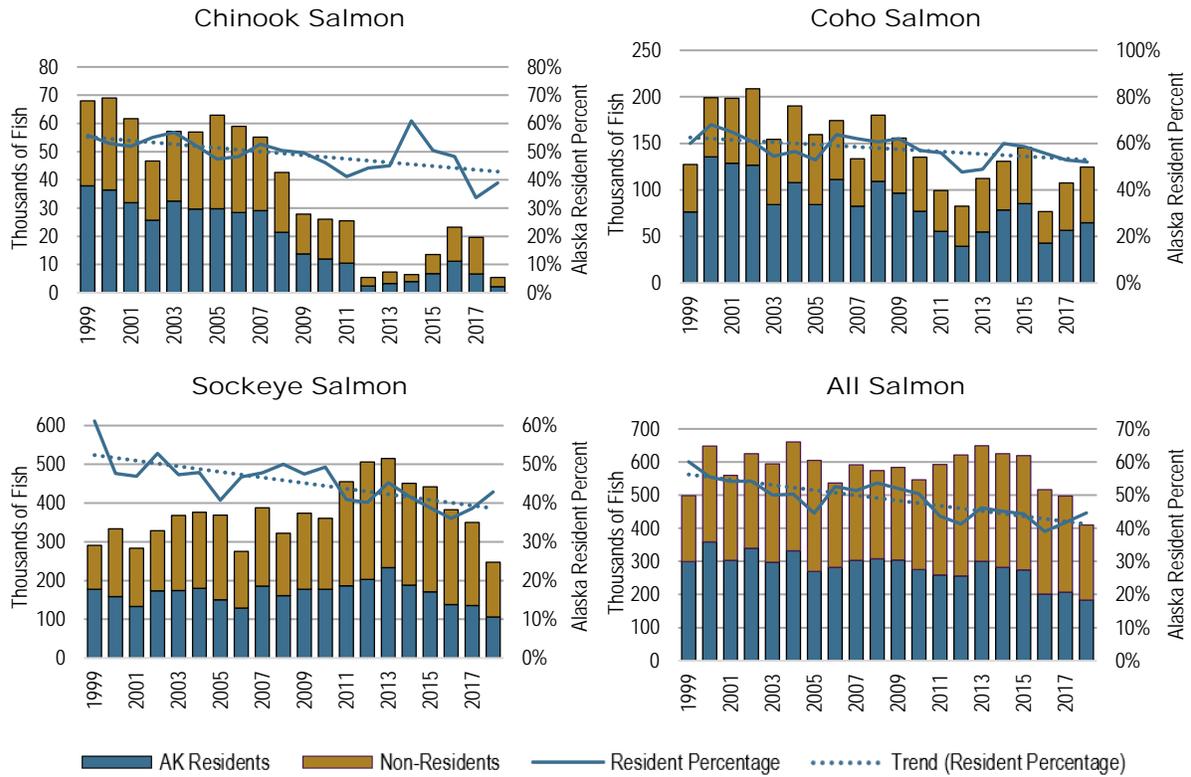
A large proportion of the salmon caught in Upper Cook Inlet sport fisheries are released by anglers. On average from 2004–2017, the annual percentages of fish caught in the Northern Cook Inlet sport fish management area that were released were 69.9% for Chinook salmon; 48.2% for sockeye salmon; 40.3% for coho salmon; 93.9% for pink salmon; and 90.8% for chum salmon (Oslund et al. 2020).⁹⁷

Figure 4-51 shows the harvest in Upper Cook Inlet freshwater sport salmon fisheries by resident type and species from 1999–2018. On average during this time period, residents accounted for 49% of the Chinook harvest; 58% of the coho harvest; 46% of the sockeye harvest; and about half of the harvest of all salmon species combined.

⁹⁶ Currently, Chinook salmon fishing in the Kenai River is limited to a 50-mile area downstream from Skilak Lake from January 1 through July 31. By regulation, the early-run Kenai River Chinook salmon fishery ends on June 30. The daily bag and possession limits are one Chinook salmon 20 inches or greater in length, with a protective maximum size of retention limit (no retention, must be released) for Chinook salmon greater than 36 inches. From July 1 through July 31 from the mouth of the Kenai River to a marker downstream of Slikok Creek, the bag and possession limit remains the same, but Chinook salmon of any size may be retained. The annual (January 1–December 31) limit is two fish. However, Chinook salmon harvested prior to July 1 that are 20 inches or more in length but less than 28 inches in length do not count toward the annual limit of two fish. The majority of the harvest is taken by anglers in boats. After retaining a Chinook salmon that counts toward the annual limit, an angler is prohibited from fishing from a boat in the Kenai River downstream from Skilak Lake for the remainder of that day (Lipka et al. 2020).

⁹⁷ The Northern Cook Inlet sport fish management area includes all freshwater drainages and adjacent marine waters of Upper Cook Inlet between the southern tip of Chisik Island and the Eklutna River, excluding the upper Susitna River drainage upstream of the Oshetna River confluence (Oslund et al. 2020).

Figure 4-51 Salmon harvest (in numbers of fish) in Upper Cook Inlet freshwater sport salmon fisheries by resident type and species, 1999–2018.

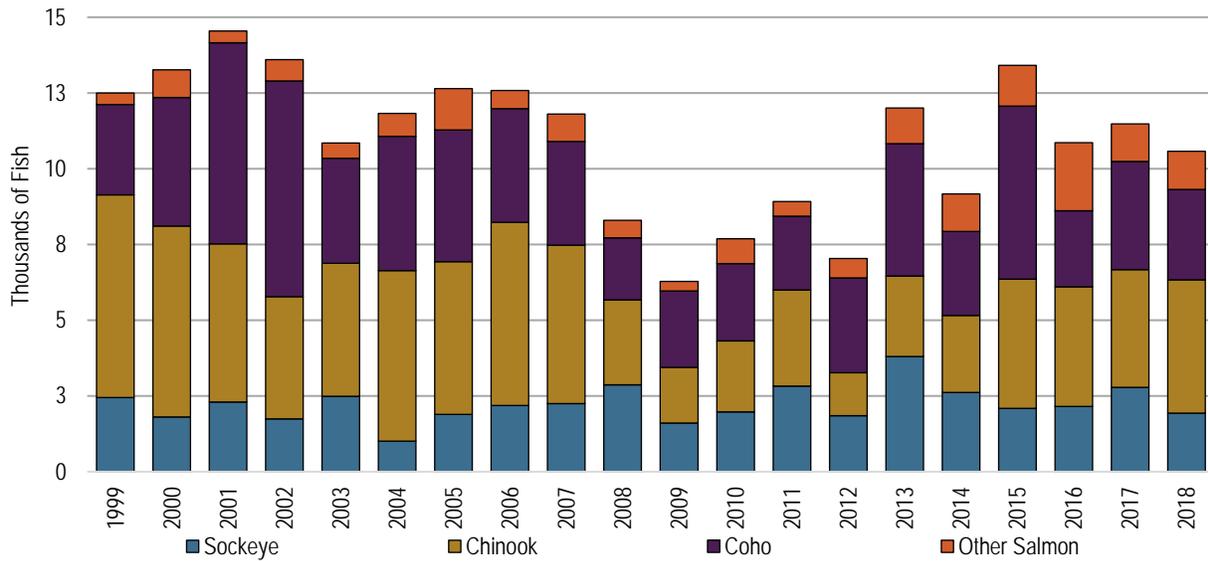


Source: Developed by Northern Economics based on Alaska Sport Fishing Harvest Survey data provided on request by Alaska Department of Fish and Game (2020b)

4.6.2.2. Saltwater Sport Fisheries

Aside from the drift gillnet fishery, the only other fisheries harvesting salmon inside the Cook Inlet EEZ are the saltwater sport fisheries. The harvest in the Upper Cook Inlet saltwater sport salmon fisheries in both the EEZ and State waters combined is relatively small, averaging less than 2% of the harvest in the Upper Cook Inlet freshwater sport salmon fisheries from 1999–2018, as described in the previous section, and less than 0.25 percent of total harvest for Upper Cook Inlet in all fisheries. Chinook salmon accounted for 37% of the harvest in the saltwater sport salmon fisheries during that time period (Figure 4-52).

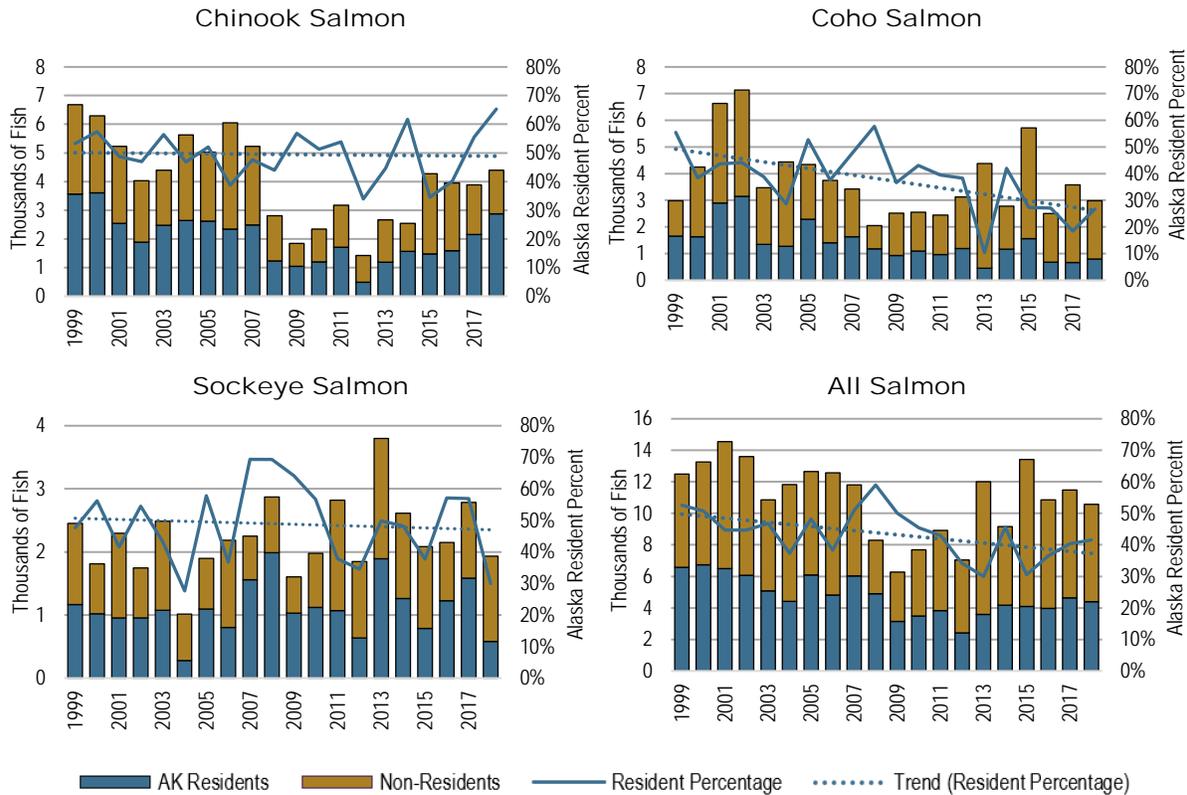
Figure 4-52 Salmon harvest (in numbers of fish) in Upper Cook Inlet saltwater sport salmon fisheries by species, 1999–2018.



Source: Developed by Northern Economics based on Alaska Sport Fishing Harvest Survey data provided on request by Alaska Department of Fish and Game (2020b)

Figure 4-53 shows the harvest in Upper Cook Inlet saltwater sport salmon fisheries by resident type and species from 1999–2018. On average during this time period, residents accounted for 49% of the Chinook harvest; 38% of the coho harvest; 49% of the sockeye harvest; and 44% of the harvest of all salmon species combined.

Figure 4-53 Salmon harvest (in numbers of fish) in Upper Cook Inlet saltwater sport salmon fisheries by resident type and species, 1999–2018.

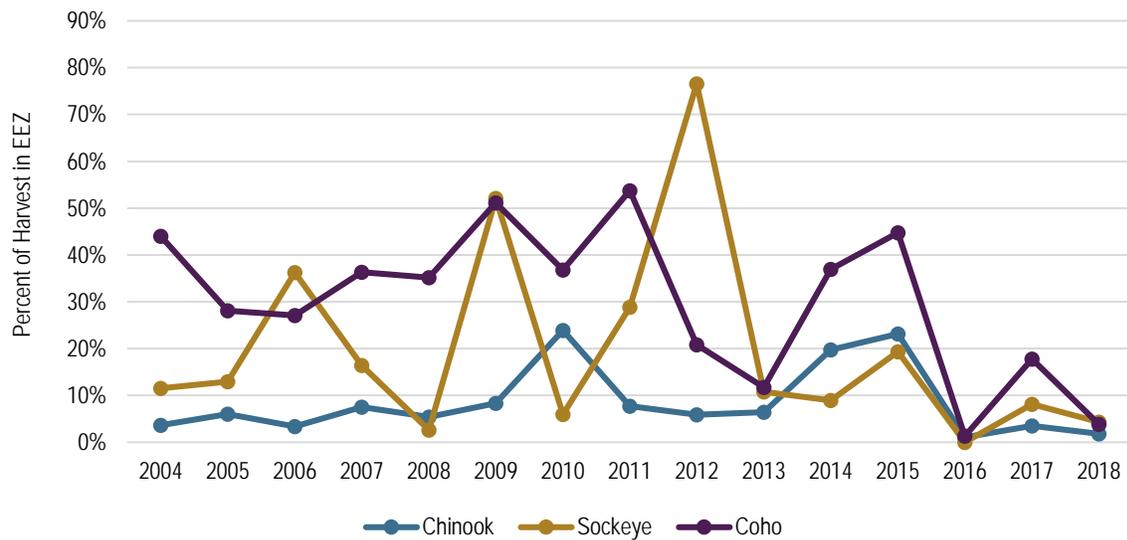


Source: Developed by Northern Economics based on Alaska Sport Fishing Harvest Survey data provided on request by Alaska Department of Fish and Game (2020b).

As with the commercial drift gillnet fishery, the UCI saltwater sport salmon fishery takes place in Federal and State waters without formal recognition of the boundary between the two areas. Therefore, harvest and effort in the fishery cannot be accurately subdivided into separate parts for Federal and State waters. However, this analysis approximated the proportion of the salmon harvest that occurred in the Cook Inlet EEZ for each species from 2004–2018 based on logbook data from sport fishing guide operations (Hasbrouck 2020). This proportion was then applied to annual ADF&G Statewide Harvest Survey estimates of harvest in the UCI saltwater sport salmon fishery. This approach assumed that guided and unguided fisheries have equal proportions of harvest in Federal versus State waters.

Figure 4-54 shows the approximate percent of harvests in the Upper Cook Inlet saltwater sport salmon fishery that occurred inside the EEZ by species from 2004–2018. On average, the EEZ accounted for 8% of the Chinook harvest in the saltwater sport salmon fishery; 30% of the coho harvest; and 20% of the sockeye harvest.

Figure 4-54 Approximate percent of salmon harvests (in numbers of fish) in the Upper Cook Inlet saltwater sport salmon fishery inside the EEZ by species, 2004–2018.



Notes: Pink salmon and chum salmon harvests were not reported.
The values reported may be an overestimate of the harvest occurring in the EEZ. The overall harvest estimates from the Statewide Harvest Survey are only for Upper Cook Inlet, but the logbook data used to estimate EEZ vs. State waters included the lower portion of Cook Inlet, which has more marine waters in the EEZ.
Source: Developed by Northern Economics based on data provided on request by Hasbrouck (2020).

4.6.3. 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(27)). Personal use fisheries differ 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 designated nonsubsistence areas.

The Joint Board is required to identify “nonsubsistence areas,” 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. Personal use fisheries provide opportunities for harvesting fish with gear other than rod and reel in nonsubsistence areas. The Joint Board has identified Ketchikan, Juneau, Anchorage-Matsu-Kenai, Fairbanks, and Valdez as nonsubsistence areas (5 AAC 99.015). Persons may participate in personal use or sport harvests for consumptive uses within nonsubsistence areas, but such noncommercial harvests do not have a preference in those areas.

Generally, fish may be taken for personal use purposes only under authority of a permit issued by ADF&G. Personal use fishing in Cook Inlet is primarily managed by ADF&G, Division of Sport Fish, but some regional or area fisheries for various species of fish are managed by the Division of Commercial Fisheries (e.g. Kasilof River set gillnet salmon personal use fishery). Further information on State management of personal use fisheries can be found on the ADF&G website at: <http://www.adfg.alaska.gov/index.cfm?adfg=fishingPersonalUse.main>.

In 1996, the current personal use fisheries in Upper Cook Inlet were adopted by the BOF, and the BOF put a permit requirement into regulation so that the number of fish harvested could be estimated. (Sechrist and Rutz 2014). Four personal use fisheries were opened to all Alaska residents: the Kasilof River set

gillnet fishery, Kasilof River dip net fishery, Kenai River dip net fishery, and, in some years, Fish Creek dip net fishery.⁹⁸ In addition, in 2008, the BOF authorized a new Upper Cook Inlet personal use fishery referred to as the Beluga River Senior Citizen dip net fishery (salmon may be taken in the fishery only by persons 60 years of age or older) (Oslund et al. 2020). At the March 2020 Upper Cook Inlet meeting, the BOF adopted a sixth Upper Cook Inlet personal use fishery in the lower Susitna River. All the personal use fisheries primarily target sockeye salmon, although Chinook, coho, pink and chum salmon are also harvested.⁹⁹ The annual limits are 25 salmon per head of household, and ten additional salmon for each household member (Oslund et al. 2020).

The Kasilof River gillnet fishery opens on June 15 and takes place from 6:00 AM until 11:00 PM daily. The fishery remains open until 11:00 PM on June 24, regardless of how many fish are harvested. The Kasilof River dip net personal use fishery occurs from June 25 through August 7, 24 hours per day. The Kenai River dip net fishery is open from July 10 through July 31, 7 days per week, but only from 6:00 AM to 11:00 PM daily, subject to the requirement of achieving the lower bound of the Kenai River late-run sockeye salmon escapement goal. If ADF&G determines that the abundance of Kenai River late-run sockeye salmon is greater than 2.3 million fish, this fishery may be extended to 24 hours per day. The Beluga River Senior Citizen dip net fishery is open 24 hours per day from July 10 through August 31. The Fish Creek dip net fishery is open from July 15 through July 31 only if ADF&G projects that the escapement of sockeye salmon into Fish Creek will exceed 35,000 fish (Oslund et al. 2020). The Susitna River personal use fishery occurs from July 10 through July 31, 2 days per week, on Wednesday and Saturday from 6:00 AM to 11:00 PM.

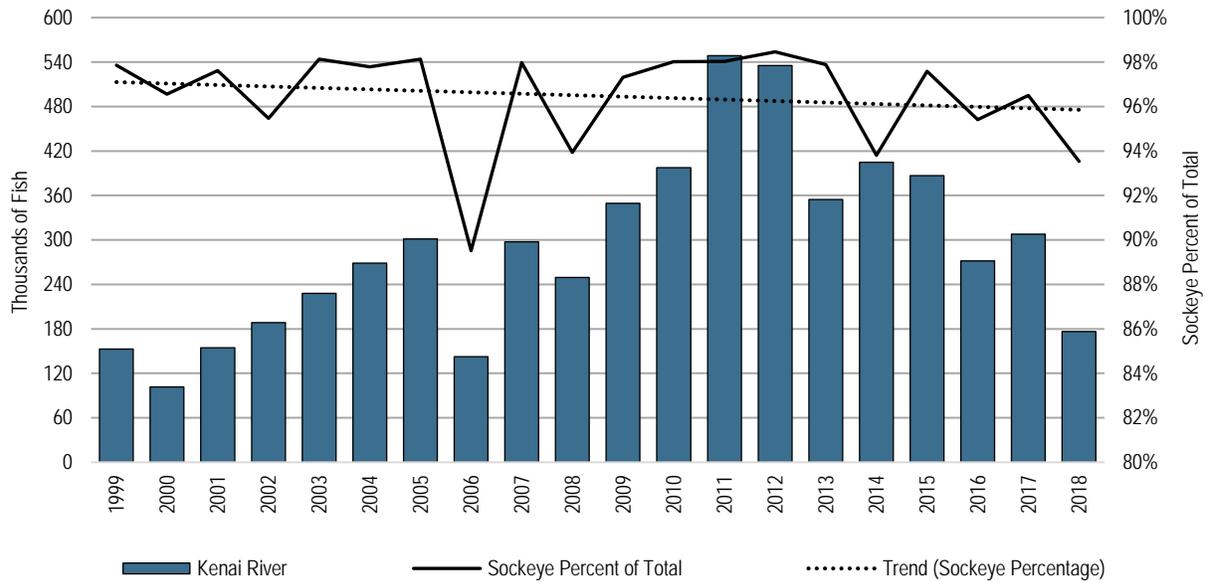
For around two decades, the popularity of the Upper Cook Inlet personal use fisheries steadily grew (Sechrist and Rutz 2014). In 1996, approximately 14,500 permits were issued for the fisheries, and by 2013, the number of permits exceeded 35,000. More recently, the number of permits has dropped, with 24,722 issued in 2018 (Alaska Department of Fish and Game 2020f).

The majority of participants fish the Kenai dipnet fishery, which has grown since 1996 with few exceptions. From 1999–2018, this fishery accounted for around three-quarters of the total harvest across all personal use fisheries (Figure 4-55). The Kasilof River set gillnet and dip net fisheries accounted for about one-fifth of the total harvest during that time period (Figure 4-56), while the combined catch of the Fish Creek and Beluga River Senior Citizen dip net fisheries represented less than 2% of the total.

⁹⁸ The Fish Creek dip net fishery is open only if ADF&G projects that the escapement of sockeye salmon into Fish Creek will exceed 35,000 fish (Marston and Frothingham 2019).

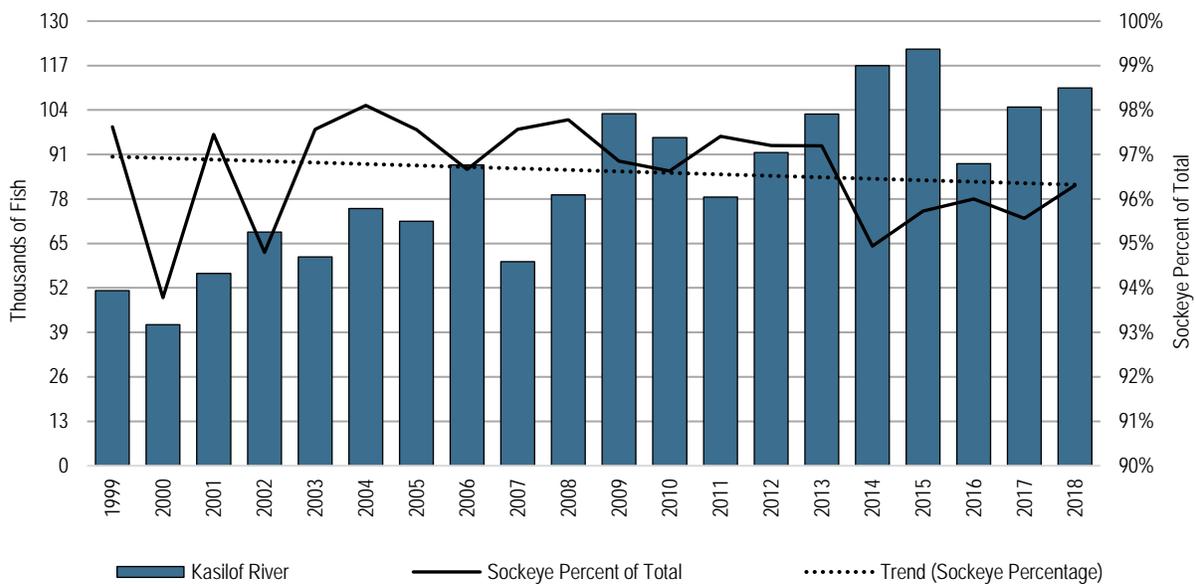
⁹⁹ In the Kasilof River dip net fishery, Chinook salmon may not be retained and must be released immediately to the water unharmed. In the Kenai River and Beluga River Senior Citizen dip net fisheries, one Chinook salmon may be retained per household (Lipka et al. 2020; Oslund et al. 2020). There are no Chinook salmon harvest restrictions in the Kasilof River gillnet personal use fishery (Marston and Frothingham 2019).

Figure 4-55 Salmon harvest (in numbers of fish) in the Kenai dipnet personal use salmon fishery, 1999–2018.



Source: Developed by Northern Economics based on data from Lipka et al. (2020).

Figure 4-56 Salmon harvest (in numbers of fish) in the Kasilof River set gillnet and dip net personal use salmon fisheries, 1999–2018.



Source: Developed by Northern Economics based on data from Lipka et al. (2020).

4.6.4. Subsistence and Educational Fisheries

4.6.4.1. State Subsistence and Educational Fisheries

The State of Alaska defines subsistence uses of wild resources as noncommercial, customary, and traditional uses for a variety of purposes. These include direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of

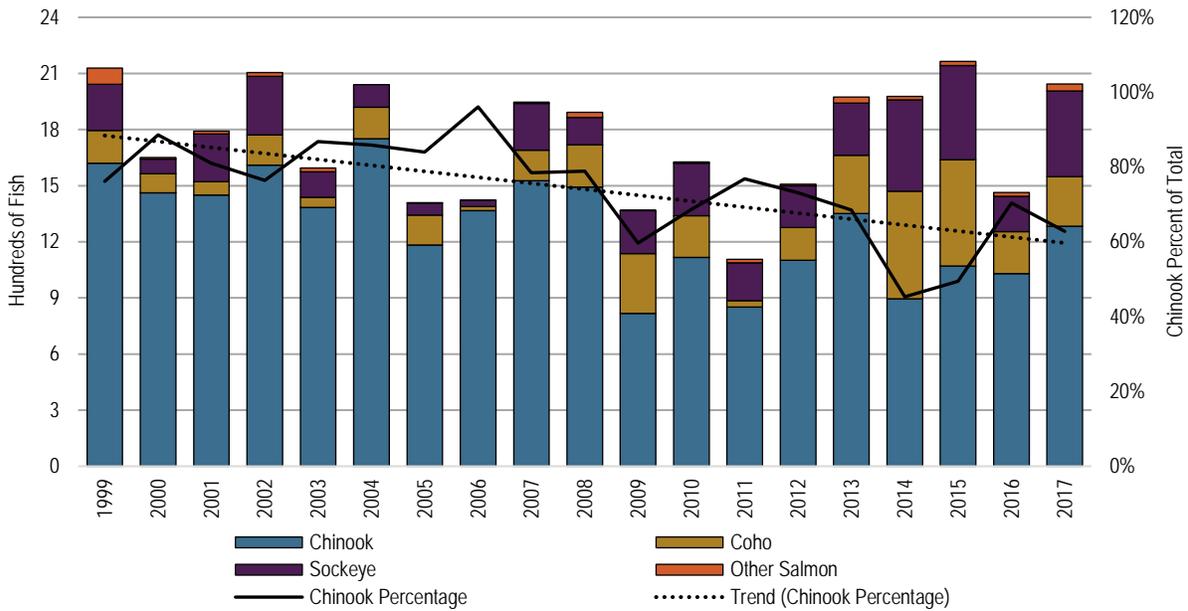
nonedible byproducts of fish and wildlife resources taken for personal or family consumption; and for the customary trade, barter, or sharing for personal or family consumption (AS 16.05.940).

ADF&G, under the direction of the BOF, manages subsistence salmon harvests in waters within the State of Alaska out to the three-nautical-mile limit. The State has 82 local fish and game advisory committees that review, make recommendations, submit proposals, and testify to the BOF concerning subsistence and other uses in their areas.

Under Alaska's subsistence statute, the BOF must identify fish stocks that support subsistence fisheries and, if there is a harvestable surplus of these stocks, determine the amount of the harvestable surplus that is reasonably necessary for subsistence uses, and adopt regulations that provide reasonable opportunities for these subsistence uses to take place. Statute defines "reasonable opportunity" as 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 by existing or proposed regulations by reviewing harvest estimates relative to the "amount reasonably necessary for subsistence use" findings as well as subsistence fishing schedules, gear restrictions, and other management actions. Whenever it is necessary to restrict harvest, subsistence fisheries have a preference over other uses of the stock (AS 16.05.258). ADF&G, Division of Commercial Fisheries, manages subsistence fisheries in the area of potential effect of this proposed Chinook Prohibited Species Catch action. Subsistence and other uses may be restricted or closed to provide for sustainability, based upon relevant adopted fishery management plans. Further information on State management of subsistence fisheries can be found on the ADF&G website at: <http://www.adfg.alaska.gov/index.cfm?adfg=fishingSubsistence.main>.

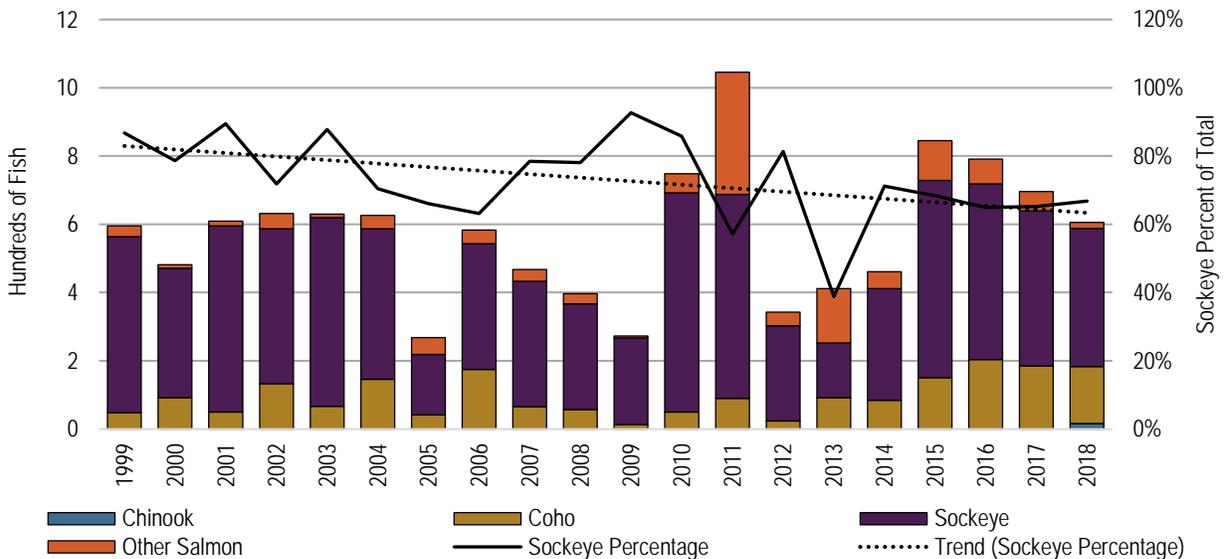
In Upper Cook Inlet, subsistence fishing is allowed in the Tyonek Subdistrict of the Northern District and in the Yentna River drainage outside the Anchorage-Matsu-Kenai Nonsubsistence Area. From 1999–2018, an average of 85 permits were issued annually in the Tyonek subsistence fishery, while an average of 22 permits were issued annually in the Yentna subsistence fishery (Marston and Frothingham 2019). Figure 4-57 and Figure 4-58 show the salmon harvests in the Tyonek subsistence fishery and Yentna subsistence fishery, respectively, from 1999–2017 and 1999–2018. Chinook salmon was the primary species caught in the Tyonek subsistence fishery, while sockeye salmon dominated the catch of the Yentna subsistence fishery.

Figure 4-57 Salmon harvest (in numbers of fish) in the Tyonek subsistence salmon fishery by species, 1999–2017.



Notes: Data from returned permit logs.
Source: Developed by Northern Economics based on data from Oslund et al. (2020).

Figure 4-58 Salmon harvest (in numbers of fish) in the Yentna subsistence salmon fishery by species, 1999–2018.



Notes: Data from returned permit logs.
Source: Developed by Northern Economics based on Oslund et al. (2020).

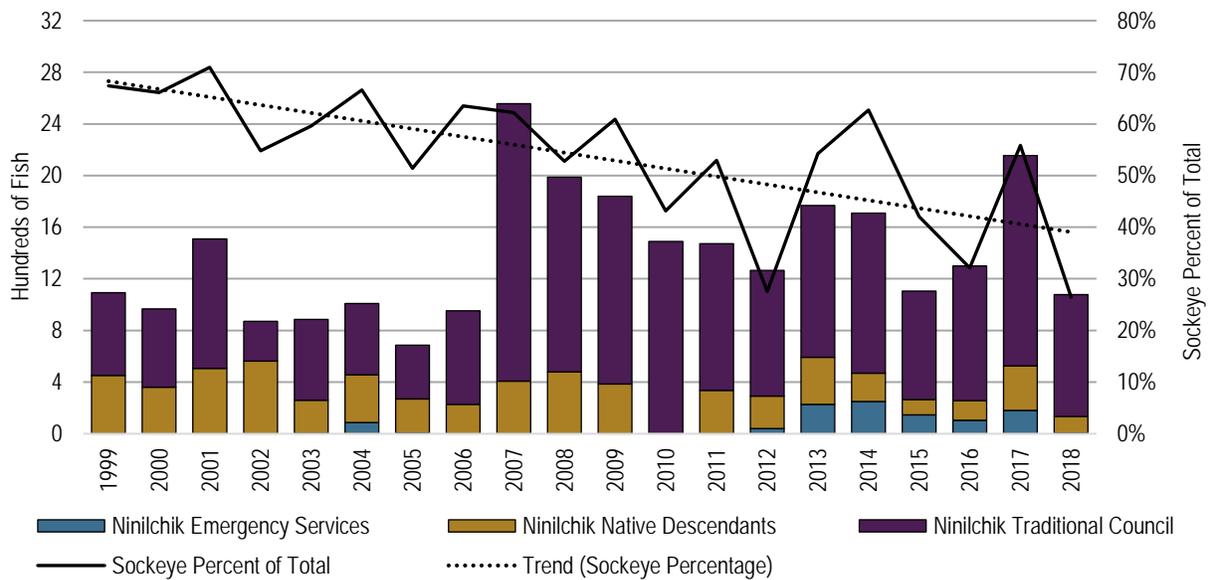
The objectives for educational fisheries are specified in 5 AAC 93.235 as “educating persons concerning historical, contemporary, or experimental methods for locating, harvesting, handling, or processing fishery resources.” The first educational fishery was the 1989 Kenaitze Tribal fishery (on the Kenai Peninsula), which originated as a Federal court-ordered subsistence fishery after extensive legislation and litigation related to both State and Federal interpretation of subsistence. Prior to the 1993 fishing season,

the Alaska Superior Court, in negotiations with ADF&G and the Kenaitze Tribe, ordered ADF&G to issue educational fishing permits (Oslund et al. 2020).

In the past two decades many groups have been issued permits by ADF&G to operate educational fishery programs in Upper Cook Inlet. In the Central District of Upper Cook Inlet, eight groups have been permitted to conduct educational fisheries, including the Kenaitze Tribal Group, Ninilchik Traditional Council, Ninilchik Native Descendants, Ninilchik Emergency Services, Anchor Point Veterans of Foreign Wars, Homer Sons of the American Legion Post 16, Kasilof Regional Historical Association, and the Southcentral Foundation. In the Northern District of Upper Cook Inlet, seven groups have been granted permits for educational fisheries, including the Knik Tribal Council, Big Lake Cultural Outreach, Native Village of Eklutna, Native Village of Tyonek (Tyonek Subsistence Camp), Alaska’s Territorial Homestead Lodge, Intertribal Native Leadership, and Chickaloon Native Village.

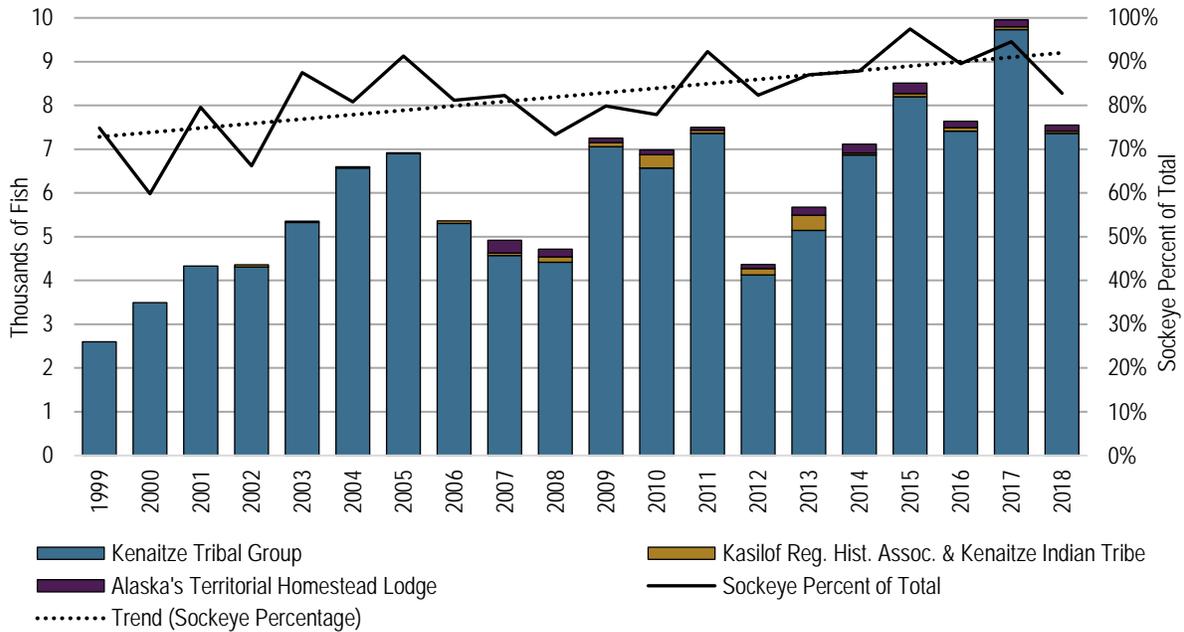
While all the groups with educational fishery permits have reported harvests, the fishing activity of some groups has been very intermittent. Figure 4-59 through Figure 4-61 show the harvests of groups whose participation in Upper Cook Inlet educational fisheries has been fairly consistent over the years. As the figures show, harvest levels have been low for all groups, with the total salmon catch in the fisheries averaging around 5,600 fish annually from 1999–2018.

Figure 4-59 Salmon harvest (in numbers of fish) in the Ninilchik Traditional Council, Ninilchik Native Descendants, and Ninilchik Emergency Services educational salmon fisheries by species, 1999–2018.



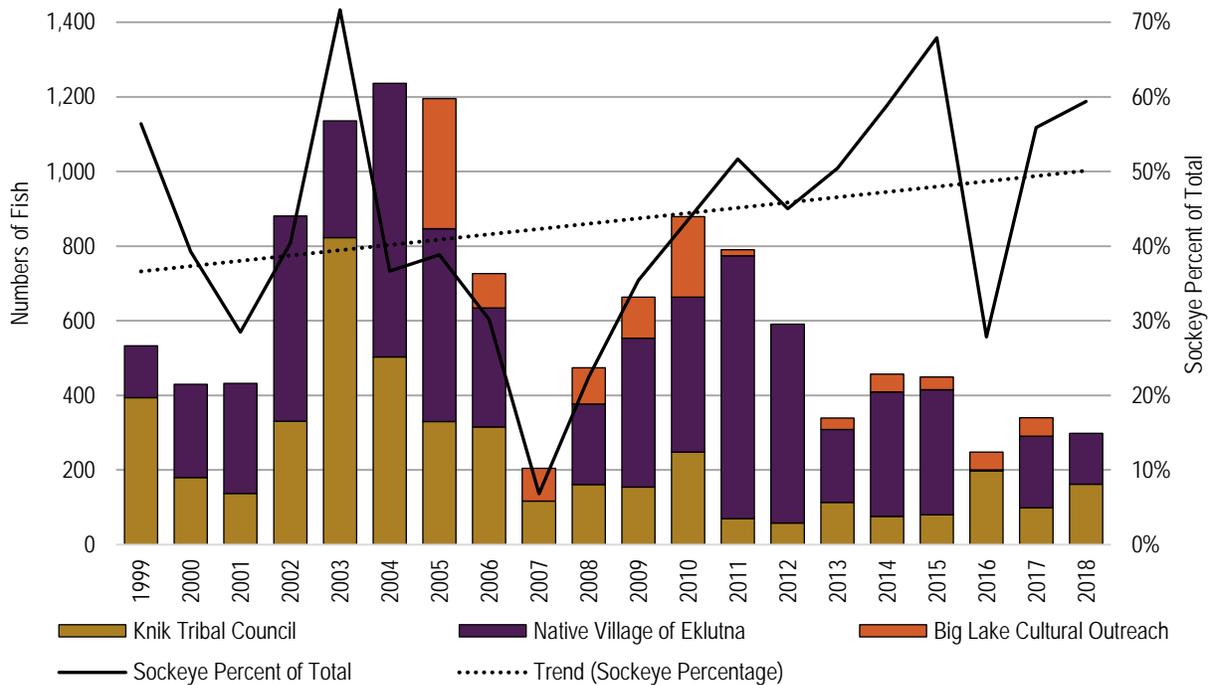
Notes: Data from returned permit logs.
Source: Developed by Northern Economics based on data from Booz et al. (2019)

Figure 4-60 Salmon harvest (in numbers of fish) in the Kenaitze Tribal Group, Kasilof Regional Historical Association, and Alaska’s Territorial Homestead Lodge educational salmon fisheries by species, 1999–2018.



Notes: Data from returned permit logs.
Source: Developed by Northern Economics based on data from Lipka et al. (2020).

Figure 4-61 Salmon harvest (in numbers of fish) in the Knik Tribal Council, Big Lake Cultural Outreach, and Native Village of Eklutna educational salmon fisheries by species, 1999–2018.



Notes: Data from returned permit logs.
Source: Developed by Northern Economics based on Oslund et al. (2020).

4.6.4.2. Federal Subsistence Fisheries

The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 mandates that, among consumptive uses of fish and wildlife, rural residents of Alaska be given a priority opportunity for customary and traditional subsistence use on Federal lands. In 1986, Alaska amended its subsistence law, mandating a rural subsistence priority to bring it 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 under provisions of the Alaska Constitution. Other Federal court cases regarding the State's administration of Title VIII of ANILCA ruled that the State would not be given deference in interpreting Federal statute. Proposed amendments to ANILCA and the constitution were not adopted to rectify these conflicts. Therefore, the Secretaries of Interior and of Agriculture implemented a duplicate regulatory program to assure the rural subsistence priority is applied under ANILCA on Federal lands. As a result, beginning in 1990, the State and Federal governments both provide subsistence uses on Federal public lands and waters in Alaska, which covers about 230 million acres or 60% of the land within the State.¹⁰⁰ In 1992, the Secretaries of the Interior and of Agriculture established the Federal Subsistence Board and ten Regional Advisory Councils to administer the responsibility. The Board'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, U.S. Department of Agriculture Forest Service.

Through the Federal Subsistence Board, these agencies participate in developing regulations which establish the program structure, determine which Alaska residents are eligible to take specific species for subsistence uses, and establish seasons, harvest limits, methods and means for subsistence take of species in specific Federal areas. The Regional Advisory Councils provide recommendations and information to the Federal Subsistence Board; review proposed regulations, policies, and management plans; and provide a public forum for subsistence issues. Each Regional Advisory Council consists of residents representing subsistence, sport, and commercial fishing and hunting interests. Further information on the Federal Subsistence Management Program can be found at <https://www.doi.gov/subsistence>.

Since 2007, Federal regulations allow for the harvest of salmon, trout, and Dolly Varden in the Kenai Wildlife Refuge and Chugach National Forest by residents of Cooper Landing, Hope, and Ninilchik. In 2016, the most recent year for which data are available, a total of 227 permits issued to these communities, with 102 permits issued to residents of Cooper Landing, 27 to residents of Hope, and 98 to residents of Ninilchik. The total harvest in the Federal subsistence fishery on the Kenai and Kasilof Rivers in 2016 was 2,514 salmon, most (2,500) of which were sockeye salmon, 12 were coho salmon, and two were Chinook salmon (Fall 2019).

4.7. Analysis of Impacts

4.7.1. Impacts of Measures Managing Target Species Harvest

This section describes potential changes in benefits and costs to firms or individuals in the UCI salmon drift gillnet fishery as a result of proposed management measures that may restrict the harvest of salmon species in the Cook Inlet EEZ.

¹⁰⁰ 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 region (*Amoco Prod. Co. v. Village of Gambell*, 480 U.S. 531, 546-47 (1987)). However, NMFS aims to protect such uses pursuant to other laws, such as the National Environmental Policy Act and the Magnuson-Stevens Act.

4.7.1.1. Alternative 1, No Action

Alternative 1 would not change the State's management of the UCI salmon drift gillnet fishery in either Federal or State waters. Therefore, the alternative would not alter the State's escapement-based management program. Furthermore, ADF&G would continue to manage the UCI salmon drift gillnet fishery in accordance with the Central District Drift Gillnet Fishery Management Plan. The management plan sets forth time and area restrictions for the fishery that are intended to ensure adequate escapement and a harvestable surplus of salmon into the Northern District drainages.

Current trends in salmon harvest levels in the UCI salmon drift gillnet fishery are expected to continue. As in the past (Figure 4-5), harvest levels will likely fluctuate dramatically from year to year due to the inherent annual variability in the scale of wild salmon runs. In addition, the proportion of the Upper Cook Inlet salmon harvest caught by the UCI salmon drift gillnet fleet is expected to continue to follow the current trend. As shown in Figure 4-6, from 1999–2018, the UCI salmon drift gillnet fleet harvested an overall increasing percentage of the total salmon catch and catch of each species, with the exception of sockeye salmon—the fleet accounted for a relatively flat proportion of the Upper Cook Inlet sockeye harvest.

The next regularly scheduled meeting of the BOF that will review Upper Cook Inlet finfish regulations occurs in the 2022–2023 meeting cycle.¹⁰¹ At that time, the BOF will consider any proposed changes to regulations in the Central District Drift Gillnet Fishery Management Plan submitted by members of the public, local Fish and Game Advisory Committees, and ADF&G. If adopted, these proposals could change the amount of salmon caught in the UCI salmon drift gillnet fishery and/or other salmon fisheries in Upper Cook Inlet. However, it is uncertain what proposals will be submitted and approved by the BOF during the next meeting cycle.

The effects of climate change on salmon resources in Cook Inlet could significantly alter how these resources are managed. As described in Section 3.6.3, the Council, NMFS, and the State have taken actions that indicate a willingness to adapt fishery management to be proactive in the face of changing climate conditions. However, because of the large uncertainties as to what the impacts of climate changes on Cook Inlet salmon stocks might be, it is not possible to predict what form these adaptations may take or how they may affect target species harvest in the UCI salmon drift gillnet fishery or other salmon fisheries in Upper Cook Inlet.

4.7.1.2. Alternative 2

If none of the postseason ACLs established under the three-tier system are exceeded, and if no stock or stock complex is declared overfished and no overfishing is occurring, harvest level trends in the UCI salmon drift gillnet fishery are not expected to be appreciably different than those under Alternative 1. In addition, harvest level trends in other salmon fisheries in Upper Cook Inlet, including the UCI set gillnet, sport, personal use, and subsistence/educational fisheries, would be similar to those under Alternative 1. As under Alternative 1, the BOF could amend the Central District Drift Gillnet Fishery Management Plan in a way that would change the amount of salmon caught in the UCI salmon drift gillnet fishery and/or other salmon fisheries in Upper Cook Inlet. Given that a management plan amendment would likely affect the UCI salmon drift gillnet fishery in both State and Federal waters, it is expected that any amendments to the Central District Drift Gillnet Fishery Management Plan would be reviewed by the Joint Protocol Committee of the Council and BOF.

¹⁰¹ The BOF could consider a proposed change to the regulations in the Central District Drift Gillnet Fishery Management Plan before the next scheduled meeting if it is determined that the proposal addresses an emergency, which is defined as "an unforeseen, unexpected event that either threatens a fish or game resource, or an unforeseen, unexpected resource situation where a biologically allowable resource harvest would be precluded by delayed regulatory action and such delay would be significantly burdensome to the petitioners because the resource would be unavailable in the future" (5 AAC 96.625(f)).

If any of the postseason ACLs are exceeded, or if a stock or stock complex is declared overfished or if overfishing is occurring, the Council would request that the State report to the Council the remedial management measures the State proposes to implement. If the Council and NMFS deem the State's proposed measures sufficient to comply with Magnuson-Stevens Act requirements, the measures may be adopted without an FMP amendment to assure timely implementation. If the Council and NMFS do not deem the State's proposed measures sufficient to comply with Magnuson-Stevens Act requirements, the Council would adopt remedial measures for recommendation to NMFS. Adoption of some measures, such as a stock or stock complex rebuilding program, would require implementation either through an FMP amendment or notice and comment rule-making process.

Either a State or Federal rebuilding program for a stock or stock complex in the UCI salmon drift gillnet fishery would likely be complex and contentious given that a variety of salmon species are caught in the fishery. Measures designed to protect and rebuild one or more overfished salmon stocks may require a substantial curtailment of catches of healthy salmon stocks because of the limited selectivity of the fishing gear in the mixed-stock fishery. Over the longer term, a successful rebuilding program is expected to increase fishery profitability as stocks return to productive levels.

As under Alternative 1, the Council, NMFS, and the State are expected to adapt fishery management to be proactive in the face of changing climate conditions. These adaptations may change levels of target species harvest in the UCI salmon drift gillnet fishery and other salmon fisheries in Upper Cook Inlet, but the extent of these changes is uncertain.

4.7.1.3. Alternative 3

Under Alternative 3, the Council could decide to control harvest through annually setting a TAC for the UCI salmon drift gillnet fishery. The establishment of a TAC would require a process to coordinate expected salmon harvests in the UCI salmon drift gillnet fishery in both State and Federal waters. Due to this, and the uncertainty inherent to a forecast-based ACL for salmon, the TAC would have to be set conservatively to avoid it being exceeded. When the TAC is attained, all S03H permit holders would be required to forego fishing in the Cook Inlet EEZ. The overall result would likely be a lower harvest level for the UCI salmon drift gillnet fleet as a whole.

The impact on individual vessels would be proportional to the extent that they rely on the EEZ for target fishing. As noted in section 4.5.2.3, the entire active UCI salmon drift gillnet fleet likely fishes in the EEZ at some time during each fishing season, but over the entire season vessels differ with respect to their level of economic dependency on fishing grounds in the EEZ. While the difference between vessel groups is small, the analysis in Section 4.5.2.3 shows that the EEZ accounted for more of the annual catch of vessels that generally catch the fewest fish during a season.

UCI salmon drift gillnet vessels displaced by an EEZ closure would have the options of ceasing to fish or relocating their fishing activities to State waters. However, a number of factors may potentially make it difficult for vessels to offset the loss of access to the EEZ by increasing effort inside State waters. If the abundance and availability of salmon across all stocks are lower in State waters than in the EEZ, catch rates would fall, translating into less harvesting revenue for any given effort level. As discussed in section 4.5.2.1, much of the southwestern range of the UCI salmon drift gillnet fleet approximates the boundaries of the Cook Inlet EEZ because the rip tide zones favored for salmon drift gillnet fishing are located in the EEZ. In addition, congestion costs may be incurred by displaced vessels as well as by vessels that normally fish in State waters. For example, catch rates of displaced and existing vessels may fall as they compete for the fish in the open fishing areas. Additionally, gear conflicts could be exacerbated, and gear may be lost due to entanglement. Finally, an EEZ closure may force some vessels to travel farther than previously, thereby increasing operating costs such as fuel expenses.

Due to data limitations, it is not possible to estimate the maximum amount of commercial fishing revenue that would be at risk as a result of a Cook Inlet EEZ closure (i.e., the fishing revenue that would be foregone if fishing vessel operators in the UCI salmon drift gillnet fishery cannot offset the revenue loss of an EEZ closure by fishing in a different location). A revenue at risk estimate would require historical data on the amount of salmon available for harvest within the EEZ at a given point in time across the fishing season, and these data are unavailable.

If the Cook Inlet EEZ is closed before sockeye salmon harvests begin to slow (typically around July 23 as shown in Figure 4-1), it is expected that ADF&G fishery managers would do what they could to enable the drift gillnet fleet to achieve the same harvest it would have attained in the absence of an EEZ closure. For example, ADF&G fishery managers could adjust openings for the UCI salmon drift gillnet fishery in State waters to the extent allowed by the Central District Drift Gillnet Fishery Management Plan. However, such adjustments may be insufficient to compensate the drift gillnet fleet for the loss of fishing grounds, and the fleet's harvest would be reduced. In that case, the harvests of other user groups, including participants in the UCI set gillnet, sport, personal use, and subsistence/educational fisheries, would increase and/or overall levels of escapement would increase. Beyond any inseason adjustments made by the ADF&G, it is possible that the BOF would amend the Central District Drift Gillnet Fishery Management Plan so as to give ADF&G fishery managers additional flexibility in the event of an EEZ closure. To minimize conflicts between State and Federal salmon management actions the Council and BOF would need to work closely through the Joint Protocol Committee.

To the extent that an EEZ closure results in a decrease in the amount of salmon delivered by the UCI salmon drift gillnet fleet to processors and buyers, firms and individuals in the processing sector could experience a reduction in the overall level of production. Smaller operations would probably be more affected by changes in landings than larger buyers because smaller buyers tend to be less diversified in the range of species handled. Substantial decreases in production could lead to a temporary shutdown or permanent closing of some processing businesses. This, in turn, would potentially result in a range of adverse socioeconomic impacts in, but not limited to, the communities where those businesses are located.

If displaced fishermen cannot mitigate losses incurred due to an EEZ closure by shifting fishing effort to State waters, their communities likewise would be negatively affected as less income flows through different sectors of the local economy. Depending on the timing of the closure, different communities may be differentially affected based on their specific location relative to the Cook Inlet EEZ. For example, if the Cook Inlet EEZ is closed early in the season, drift gillnet vessels based in communities to the south of the EEZ that attempt to access fishing areas still open could experience longer run times. Such closures could also impact where vessels would spend larger or smaller portions of the fishing season which, in turn, could impact communities where goods and services were obtained by those vessels and their crews.

Because of the need to avoid exceeding the EEZ catch limits established pre-season, self-reporting of State/EEZ salmon harvest proportions from a single trip would not provide suitably accurate data to inseason managers. At a minimum, deliveries from a single Cook Inlet drift gillnet fishing trip could not include fish harvested from both the EEZ and State waters. A Federal VMS requirement for salmon drift gillnet vessels registered to fish in the EEZ would provide data to verify that these vessels were fishing only in the EEZ or only in State waters during a given trip (See Section 4.7.2.2.6 for a discussion of the benefits and costs of VMS). However, salmon drift gillnet vessels not registered to fish in the EEZ would not be subject to a Federal VMS requirement. For those vessels, enforcement of a provision prohibiting fish caught in the EEZ and State waters from being onboard during the same trip would require that State and EEZ salmon drift gillnet fisheries not occur at the same time. A system of non-concurrent Federal and State openings would allow UCI salmon drift gillnet vessels to fish in both EEZ and State waters salmon fisheries. However, this system would require close coordination between State and Federal agencies so

that vessels are able to readily adjust their fishing locations in response to changes in the distribution of salmon between the EEZ and State waters over the course of a season. Otherwise, a system of non-concurrent openings would likely constrain the economic efficiency of fishing operations, although it is difficult to predict to what extent.

If concurrent openings of the EEZ and State waters fishery are identified as a management priority by the Council, then additional monitoring requirements (e.g., VMS) would have to be imposed by ADF&G on salmon drift gillnet vessels not registered to fish in the EEZ to ensure compliance with the prohibition on mixed EEZ/State water catches. With concurrent openings, vessels would have to choose on a day-by-day or trip-by-trip basis to fish in either EEZ or State waters.

As under Alternative 1, the Council, NMFS, and the State are expected to adapt fishery management to be proactive in the face of changing climate conditions. These adaptations may change levels of target species harvest in the UCI salmon drift gillnet fishery and other salmon fisheries in Upper Cook Inlet, but the extent of these changes is uncertain.

4.7.2. Impacts of Monitoring, Recordkeeping, and Reporting Requirements

This section describes potential changes in benefits and costs to firms or individuals in the UCI salmon drift gillnet fishery as a result of proposed monitoring, recordkeeping, and reporting measures designed to collect data to effectively manage and conduct the fishery in Federal waters.

4.7.2.1. Alternative 1, No Action

Alternative 1 would not change the State's management of the UCI salmon drift gillnet fishery in either Federal or State waters. Therefore, the alternative does not substantially change existing State monitoring, recordkeeping, and reporting requirements in a way that is relevant to harvesting and processing sectors, government, or fishing communities.

Currently, ADF&G fish tickets are the primary source of data for the UCI salmon drift gillnet fishery. All State-licensed processors of raw fishery resources must complete and submit this form for each landing from a fishing permit holder. Information such as the vessel ADF&G number, number of crew onboard, fishing trip dates, State statistical areas, Federal areas, State and Federal fishing permits (as applicable), and species weights and dispositions are captured in the form. eLandings, which is an electronic version of ADF&G fish tickets, is required to be used by processors that submitted more than 2,000 salmon fish tickets or bought over 20 million pounds of salmon in any of the previous three calendar years (5 AAC 39.130(b)).

Under Alternative 1, the amount of salmon and other species harvested by the UCI salmon drift gillnet fleet in the EEZ versus State waters cannot be precisely determined because the boundaries of EEZ waters do not align with the areas used by fish tickets to record the location of salmon harvests. In addition, while there are currently accommodations in fish tickets for reporting at-sea discards, this information is not required to be reported.¹⁰² Fish tickets are currently serving as the Standardized Bycatch Reporting Methodology for the commercial salmon troll fishery in the East Area of the Salmon Management Area.

Under Alternative 1, the number of marine mammal and seabird interactions in the UCI salmon drift gillnet fishery could be determined even though the fishery is under State jurisdiction. For example, the Cook Inlet salmon drift gillnet fishery was observed in 1999 and 2000 under NMFS' Alaska Marine Mammal Observer Program, which conducts observer coverage of State-managed fisheries. NMFS marine mammal observers were deployed aboard drift gillnet vessels at no financial cost to vessel owners. Observer coverage was 1.75% in 1999 and 3.73% in 2000. The Alaska Marine Mammal Observer

¹⁰² Reporting of at-sea discards is not required because processors cannot be held responsible for determining discard amounts that they cannot verify.

Program monitored fisheries on rotational observation periods based on available funding. Recently, NMFS suspended the program due to a lack of resources (National Marine Fisheries Service 2020a).

4.7.2.2. Alternatives 2 and 3

As discussed in Section 2.6, in designing FMP and associated regulatory requirements under Alternatives 2 and 3, the Council and NMFS will need to consider their ability to monitor the following fishery-dependent activity:

- The collection of data to estimate the amount of species-specific groundfish and salmon discarded in gillnet fishery that occurs in the Cook Inlet EEZ.
- Full accounting of retained salmon in State and Federal waters.
- Depending on the data requirements for status determination, the Council and NMFS may need to assess effort and catch that occurred in the EEZ. This may include regulatory requirements to aide in the identification of landed catch such that the location of capture and stock of origin can be determined.
- Accounting of marine mammal and seabird interactions.
- Compliance with fishery regulations, including open/closed areas.

Section 2.6 notes that it is expected that Alternative 3 would require the greatest amount of fishery monitoring, recordkeeping, and reporting due to data requirements of Federal managers and to allow for the effective enforcement of distinct Federal and State UCI salmon drift gillnet fisheries. In particular, if mixed deliveries of salmon from the State and Federal fishery are allowed, then methods to accurately determine EEZ removals would have to be established to allow for precise accounting of when the EEZ TAC is reached. Under Alternative 2, the UCI salmon drift gillnet fishery would be managed jointly in State and EEZ waters, and the harvest of salmon would accrue toward a unified catch limit. With the catch from both areas being counted against the same limit, precisely determining which fish were harvested in the EEZ or State waters is less important for inseason management.

Possible fishery monitoring, recordkeeping, and reporting measures that could be implemented under Alternatives 2 and 3 are presented in Table 4-32. For each measure, the table summarizes its purpose; how it would be applied to management of the UCI salmon drift gillnet fishery in Federal waters; qualitative assessments of the cost to industry of complying with the measure and the level of effort required by fishery managers to implement it; and any information gaps associated with the measure. These attributes of each measure are described in detail in the sections below. See Section 2.6 for additional information on the differences between Alternatives 2 and 3 with respect to monitoring, recordkeeping, and reporting needs. Table 2-3 in that section summarizes the importance of monitoring, recordkeeping, and reporting measures for implementing Alternative 2 versus Alternative 3.

Table 4-32 Potential monitoring, recordkeeping, and reporting measures under Alternatives 2 and 3.

Monitoring, Recordkeeping, and Reporting Measure	Purpose	Application to UCI Salmon Drift Gillnet Fishery	Costs to the Industry of Compliance	Level of Effort to Implement	Information Gaps
Federal Fisheries Permit	Identify vessels fishing in Federal waters	<ul style="list-style-type: none"> Federal monitoring, recordkeeping, and reporting requirements can be tied to the permit 	Low	Easier	
Federal Daily Fishing Logbook (eLogbook)	Estimate effort levels	<ul style="list-style-type: none"> Inseason management catch estimates Bycatch level monitoring 	Low	Medium	Relies on self-reporting of data. Information can be verified by additional data collection efforts.
	Estimate catch location				
	Estimate haul weight for each set by species				
	Estimate level of discards by species				
Estimate total catch by species					
Full Retention of Groundfish	Prohibit discards of groundfish	<ul style="list-style-type: none"> Bycatch prohibition enforcement 	Low	Medium (Compliance monitoring may be expensive)	
Onboard Observers	Estimate level of discards by species	<ul style="list-style-type: none"> Bycatch level monitoring Bycatch prohibition enforcement Protected species interaction monitoring 	High	Difficult (Deployment may be expensive and logistically challenging because most drift gillnet vessels are smaller than 40 ft LOA)	
	Estimate haul weight for each set by species				
	Estimate interactions with protected species				
Electronic Monitoring System (camera-based)	Estimate level of discards by species	<ul style="list-style-type: none"> Bycatch level monitoring Bycatch prohibition enforcement 	Medium or High	Difficult (Technology may be expensive to develop for drift gillnet vessels)	
Vessel Monitoring System	Track vessel movement and catch location	<ul style="list-style-type: none"> Inseason management catch estimates Area closure enforcement 	Medium	Medium (Need to create algorithm to provide fishing effort information)	
ADF&G Fish Tickets and eLandings Electronic Reporting System	Measure total landings by species	<ul style="list-style-type: none"> Inseason management catch estimates Bycatch level monitoring 	Low or Medium	Easier (Already in place for most processors; may need modification to account for Federal/State waters line)	Relies on self-reporting of data. Information can be verified by additional data collection efforts.
	Estimate catch location				
	Estimate level of discards by species				

The primary stakeholder groups that would be directly affected by regulations implementing the proposed monitoring, recordkeeping, and reporting measures are the harvesters and processors that participate in the UCI salmon drift gillnet fishery. The sections below provide estimates of the economic burden each proposed monitoring, recordkeeping, and reporting measure may impose on harvesters and processors. In addition, the management and enforcement considerations applicable to each measure are discussed. Additional information on management and enforcement considerations under the action alternatives is provided in Section 4.8.

Should any of the proposed monitoring, recordkeeping, and reporting measures in Table 4-32 be implemented, the economic impacts of the additional costs that participants in the UCI salmon drift gillnet fishery would incur as a result are expected to vary from year to year. In general, the additional costs

would be most disruptive to harvesters and processors in years when they are operating nearest their profit margin (e.g., during years when the sockeye salmon run in Cook Inlet is especially low).

In addition, the economic impact of the additional costs imposed by the monitoring, recordkeeping, and reporting measures would likely be unevenly distributed across fishery participants. The costs of the measures would not account for the size or profitability of individual harvesters or processors. Smaller vessel operators and processors that participate in the fishery would face costs that are disproportionately high relative to their gross revenue. Similarly, the additional costs would have a higher marginal impact on harvesting and processing operations that are less profitable or less well capitalized. These distributive effects, in turn, could change the size, composition, and geographic distribution of the UCI salmon drift gillnet fleet.

4.7.2.2.1. Federal Fisheries Permit

Under this measure, all vessels fishing for salmon in Federal waters of Cook Inlet with drift gillnet gear would be required to hold a Federal Fisheries Permit (FFP). A number of the monitoring, recordkeeping, and reporting measures listed in Table 4-32, including VMS, groundfish retention, and observer coverage, could be tied to an FFP. This regulatory connection to an FFP would allow NMFS to require a UCI salmon drift gillnet vessel with an FFP to comply with these monitoring, recordkeeping, and reporting measures regardless if the vessel was fishing in State or Federal waters.

Some operators of UCI salmon drift gillnet vessels may choose to avoid the costs associated with the monitoring, recordkeeping, and reporting measures tied to an FFP by altering their operations so as to avoid fishing in Federal waters (thereby precluding their need to obtain an FFP). However, these changes could increase other types of costs for vessel operators. For example, if the abundance and availability of salmon across all stocks are lower in State waters than in the EEZ, catch rates would fall, translating into less harvesting revenue for any given effort level.

Costs to the Industry of Compliance

NMFS may assess and collect fees to recover the administrative costs incurred by the Federal government in processing applications for Federal permits required to participate in the fisheries managed under an FMP (16 U.S.C 1853(b)). However, as with the FFP for the BSAI and GOA groundfish fisheries, an FFP for the UCI salmon drift gillnet fishery is expected to be a non-transferable, three-year permit issued on request and without charge to vessel owners.

As shown in Table 4-33, a number of active vessels in the UCI salmon drift gillnet fishery have participated in other Alaska fisheries in which an FFP is required. Although the percent of vessels that have an FFP in a given year shows a downward trend, the percent of vessels that held an FFP during at least one year from 2005–2018 has been fairly constant.

Table 4-33 Number of active vessels in the UCI salmon drift gillnet fishery with a Federal Fisheries Permit, 2005–2018.

	Number of Active Vessels	Vessels with an FFP		Vessels with an FFP for One or More Years from 2005–2018	
		Number	Percent	Number	Percent
2005	467	157	34%	176	38%
2006	392	104	27%	145	37%
2007	414	113	27%	150	36%
2008	415	113	27%	149	36%
2009	388	90	23%	142	37%
2010	353	84	24%	134	38%
2011	420	99	24%	150	36%
2012	457	90	20%	153	33%
2013	471	94	20%	161	34%
2014	478	99	21%	161	34%
2015	463	81	17%	152	33%
2016	455	84	18%	148	33%
2017	404	79	20%	138	34%
2018	385	57	15%	130	34%

Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Management and Enforcement Considerations

The Council and NMFS have broad authority over vessels that hold Federal permits and licenses. As discussed above, tying monitoring, recordkeeping, and reporting measures implemented under Alternatives 2 or 3 to an FFP would allow NMFS to require a UCI salmon drift gillnet vessel with an FFP to comply with Federal regulations regardless if the vessel was fishing in State or Federal waters. In the absence of an FFP, active S03H permit holders that fish in both Federal and State waters could be subject to two different sets of regulations concerning management of the UCI salmon drift gillnet fishery. For example, a vessel operator fishing in multiple areas could have differing groundfish retention requirements in a single trip. Such Federal and State management inconsistencies could create confusion that may result in unintentional non-compliance.

A potential management issue related to an FFP could arise if UCI salmon drift gillnet vessels were allowed to surrender their FFPs at some point during the fishing season in order to avoid having to comply with Federal monitoring, recordkeeping, and reporting requirements while fishing in State waters. The Council could address this issue by placing restrictions on the ease with which vessels can surrender their FFPs during a fishing season.

4.7.2.2.2. Federal Daily Fishing Logbook

A Federal Daily Fishing Logbook would provide on-the-water information for the UCI salmon drift gillnet fishery, including set number, time and date gear was set and hauled, starting and ending latitude and longitude for each set, permit numbers, and estimated number of fish and total haul weight for each set. Information on set location (deployment and retrieval) and species caught could be used to determine whether fishing occurred in the EEZ and whether fish were retained or discarded.

An eLogbook, which is an electronic version of a Federal Daily Fishing Logbook, would delineate harvest and effort relative to the EEZ in near real-time, thereby facilitating inseason management action in the UCI salmon drift gillnet fishery in Federal waters. With an eLogbook system, logbook data are transmitted from a vessel to a NMFS server via a secure website or email when the vessel is in Wi-Fi range (e.g., at the processing plant) or the vessel operator has access to email. Electronic logbooks provide detailed information on fishing effort that is not easily accessible from paper logbooks and not available on landing reports in eLandings.

Costs to the Industry of Compliance

As in the Alaska groundfish fishery, it is expected that a paper logbook would be provided to UCI salmon drift gillnet vessels on request by NMFS at no cost to vessel operators. Also based on experience in the Alaska groundfish fishery, the minimum requirements for an eLogbook would require vessel operators to purchase a laptop (or perhaps tablet), Windows operating system, and a printer (\$500 or more). The printer is needed to maintain hard copy records onboard the vessel for enforcement purposes, and also to provide a processor with information on at-sea discards. It is expected that NMFS would provide the logbook application, user support, and training that is offered either in person or through the internet.

A number of active vessels in the UCI salmon drift gillnet fishery are currently participating, or have participated in Alaska fisheries in which a Federal Daily Fishing Logbook is required, such as the sablefish and halibut IFQ fisheries. The operators of these vessels are likely proficient in logbook entries. For vessels that have not been subject to mandatory logbook reporting of fishing activity, some learning would be expected to be needed before vessel operators become proficient in the reporting requirements. However, the information required would not be expected to be complex or substantially beyond that necessary to meet the record-keeping needs of normal fishing business operational purposes. The use of electronic logbooks may confer benefits to vessel operators, including data entry time savings and improved accuracy of calculations. In general, vessel operators would likely prefer to use eLogbooks over paper logbooks because the electronic features generally make reporting and recordkeeping easier for vessel crew.

Management and Enforcement Considerations

NMFS can assess and collect fees to recover the administrative costs incurred by the Federal government in processing applications for Federal permits required to participate in the fisheries managed under the *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska*, as authorized by the Magnuson-Stevens Act (16 U.S.C 1853(b)).

A logbook for the UCI salmon drift gillnet fishery would need to be developed since there currently is not a State or Federal logbook for the fishery (or any other Alaska commercial salmon fishery). The use of an eLogbook in the fishery would require developing a fishery-specific logbook application (likely a modification of the groundfish logbook and backend functionality).

An upper bound approximation of the costs associated with developing and implementing an eLogbook system is provided by the Pacific States Marine Fisheries Commission (PSMFC), which recently estimated the costs of an eLogbook system for the Crab Rationalization Program fisheries in the BSAI (North Pacific Fishery Management Council 2020). After consulting with their software development staff, PSMFC estimated a range of \$200,000–\$300,000 based on experience with eLogbooks. This estimate is for labor development only and represents a one-time, upfront cost. Approximately \$50,000 of that total would be used by developers to determine the eLogbook system requirements, and the remainder would be used to build the system. The estimate does not include servers, data entry staff, maintenance, troubleshooting software glitches, etc. PSMFC estimated ongoing annual costs of \$10,000–\$20,000. Funds would also be needed to be appropriated for hiring full-time technical support for the users that would operate the system (North Pacific Fishery Management Council 2020). Developing and implementing an eLogbook system for the UCI salmon drift gillnet fishery is expected to be considerably less expensive than the one developed for the BSAI crab fisheries since it would be simpler, with a focus on set location and the amount of fish retained and discarded. The format would likely be based on a modified version of the existing groundfish eLogbook system.

A Federal Daily Fishing Logbook requirement would be relatively easy to enforce. At-sea boarding by USCG and random dockside inspections by NOAA Office of Law Enforcement (NOAA OLE) officers

and Alaska Wildlife Troopers can verify the presence and use of paper or electronic logbooks. Since a logbook relies on self-reporting of data, it is possible for vessel operators to submit incorrect information either intentionally or unintentionally. The accuracy of recorded landings can be validated during dockside inspections, and other logbook information can be verified by additional data collection efforts, such as onboard observers, ADF&G fish tickets (including eLandings), and VMS.¹⁰³

4.7.2.2.3. Full Retention of Groundfish

When combined with a compliance monitoring tool (e.g., EM, observers), requiring full groundfish retention for vessels operating in the UCI salmon drift gillnet fishery would provide fishery managers with an accurate picture of groundfish catch in the fishery.

Costs to the Industry of Compliance

The economic impacts of a 100% groundfish retention requirement on vessel operators is hard to quantify. However, given the low level of bycatch in the UCI salmon drift gillnet fishery as described in Section 4.5.2.4, the potential economic impacts of this requirement on fishing operations are expected to be small. With few, if any, groundfish caught during a typical fishing trip, the requirement would only minimally reduce hold space for more valuable species. Moreover, vessels typically do not load the boat to capacity and have space for additional harvest of non-target species. In the rare event that large amounts of groundfish are encountered, the retention of groundfish may require vessel operators to end trips when the hold space is full. Smaller vessels may be disproportionately affected by a groundfish retention requirement because they are more likely constrained by hold space during a fishing trip.

It is conceivable that the commercial value of a vessel's salmon catch could be reduced by mixing groundfish in the fish hold. For example, placing groundfish with salmon in the same storage compartment could damage the scales and flesh of the salmon through abrasion. However, these potential issues may be dealt with by segregating the bycatch from the salmon catch contained in the brailer bag in a given hold, or alternatively, using an entirely separate hold to store bycatch. Incidentally-caught sharks may also require onboard processing in order to remove as much of the non-protein nitrogen compounds in the flesh as possible before storing in a hold.¹⁰⁴ The economic costs of these additional steps in vessel operations would be minimal because so few non-target fish are caught in the UCI salmon drift gillnet fishery.

A full retention requirement would allow vessel operators to sell incidentally caught groundfish, thereby at least partially offsetting the cost of the requirement to operators. However, the decision to purchase, process, or discard groundfish would be at the discretion of each individual processor. Given that the total amount of groundfish caught annually in the UCI salmon drift gillnet fishery is small and that there are multiple processors receiving deliveries from the fishery, the impact to a specific processor from the retention of groundfish is likely to be negligible.

Management and Enforcement Considerations

If a full retention requirement is combined with a Federal Daily Fishing Logbook requirement, NMFS could verify that fish reported in the logbook were landed shoreside rather than discarded at-sea. Fish landed shoreside would be reported to NMFS through ADF&G fish tickets/eLandings.

While the costs of storage, handling, and delivery of incidentally caught groundfish are expected to be minimal, some vessel operators might choose to violate the full retention requirements (i.e., vessel

¹⁰³ With an eLogbook system the potential to misreport fishing locations can also be mitigated through automation and integration with a global positioning system.

¹⁰⁴ When a shark dies bacteria rapidly convert the non-protein nitrogen compounds in the shark's flesh to ammonia, which contributes to spoilage and contamination of target catch.

operators may discard some or all of their groundfish catch). In some instances, crewmembers might report illegal discarding, but overall, discards would be difficult for NOAA OLE to monitor. Due to the risk of gear entanglement, monitoring vessels while they are actively fishing presents logistical challenges. However, the use of onboard observers and EM can assist in monitoring compliance of a full retention requirement.

4.7.2.2.4. Onboard Observers

Information about at-sea discards of groundfish and interactions with protected species could be collected for the UCI salmon drift gillnet fishery through the North Pacific Observer Program (NPOP). Estimates of groundfish discards and protected species interactions would be recorded by observers deployed on selected vessels active in the UCI salmon drift gillnet fishery. Onboard observer information could be used to extrapolate to unobserved vessels and estimate at-sea discards and protected species interactions. The amount of observer effort would be set to achieve a desirable level of precision.¹⁰⁵

Costs to the Industry of Compliance

Under the Alaska Marine Mammal Observer Program, NMFS deployed marine mammal observers on vessels participating in the UCI salmon drift gillnet fishery in 1999 and 2000, with observer coverage levels of 1.75% and 3.73%, respectively. NMFS marine mammal observers were deployed aboard drift gillnet vessels at no financial cost to vessel owners.

Section 313(a)(2) of the MSA specifically prohibits the Council from establishing an observer fee system for a salmon fishery under its jurisdiction.¹⁰⁶ Therefore, a stable funding source for an observer program in the UCI salmon drift gillnet fishery would need to be developed. Two potential funding sources are 1) Federal funding, or 2) direct industry funding for observer coverage. Given the current funding shortfall in the North Pacific Observer Program (NPOP), it is unlikely NMFS would have the funding to support an observer program in the fishery.

Assuming vessels in the UCI salmon drift gillnet fishery are placed in the partial coverage category, vessels randomly selected for coverage could contract with observer providers and pay directly for coverage.¹⁰⁷ Under this approach to funding, which is called “pay-as-you-go”, vessel operators would pay all of the direct costs of placing observers on their vessels, including salary, insurance, housing, and transportation. According to the *2018 Observer Program Annual Report*, the average cost per observer sea day in the partial coverage category was \$1,380 in 2018 (National Marine Fisheries Service 2019b).¹⁰⁸ This cost is a combination of a daily rate, which is paid for the number of days the observer is on a vessel, and reimbursable travel costs. Note that the \$1,380 per observer sea day is an estimate. Actual costs vary on a case by case basis, depending on the fishery, duration of observer coverage, and logistics (North

¹⁰⁵ Vessels are assigned observers according to the scientific sampling plan described in the Annual Deployment Plan developed by NMFS in consultation with the Council (National Marine Fisheries Service 2019b).

¹⁰⁶ NMFS and the Council established a system of fees for observer coverage on groundfish and halibut vessels in the partial coverage category (see Footnote 107). The fees, which are based on the ex-vessel value of vessel landings, are split between the processor and vessel operator (National Marine Fisheries Service 2020b).

¹⁰⁷ All vessels and processors that participate in Federally managed or parallel groundfish and halibut fisheries off Alaska (except catcher vessels delivering unsorted codends to a mothership) are assigned to one of two categories: vessels and processors that are not required to have an observer at all times, and vessels and processors that must have all operations observed. The partial observer coverage category includes catcher vessels, shoreside processors, and stationary floating processors when not participating in a catch share program with a transferrable prohibited species catch limit. The full coverage category includes catcher/processors, motherships, and catcher vessels participating in a catch share program with a transferrable prohibited species catch limit.

¹⁰⁸ The cost of an observer-day published in the observer program annual reports reflects the total amount paid through a contract with the service provider divided by the number of days deployed. The published average cost per day over recent years has varied. Annual variation can be attributed to cost growth, but also has much to do with the annual deployment model and the outcomes of the random trip selection that is inherent to the NPOP.

Pacific Fishery Management Council 2008). Some of the factors that tend to increase observer coverage costs include:

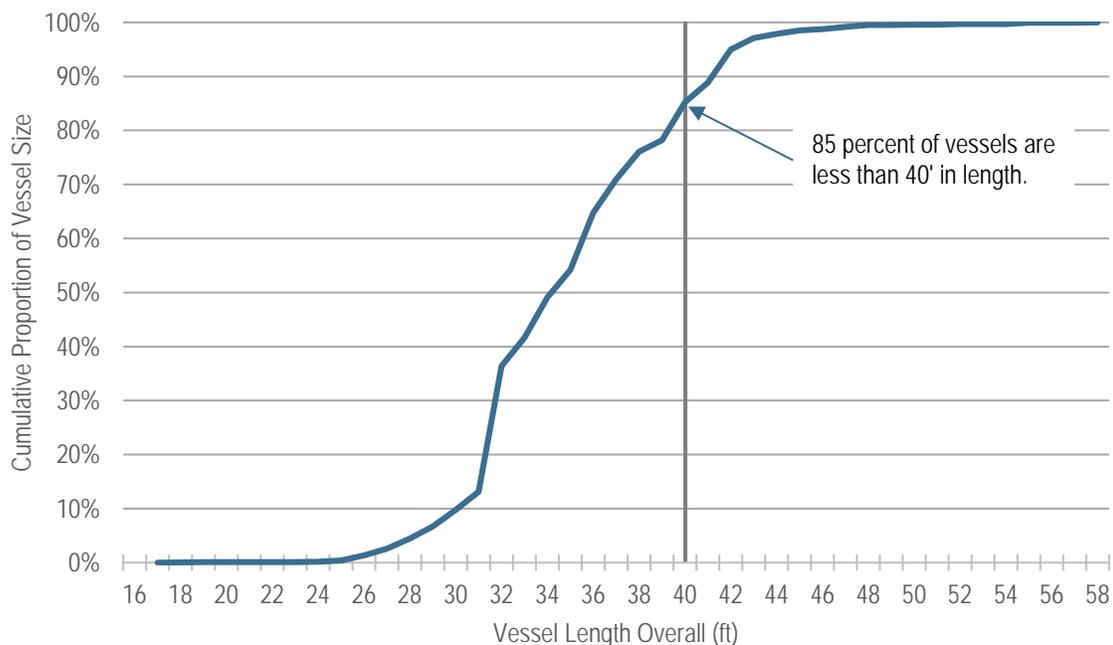
- Fishing trips of short duration
- Operation out of remote ports with high transportation costs.
- Short-term “pulse” fisheries.
- Small-scale fisheries with few participants.
- Fishery disruptions, changing fishing plans, and lack of advance planning.

Given that the UCI salmon drift gillnet fleet is dispersed across several ports and consists of vessels that make short (day-long), intermittent trips, daily observer costs may be relatively high. Moreover, the fishing schedules of these vessels may frequently change at short notice, which may make it difficult to secure observers as well as increase observer costs. An inability to secure an observer could lead to delayed or missed fishing trips.

In addition, onboard observers would be logistically challenging for smaller boats in the UCI salmon drift gillnet fleet. A small vessel size limits the feasibility of having an additional person onboard in terms of the physical space. In addition, small vessels may find it difficult to comply with existing safety and all other vessel requirements and responsibilities in 50 CFR § 679.51(e)(1). Since the start of randomized coverage in the NPOP in 2013, at-sea observation for partial coverage vessels has not occurred on groundfish and halibut vessels less than 40 ft in length overall due to the logistical considerations of putting observers onto small vessels. The Council and NMFS addressed these concerns for the groundfish and halibut fisheries by developing an electronic monitoring option for vessels 40 ft and greater and not observing vessels less than 40 ft, noting that work is ongoing to provide an electronic monitoring option for vessels less than 40 ft. In addition, many vessels between 40 ft and 50 ft have chosen electronic monitoring over taking a human observer (National Marine Fisheries Service 2019b; National Marine Fisheries Service 2019c).

As shown in Figure 4-62, 85% of the vessels fishing in the UCI salmon drift gillnet fishery from 2014–2018 were less than 40 ft in length, and all were less than 60 ft. Consequently, under the groundfish and halibut observer program length criteria, most of the fleet would have zero coverage.

Figure 4-62 Cumulative proportion of vessel lengths in the UCI salmon drift gillnet fishery, 2014–2018.



Source: ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Management and Enforcement Considerations

Development of the existing NPOP framework and coverage levels for the groundfish and halibut fisheries occurred over several decades and required extensive collaboration with fishery stakeholders. While this existing framework, program infrastructure, and past experience with the Alaska Marine Mammal Observer Program provide a foundation for the development of an observer program for the UCI salmon drift gillnet fishery, there are many fishery-specific elements that would need to be designed and tested prior to implementation. Among logistical constraints, funding mechanisms, and other program elements, appropriate coverage rates and sampling methodologies for the drift gillnet salmon fisheries would have to be identified with input from the AFSC's Fishery Monitoring and Assessment Division and the Council's Advisory Committees. Given these considerations, it is unlikely that an observer program could be designed and implemented within the available timeframe for this action.

Potential costs to NMFS of administering an observer program in the UCI salmon drift gillnet fishery are summarized in Table 4-34. Some of these cost components can be scaled up proportional to an increase in the number of observer sea days. For example, the additional observer sea days resulting from an observer program in the fishery would increase the number of hours needed to process data, and that need could be met by hiring additional data processing personnel (proportional to the increased need). However, the facilities (particularly office space) needed to accommodate the additional data processing personnel is not proportionally scalable.

Table 4-34 NMFS cost responsibilities for onboard observers.

Training and Data Processing Costs	<ul style="list-style-type: none"> • The labor and facilities costs associated with training and debriefing of monitors • Data processing
Operational Costs	<ul style="list-style-type: none"> • Certification of monitoring providers and individual monitors; performance monitoring to maintain certifications • Developing and executing vessel selection • Costs associated with liaison activities between service providers, NMFS, Council, fishing industry, and other partners

Using the groundfish and halibut observer program length criteria, only vessels in the UCI salmon drift gillnet fleet greater than 40 ft would be observed. The bycatch and protected species interaction information collected by observers on these vessels could be extrapolated to the entire fleet using similar procedures to those currently used to estimate catch on unobserved halibut and groundfish vessels (Cahalan et al. 2015). However, as noted above, most of the fleet is less than 40 ft and likely would have zero coverage. Consequently, there could be a high risk for biased estimates on bycatch, and a low probability of detecting a marine mammal or seabird mortality event.

While observers are not law enforcement personnel, they do play a significant compliance role by reporting potential violations they witness. Observers can provide evidence for a specific violation and their data, taken in aggregate, can be useful for targeting enforcement activity or proving elements of a violation.

4.7.2.2.5. Electronic Monitoring (Camera-based)

Compliance monitoring of a groundfish retention requirement could possibly be achieved through a camera-based electronic monitoring system (EM). In addition, the data collected from EM systems deployed on vessels could be used in conjunction with other reporting and recordkeeping tools (e.g., eLandings/eLogbook) to obtain catch and discard information from these vessels. NMFS could develop regulations to allow vessels in observer coverage to opt into EM coverage for the calendar year rather than carrying an observer.

An EM system typically consists of wide-angle digital video cameras, a GPS receiver, gear usage sensors, storage and processing devices, and a display screen. Sensors can collect data about boat locations and when fishing gear is being used. Cameras record imagery that can be analyzed for determining fishing effort (e.g., number of sets) and total catch (species, length, and fate (retained/discarded)), and other noticeable events (e.g., crew behaviors). They are “closed systems” that do not allow for manual input or changes to data that is stored. Sensor data would be sent to shorebased EM reviewers in real-time via satellite. Imagery from cameras would be stored on removable storage devices that are provided to EM reviewers once the vessel returns to port.¹⁰⁹ A feedback report can be sent to the vessel operator to ensure that they keep the systems maintained with cameras and sensors operating effectively. Trip reports can be sent to fishery managers and law enforcement officers to alert them of any issues (Course 2015; National Marine Fisheries Service 2017). As with VMS (Section 4.7.2.2.6), EM can be used to track the spatial dispersion of fishing effort.

¹⁰⁹ Video/imagery would not necessarily have to be transferred, reviewed, and stored if an onboard application completes the processing of both sensor and image data into species enumeration and lengths. This type of system would reduce time lags and costs associated with current EM systems and post processing methods (National Marine Fisheries Service 2019c).

Costs to the Industry of Compliance

The costs to UCI salmon drift gillnet vessels of complying with an EM requirement are uncertain. EM would require further development for use on these vessels. Such a system would not necessarily be more affordable than onboard observers. The initial cost of installing EM equipment on vessels is relatively high, and vessels may incur ongoing monitoring costs (primarily maintenance, licensing, and data review). Further, it is possible that the vessels in the UCI salmon drift gillnet fishery are not ideally suited for making EM economically efficient because they may not carry out enough fishing trips each year to make up for the initial investment costs of EM system installation.¹¹⁰

Management and Enforcement Considerations

Much of the recurring annual cost of an EM program is driven by data review and data storage. Review cost are influenced by the review rate (currently equal to coverage rate), the catch handling procedures of the monitored vessels, and the data needing to be captured to meet monitoring objectives. More complex catch events take more time for video review as do increases of data points needed to meet monitoring objectives. The costs associated with EM data review can be especially high for rare events such as protected species interactions (Bonney et al. 2009). Depending on program structure these costs may be borne by industry or by NMFS.

4.7.2.2.6. Vessel Monitoring System

VMS is a continuous monitoring equipment, which when installed on a UCI salmon drift gillnet vessel would record and transmit satellite information on the vessel's geographic position, course, and speed. The real-time vessel location information provided by VMS could be used to facilitate enforcement of a commercial salmon fishing closure for the Cook Inlet EEZ. In addition, supplemental to its utility for law enforcement, VMS could potentially be used to validate the area fished reported by eLandings or eLogbook, and to apportion effort in the UCI salmon drift gillnet fishery between State and Federal waters by providing a continuous record of fishing locations.

VMS units integrate global positioning system (GPS) and communications electronics in a single, tamper-resistant package to automatically determine the vessel's position several times per hour. The units can be set to transmit a vessel's location periodically and automatically to an overhead satellite in real time. A communications service provider receives the transmission and relays it to NOAA OLE. The VMS data are monitored and interpreted by NOAA OLE officers. Currently, no officers are directly dedicated to the NMFS Alaska Region VMS Program; however, a program manager, information technology technician, and enforcement technician work on VMS each day for some hours.

The VMS program in Alaska is a relatively simple one involving VMS units set to report a vessel identification and location at fixed 30-minute intervals to the NOAA OLE processing center. Some of these units allow NOAA OLE to communicate with the unit and modify the reporting frequency. The Alaska program is relatively simple, because it doesn't require the range of functions that are required for VMS in some other regions of the United States. Moreover, the Alaska program doesn't require the VMS unit to report on the status of other vessel sensors (in addition to the GPS). VMS units on a vessel have the following components:

- A power source and power cabling;
- A GPS antenna to pick up satellite signals;

¹¹⁰ Sylvia et al. (2016) notes that the costs of onboard observers to a fishing vessel are normally realized as purely "variable" costs – they are paid for on a "per day" basis. EM, however, requires significant initial investment in equipment, installation, and training as a fixed cost. Depending on required video review rates and storage costs, variable costs of EM are potentially much lower than the variable cost of an onboard observer, which makes the scale of fishing effort important. In general, if a vessel does not fish many days, or is required to be observed on only a small percentage of trips, EM is likely to be more expensive than onboard observers; the converse also holds.

- The VMS itself—a box about the size of a car radio containing a GPS and VHF radio;
- A VHF antenna to transmit the report to a satellite;
- A battery; and
- Cabling between the VMS and both antennas

Some vessel operators with VMS units add optional equipment by connecting an onboard computer to the VMS unit. This can significantly enhance communications, and the potential for onboard use of information collected by the VMS.

Costs to the Industry of Compliance

The VMS unit is passive and automatic, requiring no reporting effort by the vessel operator. However, there are both fixed and variable costs associated with the installation and operation of a new VMS. Estimating the average costs of installing and operating VMS is difficult as the costs depend on a number of factors, including whether vessel operators pay list price for the VMS unit or a negotiated sale price; the time requirements for installation; the nature of the transmission package they purchase; and the average number of days or months they transmit. Currently, there are four NOAA-approved VMS units available for use in the Alaska region.

The best available average cost estimates for industry are summarized in Table 4-35. Average fixed cost for purchase, installation, and activation is about \$3,500. Annual variable costs may include transmission costs of around \$800 and potential maintenance and repairs averaging \$77.

Table 4-35 Estimated cost of VMS.

Base unit cost with data terminal	\$2,971
Installation	\$239
Brackets	\$60
Installation fee (with satellite service provider)	\$150
Notify NOAA OLE	\$11
Sales taxes	\$108
Total acquisition and installation w/out reimbursement	\$3,539
Transmission costs for one year for two poll per hour	\$815
Maintenance and repairs for one year	\$77

Note: Unit costs are from survey of NOAA approved VMS units available in the Alaska region. Installation and maintenance costs originated from the VMS exemption for dinglebar fisherman analysis dated March 31, 2009.
Source: North Pacific Fishery Management Council (2012).

The vessel owner and operator would be responsible for all costs associated with the purchase, installation, and maintenance of the VMS unit, and for all charges levied by the mobile communications service provider. However, Federal funds may be available to qualified vessel owners or operators for reimbursement of the cost of purchasing type-approved VMS units. The Vessel Monitoring System Reimbursement Program, which is funded by NOAA and administered by the Pacific States Marine Fisheries Commission, could potentially aid eligible users up to \$3,100 of the initial capital/startup cost (Pacific States Marine Fisheries Commission 2012). It is expected that all vessel operators participating in the UCI salmon drift gillnet fishery would qualify for a reimbursement under this program (Gray 2020)

Vessel operators would only be able to use the reimbursement program for the unit cost and installation of their first VMS unit. They would have to replace their VMS units at their own expense as units wore out or became technologically obsolete. Thus, the initial purchase cost underestimates the lifetime costs a VMS requirement would impose on fishermen. One supplier estimates the likely life of their VMS unit as 8 years and the VFH antenna as about 4 years. On the other hand, technological change and competition may reduce the future costs of VMS units (National Marine Fisheries Service 2005).

Fishing operations also face the possibility of lost fishing time if a VMS unit stops working. While NOAA OLE handles breakdowns on a case-by-case basis, it does not normally require a vessel to interrupt a fishing trip and return to port when a breakdown is identified. Nevertheless, a vessel with a damaged VMS unit would have to get it repaired before it begins a new trip. While the number of units that would break down in the UCI salmon drift gillnet fishery each year is uncertain, NOAA OLE experience with the units installed under the Steller sea lion protection program suggests a breakdown rate of about 3% to 5% per year for those units (National Marine Fisheries Service 2008)

Placement of a VMS unit may pose a challenge for small vessels because of the limited space. In addition, breakdown rates for VMS units may be higher for smaller vessels than for larger ones. Smaller vessels may have fewer enclosed and moisture free areas, and VMS units may be exposed to severe operating conditions, with resulting higher breakdown rates. As shown in Figure 4-62, 84% of the vessels in the UCI salmon drift gillnet fleet are less than 40 ft in length.

As shown in Table 4-36, some active vessels in the UCI salmon drift gillnet fishery have participated in other Alaska fisheries in which a VMS is required, although the number is relatively small. To the extent that vessel operators have acquired VMS units under existing VMS programs, the costs of acquisition would not be attributable to the VMS program proposed under Alternatives 2 or 3.

Table 4-36 Number of active vessels in the UCI salmon drift gillnet fishery using VMS, 2009–2018.

	Number of Active Vessels	Vessels Using VMS		Vessels Using VMS for One or More Years from 2014–2018	
		Number	Percent	Number	Percent
2009	388	33	9%	30	8%
2010	353	20	6%	27	8%
2011	420	25	6%	33	8%
2012	457	26	6%	34	7%
2013	471	24	5%	33	7%
2014	478	25	5%	31	6%
2015	463	24	5%	29	6%
2016	455	22	5%	29	6%
2017	404	16	4%	23	6%
2018	385	15	4%	24	6%

Source: Keaton (2020).

An alternative tool to VMS is Automated Information System (AIS), a maritime navigation safety communications system that is currently mandatory for commercial vessels 65 ft or more in length. AIS could provide some of the location information that is provided by VMS. However, there are significant issues with this system as the information is not protected. Because anyone can get access to AIS information, many fishermen turn their AIS unit off while they are fishing to protect their fishing locations from their competitors. In addition, AIS is not a satellite-based system, so it is contingent upon line of sight communications and receive locations. U.S. Coast Guard-approved AIS units range in price from \$500 for an AIS Class B transponder to \$4,000 for an AIS Class A transponder, not including installation. Costs vary greatly for installation due to differences in vessel configuration and level of integration necessary for other shipboard systems.

Management and Enforcement Considerations

The extension of VMS coverage to the UCI salmon drift gillnet fleet, and the monitoring of VMS reports, would increase administrative costs for NOAA OLE. During the transition period when vessels are taking steps to install VMS units in order to comply with new regulations, NOAA OLE staff would have to answer questions, provide other support services, and record the initialization of new VMS units during the process of adding VMS units to the vessels.

Subsequently, NOAA OLE would have to add VMS technicians to monitor the additional VMS reports. The number and type of persons depends on the type of regulations being monitored, the number of vessels that are being monitored, and the length of the fishing season. Experience from VMS programs suggests that it takes about one VMS technician for every 350 vessels monitored (National Marine Fisheries Service 2007). The actual cost of creating the infrastructure for acquiring and storing the new VMS information has already been incurred for existing VMS coverage. These costs would be expected to change by a small amount. The principal cost to NOAA OLE of extending VMS coverage to the UCI salmon drift gillnet fleet would be the salary and benefits for new VMS technicians, if required.

In order to use VMS to obtain complete, high-resolution fishing effort data for the UCI salmon drift gillnet fishery, it will be necessary to develop a method for differentiating fishing activity from non-fishing activity in VMS data. A VMS algorithm to estimate the time and location of the start and end of gear deployment and retrieval is not yet available for the fishery.

Implementation of VMS in the Cook Inlet drift gillnet fishery may require additional consideration of the optimal sampling frequency for vessel positions. Depending on typical net soak times in this area, 30-min intervals may prove insufficient for monitoring compliance and catch apportionment across boundaries so higher frequency transmissions may be necessary, or at least warrant further discussion. Optimal VMS sampling intervals may depend on whether fishing will be allowed in both Federal and State management areas within a single fishing trip. If fishing is only allowed in one area (i.e., State or Federal) per delivery, then VMS would be needed for compliance only (and lower sampling frequencies may be adequate). However, if fishing could occur in both State and Federal areas during the same delivery, VMS may be used to apportion catches based on the proportion of effort that occurred in each area, and thus, higher sampling frequencies may be necessary. Increasing the VMS position transmission rate would increase vessel operating costs. See Section 4.8 for a more detailed discussion of management and enforcement considerations in monitoring Federal and State waters harvests under the action alternatives.

An important consideration when evaluating VMS or AIS as a catch accounting and/or compliance monitoring tool is that drift gillnet gear frequently moves independently of the vessel. Therefore, when fishing is occurring near a regulatory boundary, the vessel could be on one side while some or all of the gear is on the other side. This could be addressed in several ways. A requirement for a vessel to maintain a certain proximity or connection to the net could be added. Alternatively, a VMS or other position indicating beacon requirement could be added to the gillnet gear rather than the vessel. AIS could not be used to indicate the position of fishing gear because it is in violation of 33 CFR §164.46(a).

VMS does not replace at-sea enforcement by aircraft and vessels, but rather complements these traditional surveillance platforms, thereby increasing the level of monitoring possible. Regardless of whether VMS is used in the UCI salmon drift gillnet fishery, catch would need to be reported specific to State or Federal waters through another reporting and recordkeeping tool (e.g., eLandings/eLogbook). A logbook requirement to record set start and end locations would be an important element of enforcing VMS indicated violations as well as developing a VMS algorithm for the fishery.

4.7.2.2.7. ADF&G Fish Tickets and eLandings Electronic Reporting System

ADF&G fish tickets document the offload or delivery of fish that were harvested in State or Federal waters off Alaska. Currently, all State-licensed processors of raw fishery resources must complete and submit this form for each landing from a fishing permit holder. Information such as the vessel ADF&G number, number of crew onboard, fishing trip dates, State statistical areas, Federal areas, State and Federal fishing permits (as applicable), and species weights and dispositions are captured in the form. Fish tickets are legal documents and serve as the basis of payment on the part of the processors to harvesters.

ADF&G fish tickets could be used to delineate harvest and effort in the UCI salmon drift gillnet fishery relative to the EEZ, although the fish ticket form would need modification to account for the Federal/State waters line. In addition, ADF&G fish tickets could serve as the SBRM for the UCI salmon drift gillnet fishery. There are already accommodations in the fish ticket system for reporting any quantities of fish discarded at sea, and fish tickets are currently serving as the SBRM for the commercial salmon troll fishery in the East Area of the Salmon Management Area.

Processors are required to use an electronic version of an ADF&G fish ticket, called eLandings, if they submitted more than 2,000 salmon fish tickets or bought over 20 million pounds of salmon in any of the previous three calendar years (5 AAC 39.130(b)).¹¹¹ The landings and production data of processors using eLandings are transmitted electronically many times a day to the NMFS Alaska Regional Office. This information is made available to fishery managers in near real-time. Extending the eLandings requirement to all processors that take deliveries of salmon from the Cook Inlet EEZ would help ensure timely and accurate reporting of salmon catches in the EEZ.

Costs to the Industry of Compliance

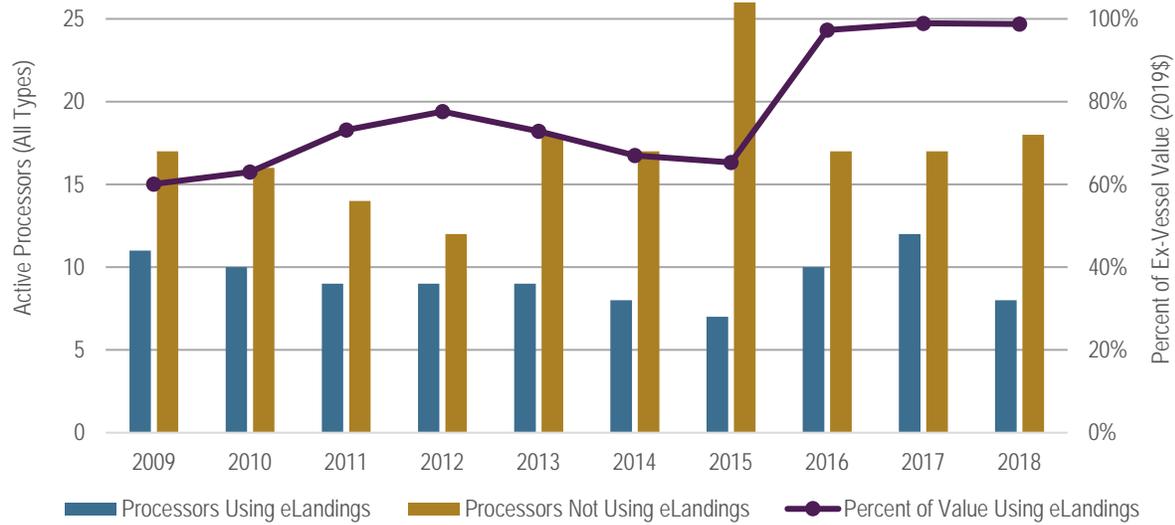
Modification of the ADF&G fish ticket form to account for the Federal/State waters line is not expected to impose any new time burden/cost burden on processors. However, extending the eLandings requirement to all processors that take deliveries of salmon from the Cook Inlet EEZ may be harmful for some small processors and limit the ability of fishery participants to direct market their catch or sell locally off the docks. Equipment cost for using eLandings include a computer, printer, and internet access (approximately \$1,000 per facility). On average, approximately 3 hours of training is required for office staff. The time is spent viewing the videos, reviewing resource documents, and completing the training scenarios. Training requirements are unique to each company. While eLandings has been beneficial for large to medium companies, some small operations may view the additional cost they would incur by adopting the eLandings system as outweighing any benefit from increased operational efficiency.¹¹²

Figure 4-63 summarizes the use of the eLandings system among all processors active in the UCI drift gillnet salmon fishery from 2009–2018, including shorebased processors, direct marketers, catcher-sellers, exporters, etc. All of the shorebased processors used the eLandings system in 2017, but in 2018, three shorebased processors used paper fish tickets. As reported in Table 4-10, there was a total of 12 shorebased processors active in the fishery in 2017, and 11 in 2018. All of the other types of processors used paper fish tickets rather than eLandings from 2009–2018. Table 4-11 shows that there were 15 direct marketers or catcher-sellers active in the fishery in 2017, and 12 in 2018. The processors continuing to submit paper fish tickets are typically small-scale operations that handle low quantities of fish. Since 2016, the proportion of fishery-wide ex-vessel gross revenue reported via paper fish tickets has averaged around 2% of the total revenue.

¹¹¹ State regulation requires processors to use eLandings for deliveries of groundfish (5 AAC 39.130(k)), including deliveries of groundfish incidentally caught in the UCI salmon drift gillnet fishery.

¹¹² The eLandings system has benefited some processors using the system by providing company seafood staff and managers an electronic record of their production and landings that they can access through an online account that has a User ID and is password protected. ADF&G and other agencies have provided business applications and interfaces to help companies access the electronic records. The continuous online access makes reporting and recordkeeping requirements less burdensome by allowing participants to more efficiently monitor their accounts and fishing activities (Northern Economics 2015).

Figure 4-63 Use of eLandings by processors active in the UCI salmon drift gillnet fishery, 2009–2018.



Source: Developed by Northern Economics based on ADF&G fish ticket data compiled by AKFIN in Comprehensive FT.

Management and Enforcement Considerations

In order for paper or electronic ADF&G fish tickets to accurately account for the catch of UCI salmon drift gillnet vessels in the Cook Inlet EEZ, changes would have to be made to either the ADF&G statistical area boundaries themselves, or how catches within the Federal portion of these areas are reported. The FMP authorizes the State to adjust management area, district, subdistrict, section, and statistical area boundaries to manage the salmon fisheries in the Cook Inlet EEZ for sustained yield and to ensure accurate recordkeeping and reporting. The Cook Inlet EEZ boundary is irregular in shape (Figure 1-2), which stakeholders have indicated could be problematic for compliance. Delineating the boundaries of the EEZ in terms of polygons defined by latitude and longitude coordinates would be easier for industry participants in the UCI salmon drift gillnet fishery to understand and comply with, and for enforcement entities to patrol and enforce. These boundary coordinates would need to be defined in the Salmon FMP or Federal regulations.

Although the eLandings system is a collaborative effort of ADF&G, the International Pacific Halibut Commission, and NMFS, ADF&G is responsible for implementation of the system in Alaska’s salmon fisheries. This implementation is coordinated with the local offices of ADF&G. Currently, all harvests from Upper Cook Inlet fisheries reported on paper fish tickets are processed at the Soldotna office of ADF&G. Extending the eLandings requirement to all processors that take deliveries of salmon from the Cook Inlet EEZ would reduce printing and data entry costs for ADF&G as well as improve the agency’s ability to track total landings in the UCI salmon drift gillnet fishery in a timely manner. However, the scale of these benefits would be modest because most large-scale processors participating in the fishery are already using eLandings.

Even with processors submitting reports in near-real time, the catch information from eLandings may be insufficiently accurate and up to date for fishery managers to make inseason decisions for a fast-paced fishery such as the UCI salmon drift gillnet fishery. See Section 4.8 for a more detailed discussion of management and enforcement considerations in monitoring Federal and State waters harvests under the action alternatives.

While there are currently accommodations in paper or electronic ADF&G fish tickets for reporting at-sea discards, this information is not required to be reported. Moreover, since fish tickets rely on self-reporting

of data, it is possible for vessel operators to submit incorrect information either intentionally or unintentionally. Paper or electronic fish ticket data may need to be verified by additional data collection efforts, such as onboard observers, daily fishing logbooks, and VMS.

4.7.3. Administrative Impacts

In accordance with the NS 7 guidelines at 50 CFR 600.340, the following sections evaluate administrative costs under each alternative. Individuals and private or public organizations as well as Federal, State, and local governments could potentially experience changes in administrative costs. The national standard guidelines State that conservation and management measures must, where practicable, minimize costs, including administrative costs, and avoid unnecessary duplication.

4.7.3.1. Alternative 1, No Action

Alternative 1 would not change the State's management of the UCI salmon drift gillnet fishery in either Federal or State waters. Therefore, the alternative does not substantially change the administrative costs of private and government entities.

4.7.3.2. Alternatives 2 and 3

NOAA Fisheries will incur additional costs for staff to participate in the annual processes to manage this salmon fishery. This includes the participation in a Salmon Plan Team and the Council process to develop ACLs and the tasks associated with this process. When Federal regulatory or FMP amendments are required for the fishery, this will lessen the availability of staff time for other rulemaking activities. For Alternative 3, additional staff time will also be required to monitor the fishery and prepare and issue any inseason management actions necessary to manage the fishery. This may require the hiring of additional staff.

NOAA Fisheries will also incur additional costs for revisions to the catch accounting system and the issuance of FFPs and logbooks. While this will increase ongoing burden to the agency, these costs are integrated with existing processes and not expected to be significant.

Finally, NOAA Fisheries would incur additional enforcement costs under Alternatives 2 and 3. Under both action alternatives, costs would be expected for investigations for violations of Federal regulations. Cooperative enforcement under Alternative 2 with the State of Alaska would minimize additional burden to NOAA OLE, but would likely maintain or slightly increase costs to the State of Alaska. For Alternative 3, there would be additional expenses for OLE to detail agents and operate vessels in support of monitoring and enforcing the fishery. The State of Alaska would have to maintain enforcement for the State waters drift gillnet fishery, but it may realize some cost savings due to not having to patrol or enforce in the EEZ.

In summary, both action alternatives will increase overall cost and burden to State and Federal governments relative to the status quo. It is expected that Alternative 3 will result in more cost and burden than Alternative 2 due to the need for separate salmon management and enforcement infrastructure for the State and Federal waters of Cook Inlet.

4.7.3.2.1. Individuals and Private or Public Organizations

Joint Federal and State management of the UCI salmon drift gillnet fishery would add administrative burdens to fishery participants, as management measures would be implemented by both Federal and State managers. This change would require fishery participants to attend or follow Board and Council processes as decisions regarding different aspects of management are made by these different bodies.

4.7.3.2.2. Federal, State, and Local Government

[To be completed after Council selects its PPA]

4.7.4. Impacts to Vessel Safety

4.7.4.1. Alternative 1, No Action

Alternative 1 would not change the State's management of the UCI salmon drift gillnet fishery in either Federal or State waters. Therefore, the alternative does not substantially change management of the fishery in a way that is relevant to fishing vessel safety.

4.7.4.2. Alternatives 2 and 3

If no stock or stock complex in the UCI salmon drift gillnet fishery is declared overfished and no overfishing is occurring, Alternative 2 would not result in substantial changes in harvest limits that would be likely to encourage unsafe fishing practices. If a stock or stock complex is declared overfished or if overfishing is occurring, measures designed to protect and rebuild the stock may require a substantial curtailment of catches of healthy salmon stocks. These measures could include a complete closure of the Cook Inlet EEZ to fishing by the drift gillnet fleet. Under Alternative 3, all S03H permit holders would be required to forego fishing in the Cook Inlet EEZ when the TAC is attained.

A closure of the EEZ under Alternative 3 would result in the displacement of UCI salmon drift gillnet vessels who normally fish in the area. Limiting areas for fishing could cause vessel congestion in the fishing areas that remain open. Increased crowding on the grounds can create conditions that reduce vessel safety. In addition, closures of traditional, local fishing areas may induce vessel operators to take additional risks, such as fishing in weather and sea conditions that they would normally avoid, in order to remain economically viable in the fishery.

The monitoring, recordkeeping, and reporting measures described in Table 4-32 are not expected to have a direct adverse effect on vessel safety in the UCI salmon drift gillnet fishery. The measures would not modify existing safety regulations, authorized gear, the size or type of vessels that may be used in the fishery, or otherwise affect the amount of salmon that could be harvested.

However, the costs of complying with these measures could have an indirect effect on vessel safety in the UCI salmon drift gillnet fishery by reducing the profitability of fishing operations. Lower profits on the part of individual harvesters limit their funds for vessel maintenance and safety equipment, which may lead to increased incidence of injury and losses of life. In addition, if vessel gross revenue declines, vessel owners and captains may find it more difficult to find, hire, and keep skilled and capable crew members. Currently, there are many skilled and capable crew members working on UCI salmon drift gillnet boats. However, it may already be the case that many crewmembers who once would have been attracted to the drift gillnet fishery are now less confident about the fishery's economic future. As discussed in Section 4.5.3.2, fishery participants have expressed concern that fewer young people are entering and staying in the fishery because of increasing operating costs, relatively low earnings, and unpredictable openings. The more vessels owners and captains are obliged to hire inexperienced crew for an opening, the more inefficient, less productive, and potentially dangerous their fishing operation may be. In addition, as profitability decreases, some vessels may operate short-handed, which further compromises vessel safety. To the extent that proposed monitoring, recordkeeping, and reporting measures contribute to a further decline in the profitability of fishing operations, these negative effects on fishing vessel safety would likely increase.

Some monitoring, recordkeeping, and reporting measures described in Table 4-32 could enhance vessel safety in the UCI salmon drift gillnet fishery. In particular, VMS provides a valuable tool for search and rescue efforts in the event of a vessel in distress. While nonreporting of a VMS unit is not an indication of

distress, should a search and rescue (SAR) coordinator be made aware of a distress situation, whether by activation of a vessel's EPIRB, a May Day call, or other established method of signaling distress, the SAR controllers can use VMS to determine the vessel's last known position and the time of that last position. Oftentimes this will greatly reduce the search area and increase the speed of response as surface and aviation assets can head directly to that last known position without waiting for time-consuming analysis to determine the size of the search area (North Pacific Fishery Management Council 2012).

4.8. Management and Enforcement Considerations

This section provides a brief summary of the management and enforcement consideration applicable to the alternatives. Summary rationale for the proposed monitoring, recordkeeping, and reporting measures are provided.

Under Alternative 1 there would be no additional Federal management or enforcement considerations or measures as the State would continue to manage the UCI salmon drift gillnet fishery outside of a Federal FMP.

Under Alternative 2, management of the UCI salmon drift gillnet fishery would be delegated to the State, and therefore subject to MSA requirements and other applicable Federal law. The State has an existing management and enforcement infrastructure for the Cook Inlet salmon drift gillnet fishery in place. These existing processes would interface with Federal fisheries management through the Council process and the Salmon Plan Team, which would provide additional review and resources to evaluate Cook Inlet salmon stocks and inform their management. Regarding inseason management, the State would manage to achieve escapement goals rather than a binding catch limit established pre-season. ACLs and the status of the stock would be evaluated post-season. In order to fulfill MSA catch accounting requirements, particularly for bycatch, there would be a requirement to record discards in a logbook and report them at the time of landing through fish tickets or eLandings. In addition to this, reporting of catch would require estimation of the proportional contribution of State and EEZ waters to harvests from each delivery. The data on harvest proportion would be used for pre- and post-season fishery evaluations and not inseason management against distinct catch limits. As a result, an estimate derived from logbook entries would be sufficient to provide information to the plan team and Council. Using logbooks to report the location of harvest would also provide fishery participants with an objective methodology for compliant reporting and improve the consistency and quality of reported data for the fishery as a whole.

State of Alaska law enforcement would establish cooperative agreements with NOAA OLE to monitor and enforce these requirements. By leveraging existing State management and enforcement infrastructure, duplication of effort at the Federal level would be avoided under Alternative 2.

Alternative 3 would result in NMFS managing the UCI salmon drift gillnet fishery under the Salmon FMP. This would require the creation of a completely new Federal management and enforcement infrastructure for the fishery. NMFS inseason management would be responsible for opening the fishery, monitoring catch and landings data, and closing the fishery before EEZ catch limits are exceeded. In order to do this, eLandings use would need to be required for all landings in the fishery, with suitable reporting timeliness requirements. Because of the need to avoid exceeding the EEZ catch limits established pre-season, self-reporting of State/EEZ salmon harvest proportions from a single trip would not provide suitably accurate data to inseason managers. At a minimum, deliveries from a single Cook Inlet drift gillnet fishing trip could not include fish harvested from both the EEZ and State waters. A Federal VMS requirement for salmon drift gillnet vessels registered to fish in the EEZ would provide data to verify that these vessels were fishing only in the EEZ or only in State waters during a given trip. However, salmon drift gillnet vessels not registered to fish in the EEZ would not be subject to a Federal VMS requirement. For those vessels, enforcement of a provision prohibiting fish caught in the EEZ and State waters from

being onboard during the same trip would require that State and EEZ salmon drift gillnet fisheries not occur at the same time. A system of non-concurrent Federal and State openings would require close coordination between State and Federal agencies at the start of each fishing season. If concurrent openings of the EEZ and State waters fishery are implemented, then additional monitoring requirements (e.g., VMS) would have to be imposed by ADF&G on salmon drift gillnet vessels not registered to fish in the EEZ to ensure compliance with the prohibition on mixed EEZ/State water catches.

NOAA OLE would be solely responsible for the water monitoring and enforcement of the drift gillnet fishery in the Cook Inlet EEZ. VMS and corresponding logbooks would provide actionable information to ensure that participants are operating in the appropriate area. In addition to ensuring that participants in the Cook Inlet EEZ salmon drift gillnet fishery are in compliance with open times and areas, monitoring would also need to be in place to verify that no fishing was occurring in Federal waters during closed periods or by vessels not in compliance with all Federal regulations. This would be particularly challenging with the adjacent and concurrent salmon drift gillnet fishery in the State waters of Cook Inlet. It is also important to note that independent Federal management of the Cook Inlet EEZ salmon drift gillnet fishery would need to be accounted for by all other State fisheries, both commercial and recreational, that harvest Cook Inlet salmon stocks. Regarding levels of salmon removals, EEZ harvests would have to be reduced for any expected removals in State waters. However, even with an established EEZ/State apportionment, Federal management measures may have other important implications for State managed fisheries. For example, under existing conditions, the State manages the commercial drift gillnet open periods during the week to allow for escapement pulses to occur on weekends in order to provide higher fish densities to in-river fisheries. Federal management measures could be disruptive to the State management plan for salmon without extensive coordination.

Existing State management and enforcement infrastructure and processes for the Cook Inlet salmon drift gillnet fishery occurring in State waters would also have to be maintained under Alternative 3 in addition to the new Federal programs.

4.9. 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 if a proposed action will result in a disproportionate and/ or significant adverse economic impact on the directly regulated small entities, and to consider any alternatives that would lessen this adverse economic impact to those small entities. NMFS Alaska Region will prepare the IRFA in the classification section of the proposed rule for an action and a separate IRFA is not necessary for Council final actions on the issue. This section will provide information that NMFS will use in preparing the IRFA for this action, namely a description and estimate of the number of small, directly regulated entities to which the proposed action will apply.

The proposed action would amend the *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* (FMP) to manage the salmon fisheries that occur in Federal waters of Cook Inlet.

Identification of Directly Regulated Entities

Entities that might be directly regulated by this action include S03H permit holders that fish in the Cook Inlet EEZ and processors that take deliveries of salmon from the Cook Inlet EEZ.

Count of Small, Directly Regulated Entities

Under the RFA, businesses that are 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, regardless of the type of fishing operation (81 FR 4469; January 26, 2016). If a

vessel has a known affiliation with other vessels—through a business ownership or through a cooperative—these thresholds are measured against the small entity threshold based on the total gross revenues of all affiliated vessels.

Vessel owners with S03H permits had an average gross revenue from the fishery of \$73,830. An average of 73% of permit holders reported that 100% of their fishery income came from the Cook Inlet drift gillnet fishery. Approximately 7% of reported that the Cook Inlet drift gillnet fishery accounted for less than 25% of their annual fishery revenue. Therefore, all ~580 S03H permit holders are considered small entities.

A shoreside processor or stationary floating processor primarily involved in seafood processing is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual employment, counting all individuals employed on a full-time, part-time, or other basis, not in excess of 750 employees for all its affiliated operations worldwide (81 FR 4469; January 26, 2016).

In 2018, there were 11 shorebased processors and 15 direct marketers or catcher-sellers active in the Cook Inlet drift gillnet fishery. Other types of processors/buyers are also active in the fishery, including floating processors, buyer-exporters, and catcher-exporters, although only one or two of each type may be active in a given year. Reliable information is not available on ownership affiliations between individual processing operations or employment for the fish processors engaged in the Cook Inlet drift gillnet fishery. Therefore, this analysis assumes that all the processors directly regulated by this action could be small entities.

Impacts to Small, Directly Regulated Entities

Under Alternative 2, harvest level trends in the Cook Inlet drift gillnet fishery are not expected to be appreciably different than those under Alternative 1. Under Alternative 3, the Council could decide to control harvest through annually setting a TAC for the Cook Inlet drift gillnet fishery. The establishment of a TAC would require a process to coordinate expected salmon harvests in the Cook Inlet drift gillnet fishery in both State and Federal waters. Due to this, and the uncertainty inherent to a forecast-based ACL for salmon, the TAC would have to be set conservatively to avoid it being exceeded. When the TAC is attained, all S03H permit holders would be required to forego fishing in the Cook Inlet EEZ. The overall result would likely be a lower harvest level in the Cook Inlet drift gillnet fishery, which would lead to reduced revenue for some harvesting and processing operations engaged in the fishery.

S03H permit holders fishing in the Cook Inlet EEZ will experience a higher monitoring, recordkeeping, and reporting burden under any of the action alternatives. This additional burden is expected to be minimal under Alternative 2 with the addition of a logbook and bycatch reporting requirements. Under Alternative 3, permit holders will experience additional burden from the logbook, bycatch reporting, and VMS requirements.

Processors that take deliveries of salmon from the Cook Inlet EEZ could also experience a higher monitoring, recordkeeping, and reporting burden under any of the action alternatives. Specifically, the action alternatives could extend the eLandings requirement to all processors that take deliveries of salmon from the Cook Inlet EEZ. Most large-scale processors engaged in the Cook Inlet drift gillnet fishery are already required to utilize eLandings under existing regulations and therefore would not be impacted by an extension of the eLandings requirement. In 2018, 8 of the 11 shorebased processors active in the fishery used paper fish tickets. However, all of the direct marketers or catcher-sellers used paper fish tickets. These processors are exempt from current eLandings regulations, as they are small-scale operations that handle low quantities of fish. Extending the eLandings requirement to these processors would place an additional burden on them due to the costs of complying with the technology requirements

of eLandings. This economic burden could outweigh any potential improvements in recordkeeping and reporting efficiency derived from using eLandings.

The economic impacts of the additional costs that harvesters and processors in the UCI salmon drift gillnet fishery would incur as a result of proposed monitoring, recordkeeping, and reporting measures are expected to vary from year to year. In general, the additional costs would be most disruptive to harvesters and processors in years when they are operating nearest their profit margin (e.g., during years when the sockeye salmon run in Cook Inlet is especially low).

In addition, the economic impact of the additional costs imposed by the monitoring, recordkeeping, and reporting measures would likely be unevenly distributed across fishery participants. The costs of the measures would not account for the size or profitability of individual harvesters or processors. Smaller vessel operators and processors that participate in the fishery would face costs that are disproportionately high relative to their gross revenue. Similarly, the additional costs would have a higher marginal impact on harvesting and processing operations that are less profitable or less well capitalized. These distributive effects, in turn, could change the size, composition, and geographic distribution of the UCI salmon drift gillnet fleet.

4.10. Summation of the Alternatives with Respect to Net Benefit to the Nation

[To be completed after Council selects its PPA]

5. Magnuson-Stevens Act and FMP Considerations

[This section will be addressed when the Preliminary Preferred Alternative is selected.]

5.1. Magnuson-Stevens Act National Standards

5.2. Section 303(a)(9) Fisheries Impact Statement

5.3. Council's Ecosystem Vision Statement

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8. Appendix: Consideration and Comparison of Monitoring, Recordkeeping, and Reporting measures

Approaches to Assessing the Amount and Type of Catch and Bycatch

In the Cook Inlet salmon fishery, all species of salmon that are captured are retained and sold. The only times that a salmon may be discarded is if it has been damaged by a predator, such as a seal, or has previously entered freshwater to spawn and would not be accepted by a processor. These are thought to be infrequent occurrences. There are no other PSC considerations or other known rationale that incentivize discarding of salmon in the fishery. Therefore, it is expected that a sufficiently complete accounting of salmon catches occurs at the time of landing.

However, bycatch in the fishery has never been fully accounted for. Previously, participants with a miscellaneous finfish CFEC permit could choose to retain and sell groundfish caught as bycatch. According to fish ticket data, drift gillnet vessels land very little groundfish. Between 2002 and 2015, only seven vessels made landings of groundfish and landings ranged from three pounds to 962 pounds. The amount of discard occurring at-sea is not reported. According to fishery participants there is limited bycatch and discarding in the Cook Inlet EEZ, but data does not exist to confirm this. Currently, this information does not satisfy National Standard 9 guidelines.

NMFS currently has no method to assess at-sea discards in the salmon fisheries in the Federal waters of Cook Inlet. In the groundfish, crab, or scallop fisheries, there generally is some observer information from which to extrapolate to unobserved vessels and estimate at-sea discards. In the case of salmon fisheries, this information is not available and an estimation methodology could not be used until additional bycatch data are collected.

Regulations relating to the disposition of bycatch may impact the monitoring, recordkeeping, and reporting tools selected for the fishery. Several approaches could be used to assess fish discard in the Cook Inlet drift gillnet fishery. One approach would be to require full retention of all fish caught, thus requiring that all fish remain onboard a vessel until offloaded to a processor, tender, or packer. Another approach would be to allow the vessel to discard at-sea (which occurs now), with at-sea monitoring to assess discard amounts. Finally, there could be optional retention for participants that obtain a Federal Fisheries Permit (FFP) and comply with the associated requirements. These broad approaches could be implemented under either Alternative 2 or 3. In order to simplify regulations and compliance, the Council may wish to coordinate Federal groundfish retention regulations with State groundfish regulations.

Option 1- Full retention of groundfish: Require a groundfish FFP and require vessels to retain all groundfish. Processors receiving deliveries of GOA groundfish harvested in the EEZ would be required to have a Federal Processor Permit (FPP).¹¹³ In addition to potential logistical constraints of vessels, this may have interactions with GOA groundfish regulations, including situations where one or more groundfish species, such as Pacific cod, may be on non-retention status. The costs of a full retention requirement are discussed in Section 4.7.2.2.3 of the RIR.

Option 2- Discard of groundfish at-sea: Prohibit groundfish retention, may not require an FFP. However, in order to implement Federal monitoring or recordkeeping measures, a Federal fisheries permit specific

¹¹³§ 679.4 (f) Federal processor permit (FPP)—(1) Requirement. No shoreside processor of the United States, SFP, or CQE floating processor defined at §679.2 may receive, process, purchase, or arrange to purchase unprocessed groundfish harvested in the GOA or BSAI, unless the owner or authorized representative first obtains an FPP issued under this part. A processor may not be operated in a category other than as specified on the FPP. An FPP is issued without charge.

to the fishery is still necessary. This option likely requires additional monitoring or reporting measures to improve the quality of self-reported discard information.

NMFS requires FFP for U.S. vessels that are used to fish for groundfish in the Gulf of Alaska or Bering Sea and Aleutian Islands at 50 CFR 679.4(b).¹¹⁴ NMFS also requires an FFP for vessels used to fish for any non-groundfish species and that retain any bycatch of groundfish. Non-groundfish species includes but are not limited to halibut, crab, salmon, scallops, and herring. “Fishing” is a broad term and includes, for example: harvesting, processing, tendering, support, etc. FFPs are non-transferable, three-year permits issued on request and without charge to vessel owners. Under the FMP, vessels that fish for salmon with troll gear and that retain groundfish must have an FFP endorsed for troll gear.

Option 3- Optional retention of groundfish: Allow retention of groundfish for participants with an FFP.

This option would allow participants that obtain of an FFP to retain groundfish. If a fishery participant did not obtain an FFP, they would be required to discard all groundfish at sea. Requiring full groundfish retention for participants with an FFP could potentially provide enough data to allow for an extrapolated estimate of fishery bycatch. However, having participants operating under multiple sets of regulations would increase the enforcement and administrative complexity of the fishery. Any processors receiving groundfish harvested in the EEZ would be required to have an FFP.

Monitoring, Recordkeeping, and Reporting Tools

An array of potential monitoring, recordkeeping, and reporting tools are available to assess the amount and type of bycatch in the Cook Inlet drift gillnet fishery. In some cases, these tools may also be applicable to the monitoring of other fishery-dependent activities, including measuring retained salmon in State and Federal waters, assessing effort and catch that occurred in the EEZ, determining the number of marine mammal and seabird interactions in the fishery, and monitoring compliance with fishery regulations, including open/closed areas.

A description of potential monitoring, recordkeeping, and reporting tools is provided in in the subsequent section, noting that tools could be combined under Alternative 2 or 3. Alternative 3 would require the greatest amount of fishery monitoring, recordkeeping, and reporting due to the inseason data requirements of Federal managers to control catch below a TAC and to allow for the effective enforcement of distinct but adjacent Federal and State Cook Inlet salmon fisheries. A comprehensive discussion of the costs of each of these tools and their impacts is provided in Section 4.7.2 of the RIR.

Logbooks (paper and electronic)

Logbooks are in important enforcement and monitoring tool in the groundfish fisheries. Enforcement uses these logbooks to verify catch information, including amounts of fish retained or discarded (and for verification of Maximum Retainable Amounts), locations fished by a vessel, fishing effort, and other vessel activity information. In addition, onboard observers use information in the logbook to obtain information on total effort, location fished, total haul weights, and other trip-specific types of information. For example, all groundfish catcher vessels that are 60 feet (ft.) or greater in length overall (LOA), and fishing longline, trawl, or pot gear, and vessels fishing longline pot gear and less than 60 ft. LOA, are required to have a Federal Daily Fishing Logbook. An example of this logbook is at <https://alaskafisheries.noaa.gov/sites/default/files/CVLGLDFL.pdf>. Vessel operators request logbooks

¹¹⁴§ 679.4 (b) Federal Fisheries permit (FFP) (1) Requirements. (i) No vessel of the United States may be used to retain groundfish in the GOA or BSAI or engage in any fishery in the GOA or BSAI that requires retention of groundfish, unless the owner or authorized representative first obtains an FFP for the vessel, issued under this part. An FFP is issued without charge. Only persons who are U.S. citizens are authorized to receive or hold an FFP.

from the NMFS Alaska Regional Office (AKRO) using an online form, or calling the office, and the AKRO mails the logbooks to the operator.

Logbooks provide on-the-water information about the types and amount of fish caught, and where the fish were caught. For example, set location (deployment and retrieval) and species caught could be used to determine whether fishing occurred in the EEZ and whether fish were retained as required in regulation. This provides an important source of information to verify fishing activity on-the-water using both logbook and shoreside accounting, including enforcement of closure areas and species retention. Electronic logbooks (called eLogbooks) provide the same effort information in a timely and easily accessible format and allows the agency to broadly compare logbook information with landings off the water and also to check fishing location information.

Paper logbooks account for most of the logbook use for catcher vessels in the groundfish fisheries. Fisheries data contained in the paper logbooks are generally not electronically available for unobserved vessels. Entering information from the paper logbook is expensive for the agency and with the exception of the sablefish fishery most paper logbook data are not entered into a database unless there is a specific reason to do so (e.g., enforcement case). Some groundfish catcher vessels have switched to electronic logbooks and these data are available in an AKRO database. Electronic logbooks provide detailed information on fishing effort that is not easily accessible from paper logbooks and not available on landing reports in eLandings.

There currently is not a logbook requirement in the Salmon FMP. A logbook for the salmon fisheries would need to be developed since there currently is not a State or Federal logbook for these fisheries. The use of an eLogbook in salmon fisheries would require developing a salmon fishery logbook application (likely a modification of the groundfish logbook and backend functionality). Based on experience in the groundfish fishery, the minimum requirements for an eLogbook would require vessel operators to purchase a laptop (or tablet), suitable operating system, and a printer. The printer is needed to maintain hard copy records onboard the vessel for enforcement purposes, and also to provide a processor with information on at-sea discards. NMFS currently provides the logbook application, user support, and training that is offered either in person or through the internet. Finally, information would be transmitted from the vessel to the agency server via the internet or email when the vessel is in Wi-Fi range (e.g., at the processing plant) or the operator had access to email. A comprehensive discussion of potential logbook costs and their impacts is provided in Section 4.7.2.2.2 of the RIR.

Under either option (full retention or discard at-sea), verification of logbook information would be reliant on periodic checks by enforcement. Logbooks could be applied under Option 1, Option 2, or Option 3 in the following ways:

Option 1 - Full Retention of groundfish

Full retention would require NMFS to verify fish reported in the logbook were also landed shoreside, and fish were not discarded at-sea. Fish landed shoreside would be reported to NMFS through eLandings. All catch that was not going to be retained could be verified and counted at the dock and compared against the logbook and any information related to on-the-water enforcement.

The salmon fisheries are not likely to need inseason action on groundfish discard, and thus near real time electronic reporting would not necessarily be needed for inseason management of discards. However, fishery participants would still need to be notified if a groundfish species was placed on prohibited retention status in the GOA. A paper logbook would be available for on-site enforcement and verification purposes and to assist with eLandings reporting. However, no information on effort would be electronically available from paper logbooks without additional monitoring tools (e.g., EM or VMS) or resources to enter logbook data. The eLogbook could provide spatially explicit effort information for both

retained and discarded fish. This type of spatial information could be used to delineate harvest and effort relative to the EEZ, which could be used by NMFS if inseason action was needed due to salmon management.

Option 2 - Discard of groundfish at-sea

Similar to Option 1, the logbook could be used to assess discard in the salmon fisheries. Vessels with electronic logbooks also would provide both the accounting and effort information for managers. For vessels with a paper logbook, species-specific discard information can be reported via eLandings. In this situation, the vessel would submit a copy of the logbook page (i.e., the “blue sheet”) to the processor, and the at-sea discard would be entered into eLandings by the processor using the blue sheet information. The eLandings disposition code for at-sea discard would be used.

Without the logbook (i.e., just eLandings), there would be no at-sea record of the amounts of groundfish discarded. While both eLandings and the logbook are industry reported information, keeping a logbook would likely improve the accuracy of information given the vessel operator would be required to track catch on a set-by-set basis, rather than just reporting species-specific trip totals upon landing the salmon. Further, if accounting specific to the EEZ was needed, eLandings could be modified to accommodate this information (see eLandings section) and the logbook would provide a record of locations fished.

However, given logbooks consist of industry reported information, discard amounts would be unverified unless on-the water observation occurred.

Option 3 - Optional retention of groundfish

A logbook could also be required for participants that choose to obtain an FFP and are required to retain groundfish to verify retention and/or participants that discard all groundfish to document discards. The discussion of Option 1 and Option 2 in the preceding paragraphs review the considerations that would be applicable to each class of participant.

Observers

Under section 303(b)(8) of the MSA, the FMP may require that one or more observers be carried on board a vessel engaged in fishing for species that are subject to the plan, for the purpose of collecting data necessary for the conservation and management of the fishery; except that such a vessel shall not be required to carry an observer on board if the facilities of the vessel for the quartering of an observer, or for carrying out observer functions, are so inadequate or unsafe that the health or safety of the observer or the safe operation of the vessel would be jeopardized. Of the monitoring tools identified in Table 2-8, an observer program would provide the most comprehensive information at the level of an individual vessel, including data on marine mammal and seabird interactions. Appropriate program design, coverage levels, and funding mechanisms would have to be developed for this fishery. A comprehensive discussion of potential observer costs and their impacts are provided in Section 4.7.2.2.4 of the RIR.

Electronic monitoring - Camera technology

A number of electronic monitoring technologies have been applied to fisheries monitoring. Video based technologies are being used in several applications in the North Pacific and elsewhere. Within the North Pacific, video technology has been proposed or implemented as a way to supplement existing observer coverage; enhance the value of the data NMFS receives; and/or fill data gaps that have proven difficult to fill with human observers. A recent final rule (82 FR 36991, August 8, 2017) described the requirements for integrating EM into the North Pacific Observer Program.

Electronic monitoring is a reliable tool for compliance monitoring or a combination of compliance and catch accounting. A compliance monitoring approach would be to require industry self-reported data and

to use the EM to audit, or verify, compliance with the record keeping and reporting requirement. For example, cameras could be used to verify that all catch is retained. This is a common approach used for quota share programs in the Federal groundfish fisheries. A catch accounting approach would use EM and video reviewers to enumerate fish caught. Catch accounting approaches are currently being implemented for some longline and pot vessels subject to observer coverage in the groundfish fleet. Currently, EM is not being deployed on any vessels fishing with gillnets in waters off Alaska.

On the U.S. east coast, EM for both compliance monitoring and catch accounting is being used on gillnet vessels operating in the Greater Atlantic Region. Specifically, the Nature Conservancy was issued an Exempted Fishing Permit that exempts 15 vessels (40-50 ft. in length) from at-sea monitors if they take EM cameras; hence most of that fleet is human observed outside of the EFP. Discarded regulated groundfish species are placed on a measuring strip in view of the camera, and species other than regulated groundfish (e.g., dogfish and skates) are discarded at designed discard points that are in view of the camera. Prohibited species (e.g., marine mammals, seabirds, etc.) are also discarded in view of the camera, and mammal catches are recorded in a log. Each participating vessel is required to have a vessel monitoring plan (VMP) that is reviewed and approved by NMFS. Similar to the VMP in the Alaska groundfish fisheries, the VMP describes how fishing operations on the vessel are conducted, including how gear is set, how catch is brought on board, and where catch is retained and discarded. The VMP also describes how the EM system and associated equipment is configured to meet the data collection objectives, including camera locations, and any special catch handling requirements to ensure the data collection objectives can be met. Funding for this experimental program is provided through Federal grants, as well as NGO participation. Additional information about the potential costs of EM and their impacts is provided in Section 4.7.2.2.5 of the RIR.

Option 1 - Full Retention of groundfish

The use of EM to track regulatory compliance is a common practice for fisheries off Alaska and elsewhere in the US. Federal regulations at 50 CFR 679.28 describe in detail video monitoring system and vessel requirements for certain groundfish fisheries off Alaska where video is used to monitor how catch is sorted and weighed on a flow scale. Under the full retention option, a gillnet vessel's compliance with a prohibition on discards would be verified using video monitoring. Application of this technology would need adjustment to fit the requirements of the gillnet fishery but would likely have some components similar to those in regulation for the Alaska groundfish fisheries.

Fisheries outside of Alaska use video monitoring for compliance on small vessels (less than 60 ft. LOA). This includes testing a compliance camera system in the Gulf of Maine groundfish fishery that is designed to detect compliance of full retention requirements. NMFS is also testing EM system in the Atlantic herring and Atlantic Mackerel mid-water trawl fisheries in an effort to address concerns about the incidental catch of river herring, shad, and haddock, as well as the amount of discarding at-sea.

The use of camera monitoring systems under option 1 would be for compliance monitoring and thus catch enumeration would not be necessary. This is a simpler and potentially less expensive monitoring program than a program designed to enumerate catch.

Option 2 - Discard of groundfish at-sea

Under option 2, a full catch accounting EM program similar to the groundfish program could be implemented to enumerate at-sea discard.

Option 3 - Optional retention of groundfish

Under option 3, EM could be applied to those vessels retaining groundfish to ensure compliance and/or to those vessels discarding groundfish for catch accounting.

In summary, the use of cameras for monitoring discard under either Option 1, 2, or 3 is likely feasible from a technology standpoint. However, prior to implementation either retention option would require additional research and testing to develop an appropriate and effective EM system for the gillnet fishery, including consideration of costs for the equipment and video review. As with placing observers on vessels, funding sources would be needed, and further analysis needed as to how an EM program would be structured and implemented.

Vessel Monitoring System

Another option could be the use of vessel monitoring system (VMS) to track vessel activity using location information that is transmitted to NOAA. The VMS is useful for enforcing area closures and inferring where fishing occurred. In the case of salmon management, it would provide spatial information describing where a vessel traveled that can be compared to State and Federal waters and includes a time stamp that can be compared with other reporting tools (e.g., logbook). In the groundfish fisheries, VMS is used intensively by inseason managers to assist in determining management actions. VMS provides inseason managers with useful information about the levels of effort in both space and time. This has become very useful for gauging fishery season length given TAC limits and therefore how much longer a given fishery may be kept open without either exceeding the TAC, or leaving fish unharvested. A comprehensive discussion of potential costs of VMS and their impacts is provided in Section 4.7.2.2.6 of the RIR.

One of the challenges associated with Alternative 3 is partitioning catches between respective jurisdictions. In Cook Inlet, individual State salmon management areas (districts / sub-districts) currently span both Federal and State waters. One option would be for ADF&G to redistrict this area for catches to be monitored and allocated to the State and EEZ waters, individually. Or, a new EEZ only sub-area could be added that would be reported in addition to the State statistical area. Another option would be for processors (through eLandings) or fishers (through an eLogbook) to report the proportion of catch inside versus outside of the EEZ, without changing district lines.

In order to ensure accurate reporting and compliance based on jurisdictional boundaries, the ability to monitor vessel fishing locations would likely be necessary. Such monitoring may be achieved through EM systems that record fishing locations or through VMS (Jennings et al. 2010). VMS have been used in groundfish and crab fisheries in the GOA and Bering Sea / Aleutian Islands since the early to mid-2000s (depending on the fishery) to enforce spatial regulations by transmitting vessel locations at fixed, typically 30-min, intervals (NPFMC 2012). VMS have been typically required less among smaller vessels (less than 60 feet), like those that comprise the drift gillnet fleet, but the information provided by VMS may be a critical component for fishery management, especially during times when the two management bodies have different restrictions in place.

eLandings

The eLandings Electronic Reporting System is the electronic and Internet based reporting system maintained by ADF&G, the NMFS Alaska Region, and the International Pacific Halibut Commission to obtain non-redundant, near real- time information on catch and production.

The eLandings system includes—

eLandings – A web application for shore side and Internet capable vessels.

seaLandings – A desktop application for at-sea vessels without Internet capability.

tLandings – A portable data storage application for tender and other operations.

Landings of salmon are reported to ADF&G using a combination of paper fish tickets and eLandings/tLandings. Paper fish tickets must be manually entered, whereas eLandings information is electronically reported and available in near real time. Most salmon landings are reported through eLandings, and all harvest from the UCI reported on paper fish tickets are processed at the Soldotna office of ADF&G. For example, a tender acting as an agent for a processor located in Lower Cook Inlet or beyond may buy fish in UCI and land that product outside of UCI. Then the fish tickets are sent to the Soldotna office as the harvest occurred within their management area. These data processing procedures assure that local area management biologists have a full understanding of harvest from their area of responsibility.

ADF&G began migration of all fish ticket reporting to electronic submission in 2010. Starting January 1, 2016, the department began to require all operations, by processor code, to use eLandings if they submitted more than 2,000 salmon fish tickets or bought over 20 million pounds of salmon in any of the previous three calendar years. This includes tender vessels, floating processors, and shore based processors.¹¹⁵ Many facilities in the Cook Inlet area were required to use the eLandings System for the first time in 2016.

Under all Alternatives, the use of eLandings could be required for processors with salmon landings; however, consideration should be given to whether all processors are required to use eLandings, or whether the current 2,000 fish ticket threshold should be maintained under Alternatives 2 or 3 (for processors receiving landings from vessels fishing in the EEZ). This threshold provides flexibility for a few small processors that are sensitive to costs associated with eLandings (e.g., equipment, training, and access to robust internet service). A comprehensive discussion of potential costs of eLandings and their impacts is provided in Section 4.7.2.2.7 of the RIR.

An important advantage with the eLandings/tLandings system is the ease at which managers can access near real time information, and also the flexibility of the platform to accommodate modifications in reporting (e.g., proportion of fish from the EEZ). Paper fish tickets can take up to a year to be electronically available to managers. In addition, eLandings information is available to company seafood staff and managers through an online account that has a User ID and is password protected. Agencies have provided business applications and interfaces to help these companies access the electronic records. This feature of eLandings has been very beneficial for large to medium companies; however, the burden of additional reporting has not been viewed as a large efficiency gain for small operations.

Combination of monitoring, recordkeeping, and reporting measures

Any combination of monitoring, recordkeeping, and reporting measures reviewed in this section could be required. For example, VMS, logbook, and electronic monitoring could be combined for a comprehensive monitoring approach. Estimates of effort for inseason monitoring could be obtained using VMS and the eLogbook and providing EEZ specific eLandings reporting of catch.

¹¹⁵ 5 AAC 39.130 (b)

9. Appendix: Incorporation of Uncertainty into Escapement Goal Development and Management of Pacific Salmon in Alaska

Since Statehood Alaska has utilized a fixed escapement goal policy for managing Pacific salmon (Woodby et al. 2005) based on the work of Thompson (1951). Alaska formally adopted this policy into regulation in 2000 as the Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222) and the Policy for Statewide Salmon Escapement Goals (5 AAC 39.223). These two policies dictate that Pacific salmon be managed to achieve escapements that provide for sustained yields per the Alaska constitutional mandate to utilize, develop, and maintain fish based on the sustained yield principle (Alaska Constitution, Article VIII, Section 4). Moreover, these policies define escapement goals that maximize or sustain yields and are expressed as ranges or lower bounds that take into account salmon productivity and data uncertainty.

The biological escapement goal (BEG) is the escapement that provides the greatest potential for maximum sustained yield (MSY). The BEG is the primary fishery management objective in the absence of any allocative factors and is developed from and scientifically defensible based on the best available biological information. The BEG is always specified as a range. The sustainable escapement goal (SEG) is the escapement known to provide for sustained yield over a 5 to 10-year period and is used in situations where a BEG cannot be estimated or managed for. The SEG is the primary fishery management objective in the absence of any allocative factors and is developed from and scientifically defensible based on the best available biological information. The SEG can be a range or a lower bound.

Methods of developing escapement goals that account for salmon productivity and data uncertainty have evolved since Statehood but remain based on principles of Pacific salmon population biology, simple production models, and the stock concept. Improved data collection and methods of statistical modeling have greatly facilitated the direct incorporation of uncertainty into an escapement goal analysis. As a result, management of Pacific salmon in Alaska explicitly accounts for uncertainty by managing for a scientifically defensible escapement goal.

Production Models for Pacific Salmon

Due to the semelparous life history of salmon and harvest of largely mature fish in Alaska fisheries, production from a stock of Pacific salmon can be modeled as a simple relationship between escapement of adults and the expectation of subsequent return of offspring as adults,

$$E[R|S] = S \times \alpha \times f(S|S_{EQ}),$$

where R = production of adults in subsequent generation, S = spawning abundance (escapement) of adults, α = intrinsic rate of increase, and S_{EQ} = carrying capacity (Figure 1).

In this simple model, there is an intrinsic rate of increase (α) due to the average per-adult generation of ova and the survival of these ova to adult in the absence of competition. Counteracting this rate of increase is a discount due to competition, $f(S|S_{EQ})$, that increases as escapements tend towards a theoretical carrying capacity (i.e., average escapements in the absence of fishing mortality or S_{EQ}).

The intrinsic rate of increase, also known as the density independent parameter, is thought to be species and regionally specific. Factors influencing the intrinsic rate of increase are variability in life history characteristics such as fecundity, maturation rate, growth rate as well as environmental influences on survival in fresh and salt water.

Carrying capacity is thought to be watershed specific and can be effectuated via rearing or spawning ground limitation. Rearing limitation in Pacific salmon is thought to occur as competition among juveniles for food or space in the freshwater rearing environments of some species. Evidence of these limitations can be seen in variation in time spent residing in freshwater or in size of juveniles at the time of smoltification. Spawning ground limitation is thought to occur as adults compete for suitable spawning areas. Evidence of these limitations can be seen in variation in the location and density of redds and in the amount of egg retention in adults due to competitive interactions.

Several specific production models have been postulated for Pacific salmon. The main difference in these models is the mathematical formulation of compensation in survival rates (R/S) as competition increases. Two common models for compensation in survival rates are: 1) asymptotic (S/R increases linearly) or 2) exponential ($\ln(R/S)$ decreases linearly) as spawning abundance increases. In relation to the generic production model above, the differing forms for discounting due to competition are:

$$f(S|S_{EQ}) = \frac{1}{1 + \frac{(\alpha-1)S}{S_{EQ}}} \text{ or } f(S|S_{EQ}) = \exp\left[-\frac{\ln(\alpha)}{S_{EQ}}S\right].$$

These two mathematical forms result in the two most common production models for Pacific salmon: 1) Beverton-Holt (Beverton and Holt 1954) and 2) Ricker (1975; Figure 2). The Beverton-Holt model can be used to model competition due to rearing or spawning limitation, whereas the Ricker model can only be used to model spawning limitation (see Quinn and Deriso 1999). The Beverton-Holt model can only exhibit simple or pure compensation, where the expectation of maximum production occurs at carrying capacity. Over-compensation can occur in the Ricker model, where the expectation of maximum production can occur at intermediate levels of escapement depending on the intrinsic rate of increase.

Although choice of production model represents one form of scientific uncertainty that could be accounted for in escapement goal development, Alaska has largely chosen to use the Ricker model. Reasons for extensive use of the Ricker production model in Alaska are both biological and practical. Production in most Pacific salmon stocks in Alaska is arguably driven by competition among adults on the spawning grounds. Biological evidence for competition among adults can be seen in egg retention from overcrowding on spawning grounds, dominance of age-1 smolts when harvest rate (and competition) is low, size of juveniles is not inversely related to parent escapements when harvest rate is low, and little or no rearing of juveniles in freshwater (i.e., for chum and pink salmon).

Empirical evidence for a Ricker production model comes from dome-shaped production plots, superior statistical fits to Ricker versus Beverton-Holt production models, and poor production from exceptionally large escapements for various stocks in Alaska, indicating that maximum production occurs when escapements are held at an intermediate level in relation to carrying capacity (see Clark et al. 2007 for examples). Moreover, many stocks of Pacific salmon in Alaska consistently provide surplus production (i.e., meet and exceed lower bound escapement goals) under moderate to high harvest rates, arguable evidence of a dome-shaped production relationship.

From a practical standpoint, use of the Ricker production model will consistently provide for precautionary management under a fixed escapement goal management paradigm. Assuming fixed intrinsic rate of increase and carrying capacity, the Ricker model will provide a lower average harvest rate and higher average escapement than the equivalent Beverton-Holt model (Figure 3).

Incorporation of Uncertainty into Production Models

Two general forms of uncertainty are accounted for in production models used to develop escapement goals in Alaska. Process error is the uncertainty in production introduced by variation in survival rates from ova to adult. Biological mechanisms for process error in Pacific salmon include variation in sex

ratio, fecundity, growth (size composition), and maturation (age composition). Environmental mechanisms for process error include variation in freshwater habitat (e.g., stream flows, stream temperature) as well as marine habitat (e.g., ocean temperature and circulation patterns). Ecosystem linkages can also create process error in survival rates in the form of predation, inter-specific competition, disease, and starvation for example.

Process error can be easily introduced into a production model as density-independent and stochastic. For example, the Ricker production model has the stochastic version:

$$E[R|S] = \exp\left(\ln(\alpha) - \frac{\ln(\alpha)}{S_{EQ}}S\right) \exp\left(\frac{\sigma_{\epsilon}^2}{2}\right),$$

where σ_{ϵ}^2 is a log-normally distributed random variable (Peterman 1981) that represents variation from the expectation due to process error. Serially correlated patterns of lag-1 are often seen in process error in Pacific salmon, so that an alternative process error model is used:

$$E[R|S] = \exp\left(\ln(\alpha) - \frac{\ln(\alpha)}{S_{EQ}}S\right) \exp\left(\frac{\sigma_{\epsilon}^2}{2(1 - \phi_1^2)}\right),$$

where ϕ_1 is the lag-1 correlation coefficient. Random walk Kalman filtering has also been used to assess serially correlated process error in salmon production (Peterman et al. 2003).

Another form of uncertainty in production models comes from measurement errors introduced into the annual stock assessment process. Escapements are routinely estimated rather than counted using weirs, sonar, mark-recapture, aerial survey, or a combination of methods to reconstruct runs. In many cases measurement error in escapements are small (e.g., complete counts at weirs) and can be ignored in development of an escapement goal. However, high measurement error in escapements can create bias in estimates of the intrinsic rate of increase that is high or low depending on the magnitude of harvest rates (Kehler et al. 2002). This bias can directly affect development of an escapement goal. Age composition of annual runs are routinely estimated from a sample of catches and escapements. Catches are also estimated with error, especially when sport or subsistence harvests are substantial and/or commercial harvests in mixed-stock fisheries are estimated from stock identification techniques such as genetic stock identification.

Time series bias can also enter the escapement goal development process (Walters 1985). Data used to develop production models usually come from annual stock assessments where the escapements in one year are not independent of escapements in proceeding years. This can confound the estimation of the relationship between escapements and production and bias estimates of intrinsic rate of increase and carrying capacity.

When necessary, uncertainty in the form of measurement errors in escapements, catches, age compositions, and other types of run reconstructions can be incorporated into the production model. Time series bias can also be accounted for in these same models. As described below, Alaska currently utilizes methods of escapement goal analysis that bring all of these sources of uncertainty into “full probability” State-space models.

Escapement Goal Analysis

Management parameters can be estimated directly from the production models described above. For example, the Ricker production model leads to the following estimates of interest to escapement goal development for Pacific salmon (from Hilborn 1985):

$$S_{MSY} \cong S_{EQ}(0.5 - 0.07\ln(\alpha')),$$

where, S_{MSY} is the escapement that maximizes sustained yield (MSY) on average and $\ln(\alpha') = \ln(\alpha) + \frac{\sigma_{\epsilon}^2}{2}$ for the log-normal random process error model. Harvest rate at MSY (U_{MSY}) can also be estimated in this way:

$$U_{MSY} \cong \ln(\alpha')(0.5 - 0.07\ln(\alpha')).$$

MSY is then calculated by plugging S_{MSY} back into the Ricker equation:

$$MSY = S_{MSY} \left(\exp \left(\ln(\alpha') - \frac{\ln(\alpha')}{S_{EQ}} S_{MSY} \right) - 1 \right).$$

The limiting rate of exploitation (that drives the stock to extinction) can also be calculated directly from α' :

$$U_{lim} = 1 - \frac{1}{\alpha'}.$$

Escapement goals in Alaska are developed directly from these management parameters or their proxies. Moreover, these goals are commonly specified as ranges (see Munro 2019). Although no specific standard has been set in policy, Alaska has generally developed these ranges based on the premise that when fisheries are managed to keep escapements within the goal range, the targeted stock would on average produce yields at or above a high (e.g., 90) percent of MSY. Use of ranges takes advantage of the fact that the Ricker production model provides relatively similar yields across a wide range of escapements close to S_{MSY} . Use of ranges also addresses uncertainty in implementing fixed escapement goal management of Pacific salmon fisheries, where preseason forecasts of run strength are often imprecise and knowledge of realized run strength improves as the fishery proceeds and escapements are assessed.

Proxies for S_{MSY}

Empirical development of production models requires time series of data on escapements and resultant production. In many cases in Alaska available fishing power is insufficient to cause overfishing (i.e., resultant escapements below the lower bound of the escapement goal), average harvest rates are generally lower than U_{MSY} , and management is largely predicated on a schedule of fixed duration fishery openings. In other cases in Alaska, there are mixed-stock and mixed-species fisheries where catches cannot be resolved by stock during the fishing season. In these fisheries, stock-specific production data are usually lacking, but a time series of post-season escapement data are available to develop an escapement goal.

Based on these realities, Alaska has developed several proxies that are based on production theory, knowledge of fishing power and relative harvest rates, and the ability (or inability) to manage fisheries in-season. Most lower bound SEG and SEG ranges are based on these proxies (Munro 2019).

Percentile Approach

The most used proxy in Alaska is the percentile approach as described in Clark et al. (2014, 2017). This proxy approach is largely based on production theory and Hilborn's (1985) approximation for S_{MSY} . In general sustained yields (i.e., surplus production) can be produced from a wide range of escapements (Figure 4). Specifically for the Ricker model, Hilborn (1985) showed that S_{MSY} lies in the range of 29 to 43 percent of carrying capacity (S_{EQ}) over the range of likely productivities of Pacific salmon ($\ln(\alpha')$ ranging from 1 to 3), with U_{MSY} ranging from 43 to 87 percent. Given that harvest rates in situations of low fishing power are generally less than U_{MSY} , a trimmed range or lower bound of observed escapements for stocks in the fishery will be a conservative estimate of (i.e., escapements generally larger than) S_{MSY} . Clark et al. (2014, 2017) used theoretical, simulation, and empirical meta analyses to evaluate the

percentile approach as a proxy for S_{MSY} . For the theoretical and simulation analyses, they used log-productivity values from 1 to 2 and various levels of average harvest rates up to 40 percent. For all three approaches, they calculated percentiles representing specific levels of spawning abundance corresponding to a desired range around S_{MSY} . The range around S_{MSY} was the smallest escapement that produced 90% of MSY at the lower bound and the largest escapement that produced 70% of MSY at the upper bound. This range represents a conservative approach to development of an SEG, where low escapements that might cause overfishing are avoided at the lower bound and larger escapements that might be informative to better understanding future production are encouraged at the upper bound. A range based on the strict 90% of MSY boundaries was considered but rejected as too narrow for development of an SEG when information on productivity of the stock is lacking. Based on overall results of the three different analyses, they recommended 3 tiers of percentiles of the observed time series of escapements based on the amount of contrast (highest observed escapement divided by lowest observed escapement) and measurement error for stocks with low to moderate average harvest rates of ≤ 40 percent (Table 1).

Examples using the percentile approach in Alaska are numerous. A series of SEG ranges were established for pink salmon stocks in lower Cook Inlet using the percentile approach. As is typical for this approach, these stocks are assessed with foot and aerial surveys that do not enumerate the entire escapement, commercial catches cannot be resolved to stock of origin, and harvest rates are low to moderate (Otis et al. 2016). The percentile algorithm in Table 1 was applied to 17 of these stocks, with SEG ranges specified using the 20th and 60th percentiles of the observed time series of escapements for each of these pink salmon stocks in lower Cook Inlet.

In a very different situation, five chum salmon stocks in Prince William Sound are managed using lower bound SEGs developed using the percentile approach. These five stocks (Eastern, Northern, Coghill, Northwestern and Southeastern districts) are occasionally targeted in commercial fisheries, but in many years experience low to moderate harvest rates from the targeted Prince William Sound pink salmon fishery (Haught et al. 2017). Assessments of escapement consist of multiple in-season aerial surveys and application of area-under-the-curve methods adjusted for an estimate of stream life. Lower bound SEGs were developed using the 20th percentile of observed escapements. These stocks are managed to maintain the long-term average escapements with these lower bound SEGs serving as precautionary escapement goals that warn managers of a decrease in productivity and/or an increase in harvest rates.

Risk-based Approach

Another approach for developing precautionary lower bound SEGs for non-targeted stocks is the risk-based approach of Bernard et al. (2009). While not as common as SEG ranges in Alaska, there are a number of non-targeted stocks for which a precautionary escapement goal is necessary (see Munro 2019). This approach models the observed time series of escapements to determine the lowest observed escapement that balances the risk of observing three to five consecutive years below the lower bound SEG (i.e., precipitating a management concern per 5 AAC 23.222(f)(21)) due to random chance with the risk of not observing a real drop in the average observed escapements due to either an increase in harvest rate or drop in production. Risk is estimated via simulation of the time series of observed escapements as either a log-normal process or a lag-1 autoregressive process and calculation of tail probabilities (see example output in Figure 5). Drops in average observed escapement are arbitrary, but the range of possible drops are usually determined from the drop from the average observed to the minimum observed escapement. This approach generally results in lower bound SEGs that are similar to the 15th percentile of the observed escapements.

Fair et al. (2012) used this approach to develop a lower bound SEG for the Nushagak chum stock in Bristol Bay. They reasoned that this chum salmon stock was coincidentally harvested in the targeted sockeye salmon fishery in the Nushagak District and was not managed for in-season. The estimated risk used to develop this lower bound SEG was a 2 percent (a 1-in-50 chance) for unwarranted concern over

three consecutive years balanced against a 16 percent risk (a 1-in-6 chance) of ignoring actual reductions in average escapement of 85%.

Habitat Models

Although less commonly used than the percentile or risk-based approaches in Alaska, habitat models are usually appended to an escapement goal analysis as corroboration of other proxies or in combination with a formal stock-recruit analysis. This approach can be used to develop a BEG or SEG. The most fully developed habitat model is for Chinook salmon and is based on the premise that carrying capacity of a stock is related to the size of the watershed in which the stock resides (Liermann et al. 2010). A Bayesian hierarchical model is used to relate estimated management parameters (S_{MSY} and S_{EQ}) from 25 Chinook salmon populations from Oregon north to Alaska to watershed area. Predictions of management parameters and their posterior distributions can be made using only watershed area or with watershed area and available production data for the stock in question. Nelson et al. (2006) first used this method for comparison with an estimate of S_{MSY} from stock-recruit analysis in the Nelson River on the Alaska Peninsula. More recently, Fleischman et al. (2011) developed a Bayesian model of Chinook salmon in the Blossom and Keta rivers in southeast Alaska, with the habitat model of Liermann et al. (2010) providing priors into the stock-recruit analysis.

Similar habitat-based approaches are used for corroborating escapement goals for lake-rearing sockeye salmon in Alaska. Spawning area, euphotic volume, and zooplankton biomass measurements in lakes have all been used as predictors of management parameters for sockeye salmon. For examples, see Nelson et al. (2006) for Ilnik River, Bear River, Mortensen Lagoon, and Thin Point Lake analyses; and Witteveen et al. (2005) for Chignik River analyses.

Theoretical Approaches

There are two proxy methods of escapement goal analysis that are used infrequently in Alaska to develop or evaluate SEGs. Both methods are based on production theory and depend on the history of harvest rates on the stock (Clark et al. 2009). For lightly harvested stocks (harvest rates below 5 percent), one can assume that the average observed escapements are a reasonable proxy for carrying capacity (Figure 6A). Using Hilborn's (1985) approximation, S_{MSY} can be estimated by substituting the average observed escapement for S_{EQ} and supplying an estimate or range of the likely species-specific $\ln(\alpha')$ for the stock. Ericksen and McPherson (2004) used this method to develop an escapement goal for Chilkat Chinook salmon during a period of low harvest rates discerned from code-wire tag recoveries.

For heavily harvested stocks in Alaska (harvest rates near U_{MSY}) there is generally production data available for conducting a stock-recruit analysis (see next section). However, when harvest rates are high, often there is not enough information in the data to determine the carrying capacity of the stock (Figure 6B), but there is enough information to determine $\ln(\alpha')$. A preponderance of stocks that experience high harvest rates also have an existing escapement goal that can be evaluated using this approach. Using Hilborn's (1985) approximation one can estimate U_{MSY} from $\ln(\alpha')$ alone. The estimate of U_{MSY} can be compared to the average harvest rate on the stock to determine if the existing escapement goal is too high or low relative to S_{MSY} . If average harvest rate is higher than U_{MSY} the existing escapement goal is too low, and conversely if average harvest rate is lower than U_{MSY} the existing escapement goal is too high. Baker et al. (2009) used this method to compare estimates of $\ln(\alpha')$ during peak and off-cycle years of production of sockeye salmon in the Kvichak River drainage and to corroborate an approach that uses an escapement goal and a maximum harvest rate of 50 percent to manage the fishery.

Stock-Recruit Analysis

When sufficient data and information content are available, stock-recruit analysis is used to develop stock-specific production models to estimate management parameters and develop escapement goals. In Alaska and elsewhere, methods of stock-recruit analysis are evolving from simple regression models that

provide point estimates of the management parameters to Bayesian State-space models that incorporate uncertainty in process and measurement error to adjust for known biases and provide marginal posterior distributions of the management parameters (Fleischman et al. 2013).

Classical methods of stock-recruit analysis usually involve linear transformation of the production model and following the linear regression recipe to estimate the parameters of interest (Ricker 1975). Recasting the stochastic Ricker production model in the following way:

$$R = S \exp(\ln(\alpha) - \beta S) \exp(\varepsilon), \text{ where } \beta = \frac{\ln(\alpha)}{S_{EQ}},$$

and then dividing by S and log-transforming so that

$$\ln\left(\frac{R}{S}\right) = \ln(\alpha) - \beta S + \varepsilon,$$

allows for the simple linear regression of $\ln\left(\frac{R}{S}\right)$ on S to estimate $\ln(\alpha)$ as the y-intercept and β as the slope. The residual error of the regression provides the estimate of ε . Management parameters can then be estimated in the usual way with $E[\varepsilon] = \frac{\sigma_\varepsilon^2}{2}$, $\ln(\alpha') = \ln(\alpha) + \frac{\sigma_\varepsilon^2}{2}$, and $S_{EQ} = \frac{\ln(\alpha')}{\beta}$.

Escapement goals (BEGs and SEGs) for many stocks in Alaska were developed using this method (see Fried 1994, Clark 2001, Geiger 2003, and Nelson et al. 2005 for examples). Ranges around the point estimate of S_{MSY} were calculated in a variety of ways, but most commonly using the range of escapement that produces 90% or more of the point estimate of MSY or by applying the results of simulation work by Eggers (1993). Eggers (1993) simulated yields from a Ricker production model along with implementation error in management and found that an escapement goal range that was 0.8 to 1.6 times the point estimate of S_{MSY} provided for average yields that were 90% or more of the point estimate of MSY .

More recently, salmon biologists in Alaska have used probabilistic approaches to the classical method of stock-recruit analysis and extended the analysis to provide information on sustained yield, yield in relation to MSY , and overfishing. These methods include bootstrapping of the linear regression recipe (see Clark and Clark 1994, Bernard et al. 2000, Clark and Etherton 2000, and McPherson and Clark 2001 for examples) and maximum likelihood estimation of the management parameters (e.g., Fair et al. 2004 for Kvichak River sockeye salmon). In addition to point estimates of the management parameters, these methods provide estimates of uncertainty distributions of these parameters. In particular, Alaska has developed probability profiles for attainment of 70%, 80% and 90% or more of MSY (Szarzi et al. 2007, Fleischman and McKinley 2013, Fleischman and Reimer 2017) and for overfishing (probability of low escapements producing less than 90% of MSY (Bernard and Jones 2010, Fleischman and McKinley 2013)). These profiles are useful for determining escapement goal ranges that are robust to uncertainty in the management parameters and describing the potential outcomes from managing to these escapement goals (Figure 7). These methods continue to be used in Alaska in situations where escapement is measured with little to no error, harvest rates are low to moderate, and there is no serial correlation in residuals (e.g., Fair et al. 2008 for Eshamy Lake sockeye salmon).

Although probabilistic approaches to classical methods are an improvement in escapement goal analysis, potential for bias in the management parameters due to measurement error in estimates of escapement, non-independent estimates of escapement through time, and serially correlated residual errors remain. To address these potential biases, Alaska has developed Bayesian State-space models of production for Pacific salmon (Meyer and Millar 2001, Fleischman et al. 2013), especially for situations where escapements are estimated with error (e.g., mark-recapture) and stock assessments are the result of a wide

range of sampling programs each with sampling error (e.g., contributions from coded wire tag recoveries to estimate stock-specific harvest or run reconstruction to estimate escapement of a large stock complex). These models mimic the stock assessment processes used to estimate the inputs to the production model. The State-space model allows for non-independence of the time series of escapements as the process to estimate catches and, therefore, estimate subsequent escapements is accounted for. In the Bayesian framework, marginal posterior distributions of the management parameters are estimated using Markov Chain-Monte Carlo methods such as implemented in WinBUGS (Lunn et al. 2000) or RJAGS (Plummer 2013).

The observation equations of the State-space model are of the general form:

$$\hat{S} = S^{true} \exp(v^S) \text{ and } \hat{C} = C^{true} \exp(v^C),$$

where, both escapement (S) and catch (C) are estimated with iid log-normal errors (e.g., $v^S \sim N(0, \tau_S^2)$).

The link between successive years is accomplished by fishing (C) on the annual run (N) to produce escapement (S) for the next brood in year t :

$$\hat{S}_t = \hat{N}_t - \hat{C}_t.$$

Subsequent production (R) from escapement in year t is estimated from annual runs and the age compositions for ages x to y , depending on the maturation schedule of the stock (e.g., $x=4$ and $y=6$ for typical Chinook salmon stocks):

$$\hat{R}_t = \sum_{a=x}^y \hat{p}_{t+a,a} \hat{N}_{t+a},$$

where the estimated age compositions (p_x, p_{x+1}, \dots, p_y) that represent the maturity schedule of a particular brood year are drawn from a *Dirichlet*($\gamma_x, \gamma_{x+1}, \dots, \gamma_y$) distribution.

The State equation for the Ricker model is then:

$$\hat{R} = \hat{S} \exp(\ln(\alpha) - \beta \hat{S}) \exp\left(\frac{\hat{\sigma}_\varepsilon^2}{2}\right).$$

In the Bayesian framework, initial States of the model are specified as priors. It is most common for uninformative priors to be used in these models, although habitat models (Fleischman et al. 2011) and regional summaries of key parameters ($\ln(\alpha)$ for example, as in Bernard and Jones 2010) have been used as priors where stock-specific information is lacking information content. Beyond the posterior density of the management parameters, outputs of these models are the same probability profiles previously discussed (Figure 7), with the additional uncertainties directly accounted for. As an extension to this framework, complex run reconstructions have been directly integrated into the stock-recruitment analysis and escapement goal development process (see Fleischman and Borba 2009, Fleischman and Evenson 2010, Bernard and Jones 2010, Eggers and Bernard 2011, Hamazaki et al. 2012, Hamazaki and Conitz 2015 for examples).

Escapement Goal Management

Sustainable Salmon Fisheries Policy and Escapement Goal Policy

The framework for fishery management in the State of Alaska is guided by the Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222). The policy was born from joint

recognition by the Board of Fisheries and ADF&G that: 1) there is need for a comprehensive policy to manage and regulate fisheries; 2) fishery management plans must consider a variety of factors including data uncertainty, environmental change, and existing harvest patterns; and 3) management plans require guiding principles and criteria. In the policy, State salmon management should be based on several principles and criteria, including:

1. Maintaining wild salmon stocks and habitats at levels of productivity that assure sustained yields,
2. Management of salmon fisheries to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem function,
3. Establish effective management systems to regulate human activities that affect salmon,
4. Encourage public support and involvement for sustained use and protection of salmon resources,
5. In the face of uncertainty, salmon stocks, fisheries, artificial propagation, and essential habitats shall be managed conservatively.

Criteria for establishing escapement goals are outlined in the Policy for Statewide Salmon Escapement Goals (5 AAC 39.223). These fixed goals provide managers specific targets for their actions. Previous discussion has documented how various uncertainties are accounted for in establishing those goals.

Management Plans

Management of salmon fisheries in Alaska is guided by management plans developed by the department in consultation with the Board of Fisheries. Salmon management plans typically provide an overview of expected run sizes, regulations, management issues and harvest strategies for a particular fishery. These plans provide commercial fishermen and processors with a generalized picture of how the fishery will be prosecuted, management options, and conditions that may trigger management actions in-season. Recent changes to fishing time, area, gear, or allocations determined by the Board of Fisheries are noted in annual updates to management plans. Plans often identify scheduled fishing periods, subject to change by emergency order. Management plans for Alaska fisheries can be accessed from the ADF&G commercial fisheries web page, <http://www.adfg.alaska.gov/index.cfm?adfg=fishingCommercial.main>.

Pre-season forecasts

In advance of each fishing season, ADF&G prepares pre-season forecasts for salmon runs that affect major fisheries around the State (see Brenner et al. 2020). Selection of species for which to develop regional or area forecasts is based upon management need, economic importance, and data availability. A variety of methods may be employed to develop these forecasts including escapement levels of parent stocks, returns to date from sibling age classes, and outmigrating fry or smolt abundance. While forecasts provide some insight to run strength and possible management strategies, there is substantial uncertainty surrounding these estimates and ADF&G pursues a conservative approach based upon a flexible management plan until more information is available on actual strength of runs. Hatchery operators typically provide forecasts for hatchery runs of pink, chum and sockeye salmon.

In-season management

Most fishery management decision-making in ADF&G is delegated to area biologists who live and work in the fisheries areas. This approach has worked effectively to help area staff acquire significant expertise about the resources, people, and fisheries within the areas they live and work. A primary management tool is “emergency order authority”, delegated by the Commissioner to State area fishery managers. This authority allows the local manager to quickly respond to changing conditions within a fishery to implement conservation measures (restriction of harvest) or to allow harvest opportunity when data supports the in-season action. Regional and area research and monitoring staff support management by collecting and analyzing an assortment of data on run abundance, run timing, harvest, escapement and population structure.

A key to in-season management designed around meeting fixed escapement goals is in-season estimates of run strength and escapement levels to local rivers. A variety of methods are employed to provide insight to managers on the strength of salmon runs and escapements including test fishing, sonars, counting towers, weirs, aerial and foot surveys, and fish wheels. Genetic analyses often play an important role in delineating stock composition of salmon runs and harvests. Historical knowledge of salmon run timing allows managers to assess the date-specific strength of escapement against the likelihood of achieving any particular goal. Timely availability of run, catch and escapement information coupled with emergency order authority to restrict fisheries provides a robust mechanism for responding to uncertainties in annual salmon runs.

Performance metrics (accountability measures)

An important measure of management performance, implicit in ADF&G's management regime is success in meeting escapement goals. There are currently 282 escapement goals for all species and management regions in Alaska (Munro 2019). During the fishing season, managers can follow escapement trends against historical data to determine the likelihood of meeting an escapement goal. Where escapement information is not yet available during the fishery, due to lengthy fish travel time from commercial fishing districts to escapement projects, manager's gain useful information from in-river counting projects and commercial, subsistence or test fish catch indexes. Because run assessment, catch and escapement data are available in-season, emergency order authority over fishing time and area provides a mechanism for responding quickly to uncertainties in expected run sizes. The system of daily catch reporting on fish tickets provides real time information on commercial catch and emergency order authority provides the tool for managers to quickly constrain catch, if necessary.

After the fishing season is complete, performance of fisheries and success at meeting escapement goals can be evaluated. An annual review of escapement goals and performance provides a Statewide perspective (Munro 2019). The sustainable salmon policy outlines a process for regular review of salmon stock status and identification of specific stocks of concern. Three categories of concern exist: yield concern - stocks that fail to produce expected yields; management concern – stocks that fail to meet established escapement goals; or conservation concern – stocks in danger of not being able to rebuild themselves. Stocks are designated as concerns if the stock fails to meet expected yields or the escapement goal over a period of 4 to 5 years despite appropriate management taken to address the concern. When stocks of concern are identified, department staff members work with the Board of Fisheries and public to develop action plans, management plans, and research plans to help return the stock to health.

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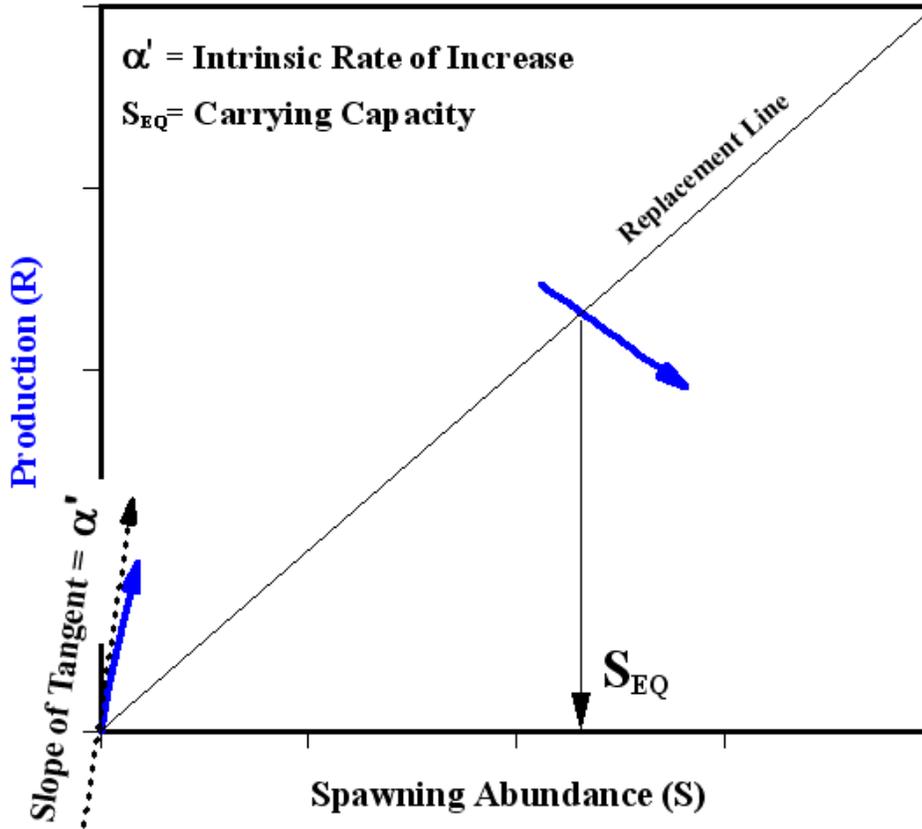


Figure 1. A generic production model for Pacific salmon with the counteracting processes (blue arrows) of reproduction and competition.

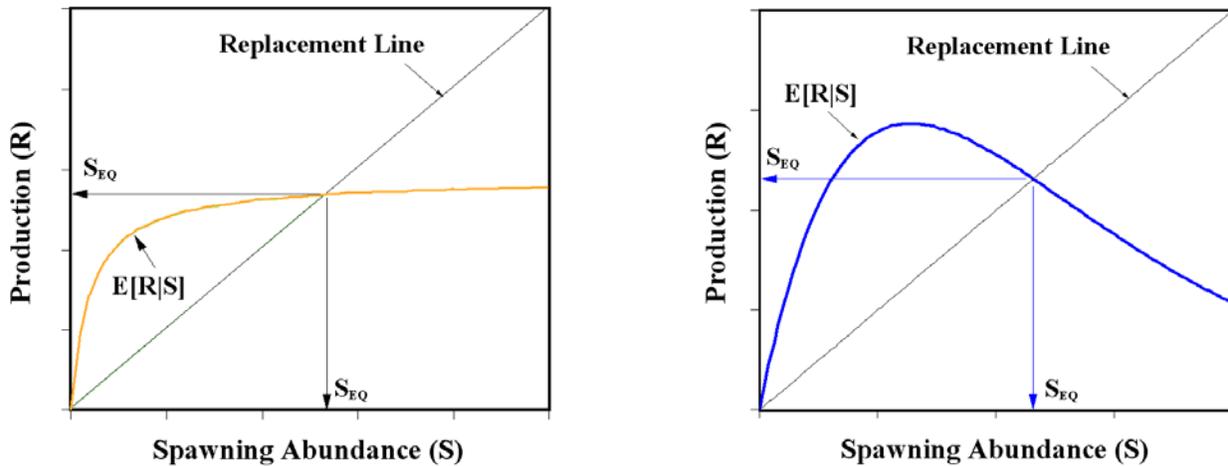


Figure 2. Beverton-Holt (left panel) and Ricker (right panel) production models.

Incorrect Choice →	Ricker	Beverton-Holt
True Model →	Beverton-Holt	Ricker
Esc. Goal Mgt. →	$S_{MSY} < \hat{S}_{MSY}$ “Under” fishing	$S_{MSY} > \hat{S}_{MSY}$ “Over” fishing
Harvest Rate Mgt. →	$U_{MSY} < \hat{U}_{MSY}$ “Over” fishing	$U_{MSY} > \hat{U}_{MSY}$ “Under” fishing

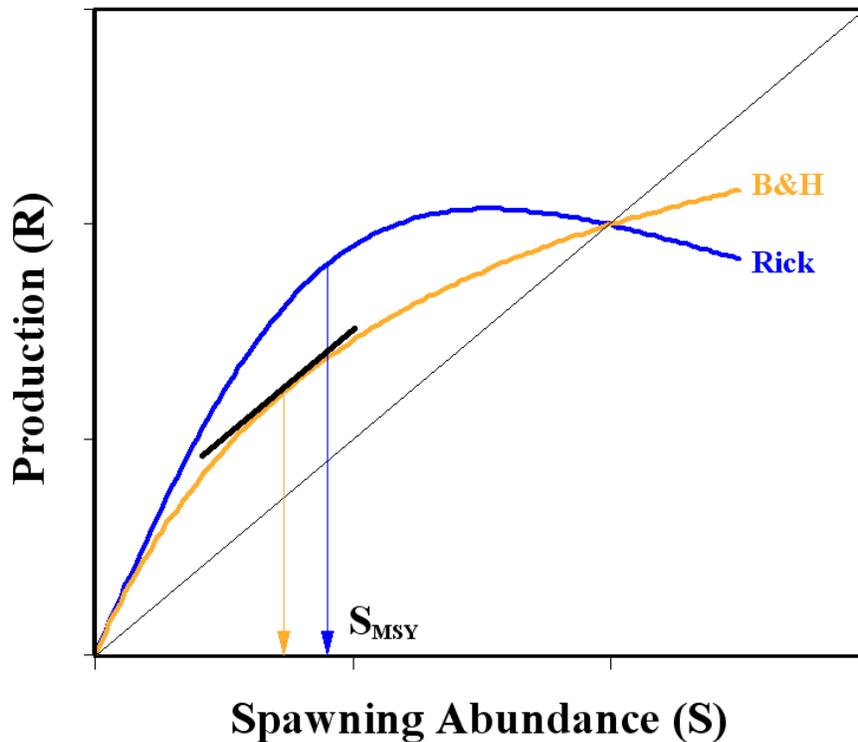


Figure 3. Decision table and graph for precautionary management under differing production models for Pacific salmon. S_{MSY} is the spawning escapement that maximizes sustainable yields and U_{MSY} is the harvest rate that maximizes sustainable yields. Quantities with hat symbols above are estimates, while those without are the true quantities.

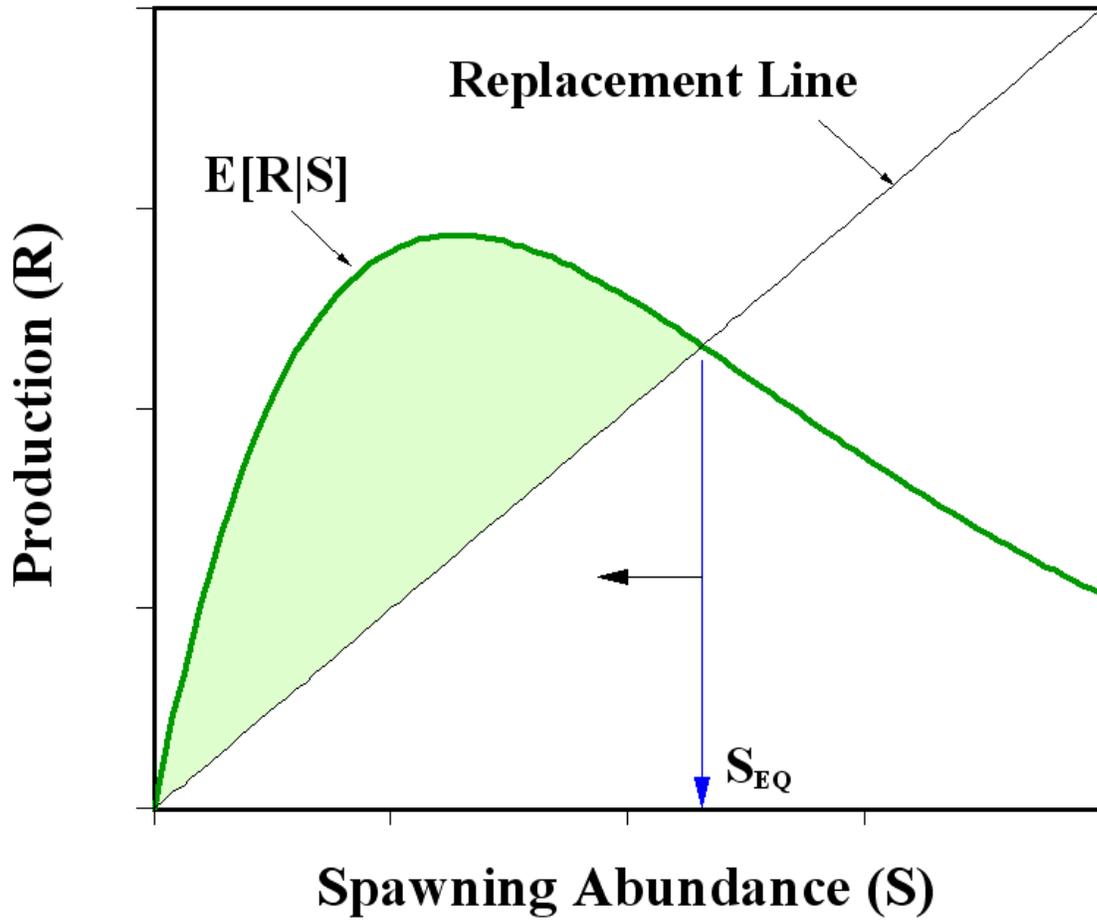


Figure 4. Schematic of the Ricker production model with potential sustained yields in the shaded area between $E[R|S]$ and the replacement line ($R = S$) and escapements less than carrying capacity (S_{EQ}). S_{MSY} generally occurs between 29 and 43 percent of S_{EQ} for Pacific salmon.

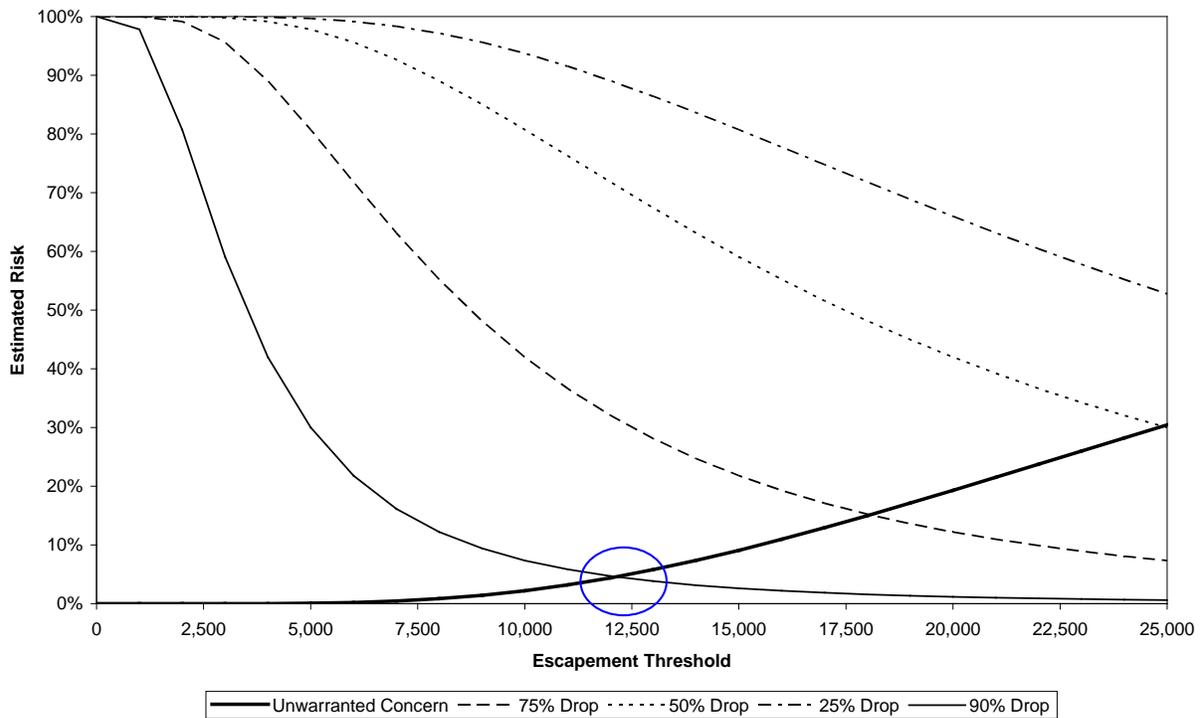


Figure 5. Estimated risk of three or more consecutive years of observed escapements below the lower bound SEG due to random chance (unwarranted concern) and risk of missing a real drop of 75-90% in the average observed escapement for Kulukak River sockeye salmon. A lower bound SEG of approximately 12,000 fish (circled) balances these two risks at a low level (< 10% risk).

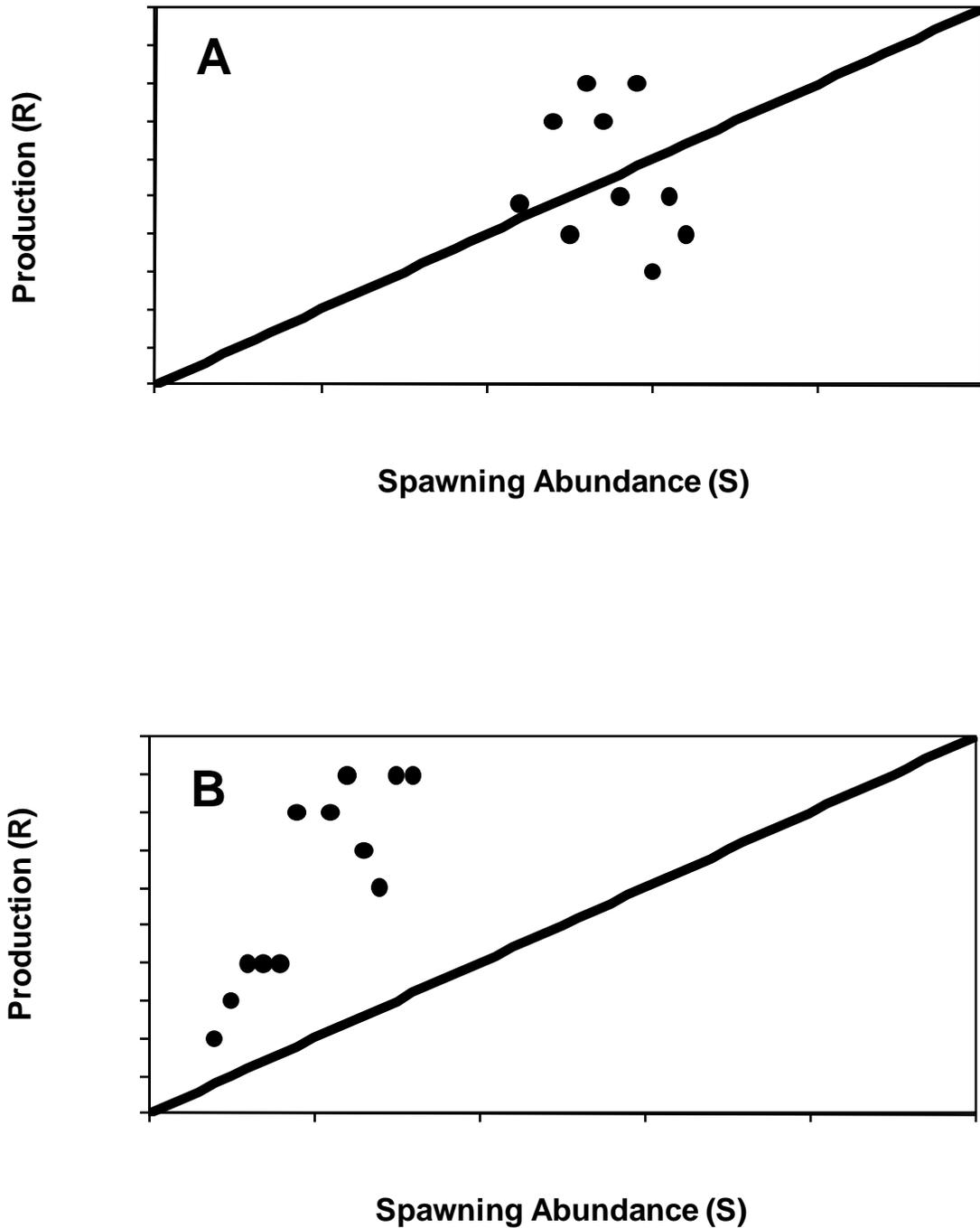


Figure 6. Schematic of observed production data (points) in relation to the replacement line (dark diagonal line) in the situation of low (A) or high (B) harvest rates.

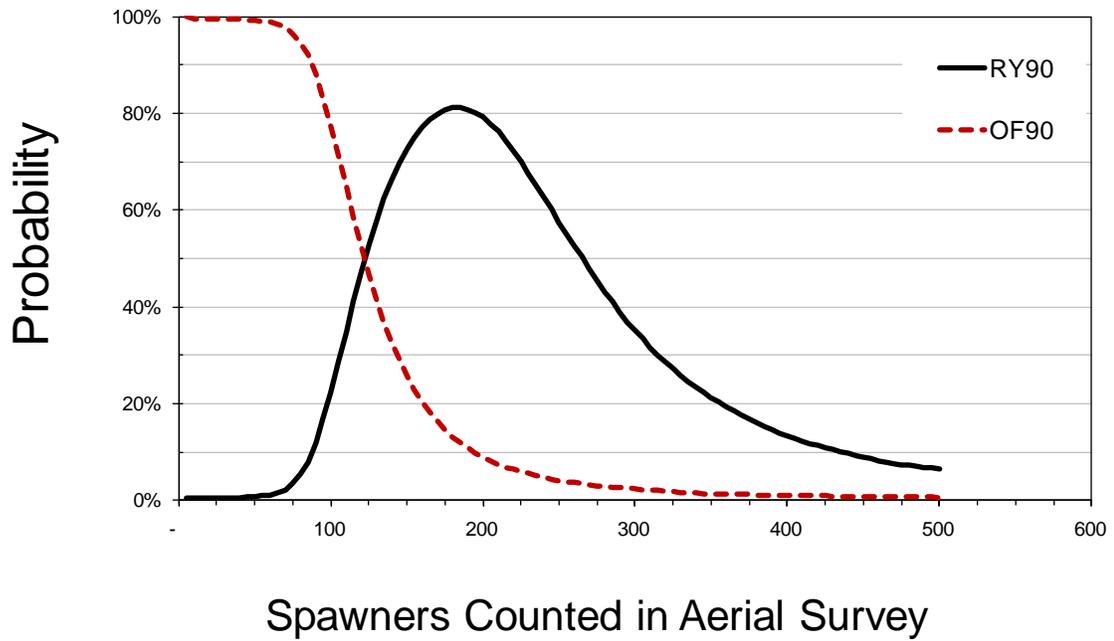


Figure 7. Schematic of probability profiles for yields of 90% or more of MSY (RY90 – solid line) or for yields less than 90% of MSY (OF90 – dotted line) over a range of escapements considered for development of an escapement goal.

Table 1. Percentile approach to estimate Sustainable Escapement Goals (SEGs) from observed escapements (adapted from Clark et al. 2014, 2017).

Tier	Contrast^a	Measurement Error	Exploitation	SEG Range
1	High (> 8)	High (aerial and foot surveys)	Low to moderate (< 0.40)	20 th to 60 th Percentile
2	High (> 8)	Low (weirs, towers)	Low to moderate (< 0.40)	15 th to 65 th Percentile
3	Low (\leq 8)		Low to moderate (< 0.40)	5 th to 65 th Percentile

^a Maximum observed escapement divided by minimum observed escapement.

10. Appendix: Exploration of Overcompensation and the Spawning Abundance Producing Maximum Sustainable Yield for Upper Cook Inlet Sockeye Salmon Stocks

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10.1. Background

Critical to the development of escapement-based management targets for Pacific salmon is quantifying the shape or form of the relationship between spawning abundance and recruitment, and the extent to which that stock-recruitment relationship exhibits compensation and overcompensation. Compensation is the tendency for population productivity (recruits-per-spawner) to decline as spawning abundance increases, resulting in a decrease in potential yield for each additional spawner beyond S_{msy} . Compensation may be contrasted with overcompensation, or the tendency for recruitment to decrease at high levels of spawning abundance, causing a stock-recruitment relationship to “bend over”.

From a management perspective the implication of surplus escapement, escapement in excess of the spawning abundance predicted to produce maximum sustainable yield (S_{msy}), depends heavily on whether the stock-recruitment relationship exhibits evidence for overcompensation. For a population exhibiting simple compensation, surplus escapement is expected to result in foregone yield in the current year, but no reduction in future recruitment. However, for a population exhibiting overcompensation, surplus escapement may be expected to result in a reduction in future recruitment. As a result, the extent of overcompensation exhibited by a salmon population has very real implications for the expected impact from, and level of risk imposed by, surplus escapement.

Compensation or Overcompensation?

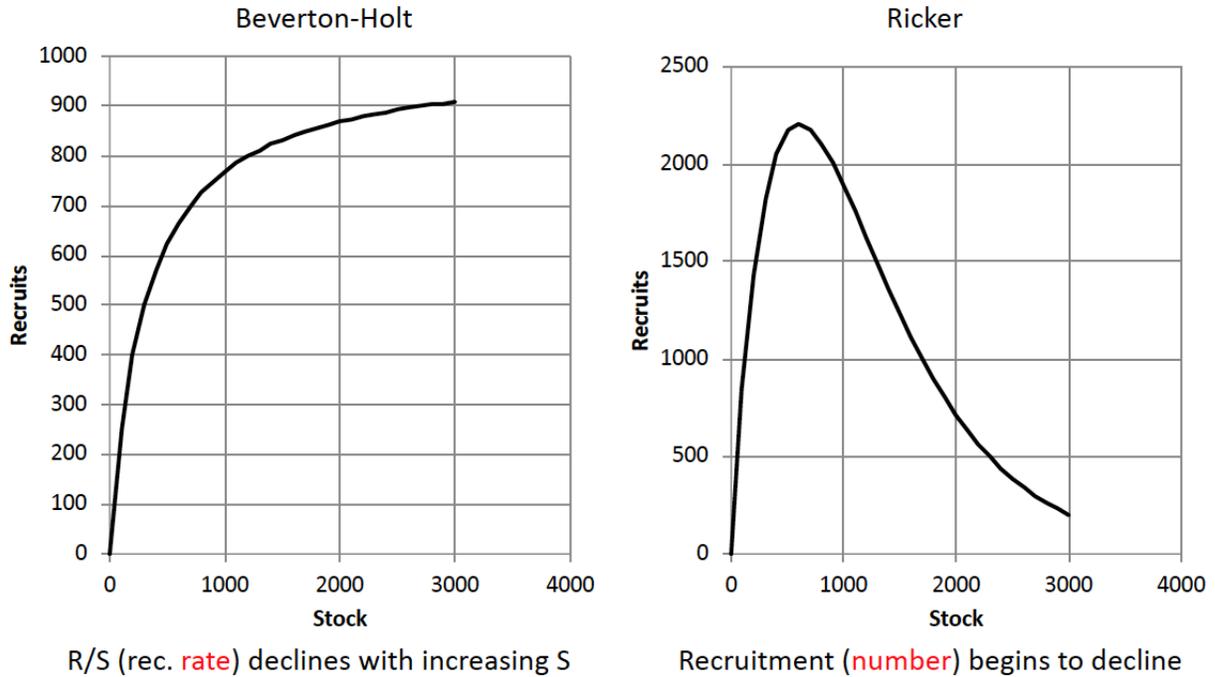


Figure 1. Graphical explanation of the difference between simple compensation and overcompensation in the context of stock-recruitment relationships.

The purpose of this analysis is to explore alternative methods for determining the spawning abundance of sockeye salmon (*Oncorhynchus nerka*) that is expected to produce maximum sustainable yield for the Kenai late-run and Kasilof river sockeye salmon stocks, and from this to quantify the extent to which the stock-recruitment data for these stocks exhibit evidence for overcompensation within the range of past observations. A broad range of mathematical forms for stock-recruitment relationships have been developed, each with specific properties and meanings for their respective parameters (Hilborn and Walters 1992, Walters and Martell 2004). We explore five alternative stock-recruitment models that are applicable to the Kenai and Kasilof river stocks, compare the statistical evidence supporting each along with differences in their estimated parameters and predictions for maximum sustainable yield (MSY) and the spawning abundance expected to produce MSY (Smsy). In addition, we use two stock-recruitment models that may take either Ricker or Beverton-Holt forms as proxy for assessing the extent to which overcompensation is evident in these data.

The table below contains definitions for common terms and references used throughout this document.

Table 1. Description of symbols, terms, and references.

Name	Definition
MSY	Maximum sustainable yield.
Smsy	The spawning abundance expected to produce MSY.
Recruitment	The number of salmon produced by the spawning stock size in a given (brood) year, returning in subsequent years, and measured as either catch or escapement.
Stock-recruitment Relationship or Spawner-recruit Relationship	The average relationship between spawning abundance and expected recruitment.
Process Error	Random variation in a stock-recruitment relationship.
Productivity	Recruits-per-spawner: The number of recruits (catch + escapement) per unit spawning abundance. Referenced by brood year.
Yield	Surplus production or recruitment of salmon in excess of the amount necessary for escapement, that may be taken as harvest.

10.2. Methods

Five alternative stock-recruitment models were fit to data from the Kenai and Kasilof river sockeye salmon stocks. Three of these models, the standard, brood year interaction, and autoregressive Ricker models are typical forms routinely evaluated by the Alaska Department of Fish and Game and included in the 2017 escapement goal review by Erickson et al. (2017) for these stocks. Two alternative stock-recruitment models were used to describe the probability that either a Beverton-Holt relationship, which does not permit overcompensation, or a Ricker-type relationship that may allow for overcompensation, have more support from the available data.

10.2.1. Standard Ricker

The Ricker (1954) model is a standard and flexible function often used in the approximation of salmon stock-recruitment relationships. The Hilborn (1985) version of the Ricker model was used because of the easier interpretation of the β parameter and the ability to approximate MSY and Smsy given the model parameters. Under this Ricker formulation:

$$R_t = S_t e^{\alpha(1-S_t/\beta)+\varepsilon_t}$$

R_t is the expected number of recruits arising from a spawning abundance S_t , from a brood year t . The α parameter describes the maximum productivity (recruits-per-spawner) of the population at low spawning abundance and the β parameter describes the equilibrium abundance of the unfished stock. It should be noted that maximum productivity in this form is the natural log of α , or $\ln(\alpha)$. Residual process error in brood year t is described by ε_t which is assumed to be normally distributed with mean zero standard deviation σ : $\varepsilon_t \sim Normal(0, \sigma^2)$.

10.2.2. Brood Year Interaction Ricker

This model is a modified version of the Hilborn (1985) Ricker model above, that includes two terms (β_1, β_2) describing density-dependence, or the tendency for expected productivity (recruits-per-spawner) to decline with increasing spawning abundance (Ward and Larkin 1964, Larkin 1971, Collie and Walters 1987). In the brood year interaction Ricker model:

$$R_t = S_t e^{\alpha - \beta_1 S_t - \beta_2 S_{t-1} + \varepsilon_t}$$

β_1 describes the effect of spawning abundance in brood year t on population productivity and β_2 describes the lagged effect of spawning abundance in the prior ($t - 1$) brood year.

10.2.3. Autoregressive Ricker

The third type of model explored accounts for serial autocorrelation in process error at a lag of one year, under the assumption that these errors may not be fully independent across time. In this autoregressive form of the Ricker model described by Fleischman and Reimer (2017),

$$R_t = \alpha S_t e^{-\beta S_t + \phi v_{t-1} + \varepsilon_t}$$

ϕ describes the effect of the residual in the prior brood year:

$$v_{t-1} = \ln(R_{t-1}) - \ln(\alpha) + \beta S_{t-1}$$

It should be noted that under this form of the Ricker model the α is not in the exponentiated portion of the equation, and therefore maximum productivity is equal to α and not $\ln(\alpha)$.

The three model alternatives described above are consistent with the standard models the Alaska Department of Fish and Game has previously used to estimate potential yield for the Kenai and Kasilof sockeye salmon stocks in the most recent escapement goal review (Erickson et al. 2017). The two models described below were used to quantify the likelihood that overcompensation (decreasing recruitment for escapements in excess of S_{msy}) or simple compensation is supported by these two datasets. We used the relative support from the data for a Ricker-type model that permits overcompensation, relative to the level of support for a Beverton-Holt model (no overcompensation possible) as a proxy for extent to which overcompensation is reflected in the data.

10.2.4. Ricker Beverton-Holt Mixture

The first model used to quantify support for the overcompensation hypothesis is a mixture of both Beverton-Holt and Ricker models. A State (δ) parameter is sampled from a Bernoulli distribution with a prior probability of 0.5, taking a value of 0 or 1 in each posterior sample. If $\delta = 1$, the stock-recruitment relationship has a Ricker form (potential overcompensation), while if $\delta = 0$ the relationship has a Beverton-Holt form (no possible overcompensation).

$$R_t = \left[\delta (S_t e^{\alpha_R (1 - S_t / \beta_R)}) + (1 - \delta) \left(\frac{\alpha_B S_t}{1 + \frac{\alpha_B S_t}{\beta_B}} \right) \right] e^{\varepsilon_t}$$

Separate productivity parameters (α_R, α_B) and density-dependence (β_R, β_B) are estimated for each model type, given their different values and meanings. After estimation, the proportion of time the model spends as a Ricker function as opposed to Beverton-Holt function can be calculated as the proportion of posterior samples where δ has a value of 1 or 0 respectively. In general terms, the more time the model spends as Beverton-Holt may be interpreted as less evidence for the overcompensation hypothesis.

10.2.5. Deriso-Schnute

The second model used to quantify support for the overcompensation hypothesis is the Deriso-Schnute model. The Deriso-Schnute is a generalized stock-recruitment model that can take the shape of either a Beverton-Holt or Ricker model depending on the value of a shape parameter c .

$$R_t = \alpha S_t (1 - c \beta S_t)^{\frac{1}{c}} e^{\varepsilon_t}$$

If $c = -1$, the model has the Beverton-Holt form, while if the $c = 0$ it takes the shape of a Ricker model. This generalized stock-recruitment model was originally introduced by Deriso (1980) and further developed by Schnute (1985). The estimated value of the shape parameter may be interpreted as evidence for a Ricker or Beverton-Holt function describing the stock-recruitment data and by extension may be a way to quantify evidence regarding the overcompensation hypothesis.

Deriso-Schnute General Model

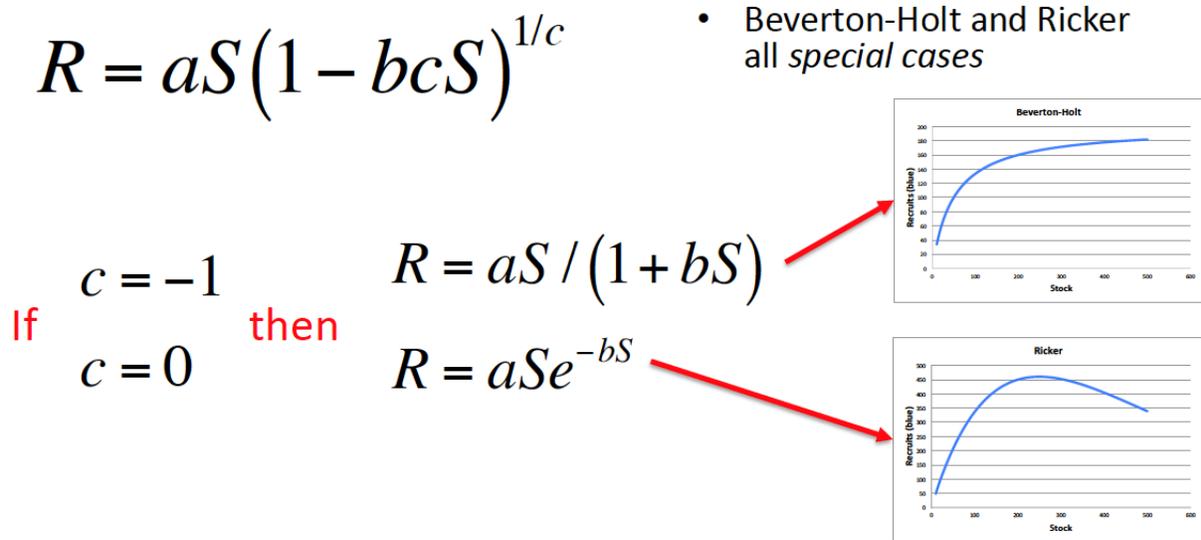


Figure 2. Visual description of the Deriso-Schnute stock-recruitment model.

10.2.6. Estimation Methods

All models were fit to available stock-recruitment data for the Kenai River late-run and Kasilof River sockeye salmon stocks using Bayesian methods, by minimizing the difference between the natural log of observed and predicted recruitment for a given brood year's spawning abundance and estimating the σ parameter describing the residual error. Bayesian posterior samples were generated with JAGS software (Plummer 2013) implemented using the R2jags package in R (Su and Yajima 2015). Three chains with random starting values were run for 2 million iterations, saving 1 in every 500 samples to reduce posterior correlation. The first 50% of the chain was discarded as a burn-in period leaving a total of 6,000 posterior samples.

Standard diagnostics were used to assess model convergence, including potential scale reduction factors (\hat{R}) and effective sample sizes for model parameters. Traceplots and the extent of autocorrelation at lags up to 20 were also evaluated. No significant convergence difficulties were observed, although under the Ricker Beverton-Holt mixture model posteriors for the Ricker parameters were less well defined because the model on average spent less time exploring this State for both stocks.

Priors for estimated model parameters were either uninformative or mildly informative (Table 2). Mildly informative priors included those for the process error standard deviation of each model (σ), which were normally distributed with mean zero and variance equal to one, and was constrained between 0 and 2. In reality all estimates of process error standard deviations were far below two and sensitivity tests indicated this choice of prior did little aside from constrain extremely unrealistic jumps in model parameters. The

shape parameter in the Deriso-Schnute model (c) was constrained between -1 and 0 as per our goal of quantifying evidence for Beverton-Holt and Ricker forms of this model. Finally, the prior probability for the different States in the mixture model was fixed at $p = 0.5$, for the Bernoulli draw in each posterior sample.

Table 2. Full model equations and priors for each model parameter. Normal distributions are presented with the with the mean and variance $Normal(mean, variance)$. [min,max] indicates truncation of the full prior distribution across a range (min-max).

Name	Equation	Priors
Ricker	$R_t = S_t e^{\alpha(1-S_t/\beta) + \varepsilon_t}$	$\alpha \sim \ln(Uniform(1e - 3, 20))$ $\beta \sim Uniform(1, 1e7)$ $\sigma \sim Normal(0, 1)[1e - 3, 2]$
Brood Year Interaction Ricker	$R_t = S_t e^{\alpha - \beta_1 S_t - \beta_2 S_{t-1} + \varepsilon_t}$	$\alpha \sim \ln(Uniform(1e - 3, 20))$ $\beta_{1,2} \sim Uniform(0, 1e - 3)$ $\sigma \sim Normal(0, 1)[1e - 3, 2]$
Autoregressive Ricker	$R_t = \alpha S_t e^{-\beta S_t + \phi v_{t-1} + \varepsilon_t}$ $v_{t-1} = \ln(R_{t-1}) - \ln(\alpha) + \beta S_{t-1}$	$\alpha \sim Uniform(1e - 3, 20)$ $\beta \sim Uniform(0, 1)$ $\phi \sim Normal(0, \sqrt{10})$ $v_0 \sim Normal\left(0, \frac{\sigma^2}{1 - \phi^2}\right)$ $\sigma \sim Normal(0, 1)[1e - 3, 2]$
Ricker Beverton-Holt Mixture	$R_t = \left[\delta (S_t e^{\alpha_R (1 - S_t / \beta_R)}) + (1 - \delta) \left(\frac{\alpha_B S_t}{1 + \frac{\alpha_B S_t}{\beta_B}} \right) \right] e^{\varepsilon_t}$	$\alpha_R \sim \ln(Uniform(1e - 3, 20))$ $\alpha_B \sim Uniform(1e - 3, 20)$ $\beta_R \sim Normal(0, (1e8)^2)[0,]$ $\beta_B \sim Normal(0, (1e8)^2)[0,]$ $\sigma \sim Normal(0, 1)[1e - 3, 2]$
Deriso-Schnute	$R_t = \alpha S_t (1 - c\beta S_t)^{\frac{1}{c}} e^{\varepsilon_t}$	$\alpha \sim Uniform(1e - 3, 20)$ $\beta \sim Uniform(0, 1)$ $c \sim Uniform(-1, 0)$ $\sigma \sim Normal(0, 1)[1e - 3, 2]$

10.2.7. Simulation of Potential Yield

Potential yield was simulated across a range of trial spawning abundances for each stock, under each of the alternative stock-recruitment models. Spawning abundance was increased iteratively in steps of 1,000 spawners across a suitable range, and at each level of spawning abundance potential yield was calculated for each of the 6,000 samples from the joint posterior distribution of model parameters. Correction for the lognormal process error distribution was achieved by using the appropriate bias correction for model parameters in the case of the standard and autoregressive Ricker models (Hilborn 1985, Fleischman and Reimer 2017), or multiplying expected recruitment by $e^{\sigma^2/2}$.

Table 3. Datasets used for analysis.

Stock	Brood Years
Kenai River late-run sockeye salmon	1968-2010
Kasilof River sockeye salmon	1968-2010

10.3. General Results

10.3.1. Model Selection

The range of models evaluated in this analysis provided very similar fits to the stock-recruitment data for the Kenai and Kasilof river sockeye salmon stocks (Figure 3). The exception is the Kasilof River stock for which the predictions from the autoregressive Ricker model better matched low recruitments at the beginning of the time series and higher recruitments observed in the late 1970s and early 1980s.

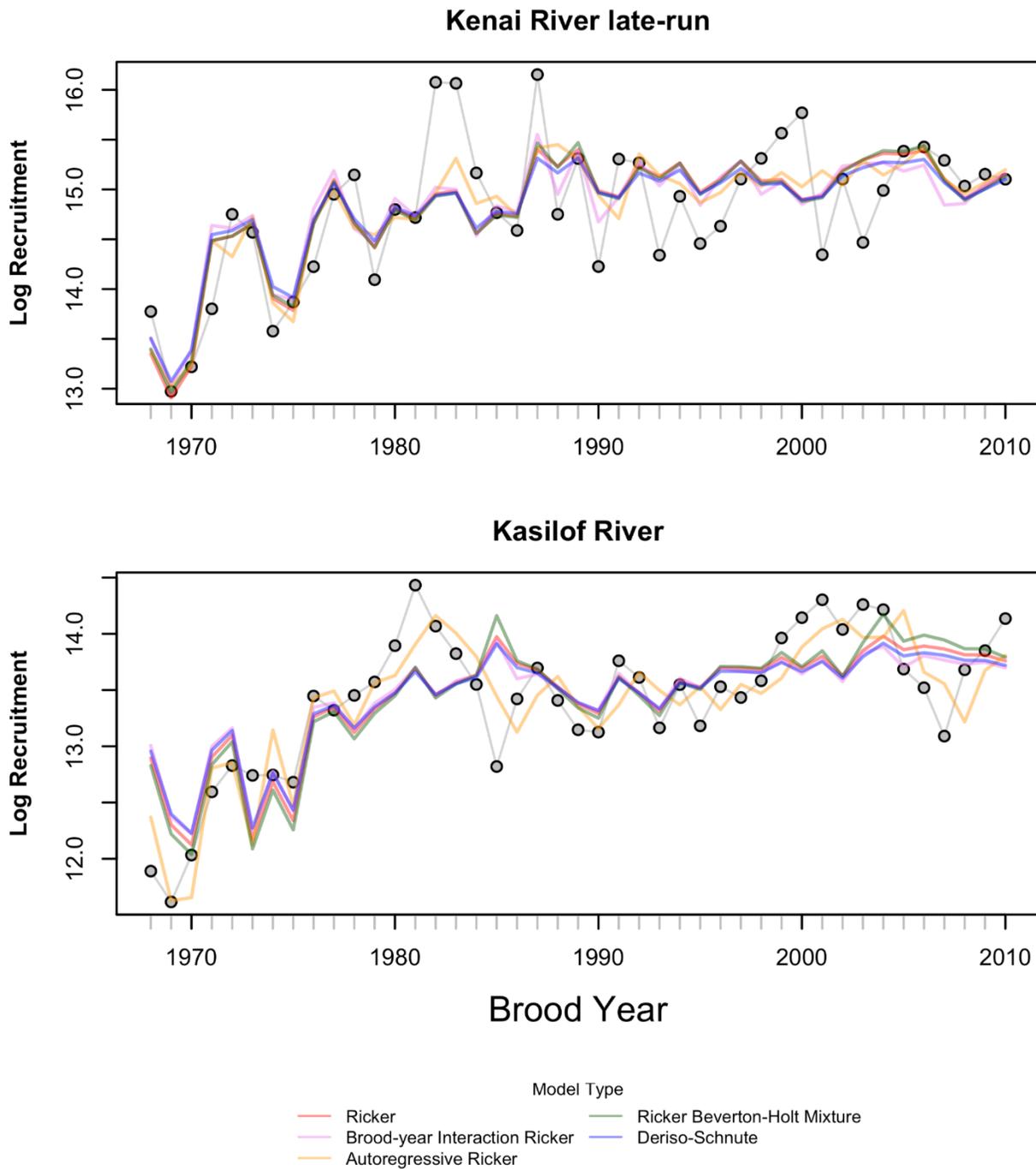


Figure 3. Predicted recruitment from the five model alternatives for the Kenai and Kasilof river sockeye salmon stocks. Lines are posterior median values for predicted recruitment in log space and points are the observed recruitments in log space, by brood year.

To evaluate support for alternative models in a Bayesian context, estimates of out-of-sample prediction error through cross-validation have been recommended (Gelman et al. 2014). The Watanabe-Akaike

information criterion (WAIC) is an approximation to cross-validation and serves as a metric for model selection in a Bayesian context. In general terms lower WAIC values indicate a better fit by the model to the data.

Table 4. WAIC values for each model fitted to each stock. Green colors indicate lower WAIC values and therefore preferred models.

Model	Kenai River	Kasilof River
Basic Ricker	61.96	53.73
Brood Year Interaction	61.46	53.72
Autoregressive Ricker	62.54	32.45
Ricker Beverton-Holt Mixture	62.45	57.26
Deriso-Schnute	61.68	52.56

Comparison of WAIC values for the range of models evaluated indicates that for the Kenai River stock there is relatively equal support for all model types, however a slight preference for the brood year interaction Ricker. Conversely, for the Kasilof River stock a substantially lower WAIC value was found for the autoregressive Ricker model. These preferred models are consistent with findings in the most recent ADF&G escapement goal review for these stocks (Erickson et al. 2017).

10.3.2. Overcompensation

The strength of evidence for the overcompensation hypothesis, that escapements in excess of S_{msy} are predicted to result in reduced future recruitment, was evaluated using two models that attempt to quantify the probability of a Ricker or Beverton-Holt model better representing the observed stock-recruitment relationship. While a model-based preference for the Ricker model does not necessarily indicate that overcompensation is present, given the flexibility of this model to describe relationships with and without overcompensation, a preference for the a Beverton-Holt like model indicates there is limited evidence for overcompensation, as this model allows for recruitment to asymptote but not decline at high spawning abundances (i.e. overcompensation). In this way one can consider the potential for overcompensation under Ricker the null hypothesis and a model-based preference for a Beverton-Holt stock-recruitment relationship to be evidence for rejecting this null hypothesis.

Results from the Ricker Beverton-Holt mixture model indicate that the majority of posterior samples were generated under the Beverton-Holt model (Figure 4). For the Kasilof River sockeye salmon stock, 13.0% of posterior samples were generated from the Ricker model while 87.0% of samples were generated from the Beverton-Holt model. For the Kenai River late-run stock, 4.5% of posterior samples were generated from the Ricker model while 95.5% of samples were generated from the Beverton-Holt model. The relative proportions of posterior samples generated from each model suggest that a Beverton-Holt model may better represent the underlying stock-recruitment relationships, and as such limited evidence for overcompensation for either stock.

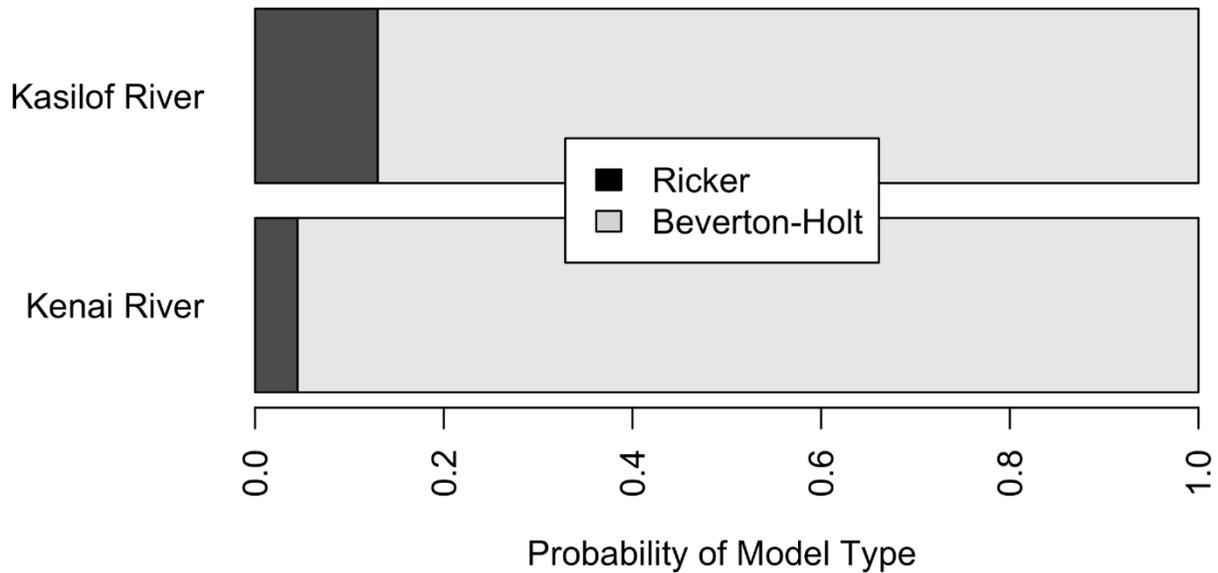


Figure 4. Probability of the Ricker or Beverton-Holt model representing stock-recruitment relationships for each sockeye salmon stock, from the mixture Ricker model. Each bar describes the proportion of time the model spent sampling as Ricker or Beverton-Holt, as defined by the proportion of posterior samples in which the State was $\delta = 1$ or $\delta = 0$, respectively.

Results from the Deriso-Schnute model with respect to overcompensation are more mixed. For the Kenai River stock the posterior distribution for the shape parameter indicates substantially higher probability for a value of -1, indicating more evidence for a Beverton-Holt type relationship (Figure 5). Given that a Beverton-Holt function does not provide for overcompensation, this indicates limited evidence for the overcompensation hypothesis with respect to the Kenai River late-run sockeye salmon stock. Conversely, when the Deriso-Schnute model was fit to stock-recruitment data from the Kasilof River the posterior distribution for the shape parameter was more uniform with a marginally higher probability for a value of -1 (Figure 5). This results suggests nearly equal evidence for Ricker and Beverton-Holt relationships representing the data for this stock. However, this result does not indicate overcompensation is present, merely that we cannot reject the overcompensation hypothesis for the Kasilof River stock under this model.

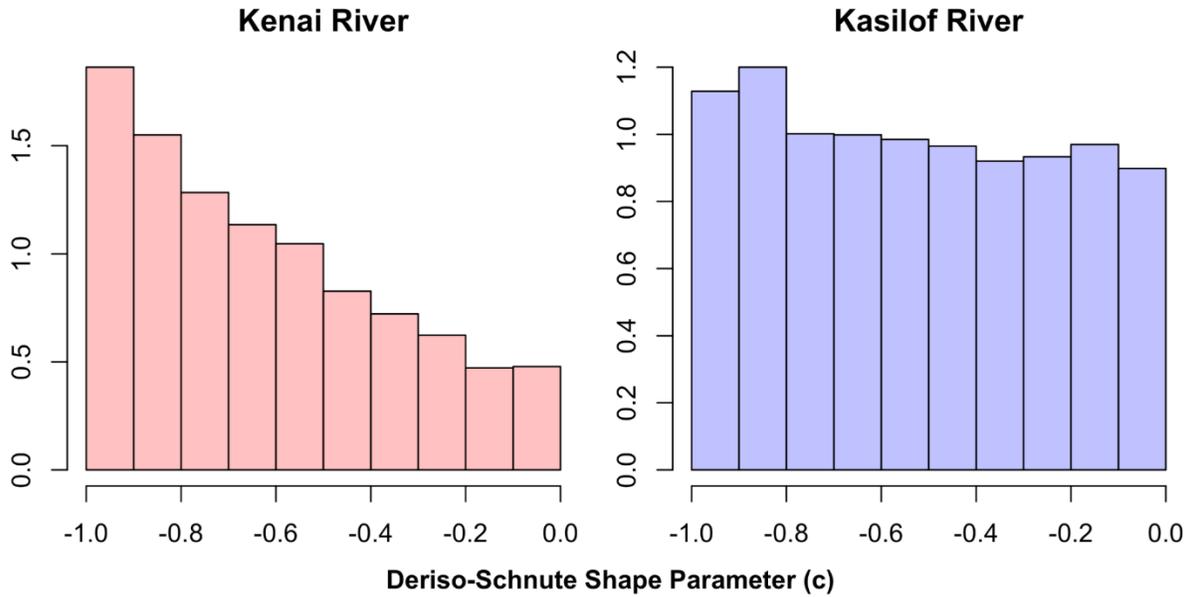


Figure 5. Evidence for a Ricker or Beverton-Holt like model better representing the data for each stock based from the Deriso-Schnute model. The Deriso-Schnute shape parameter controls whether the underlying relationship is more consistent with one of the two model types. A shape parameter value of -1 is similar to Beverton-Holt, while a shape parameter value of 0 indicates a Ricker-like form where overcompensation is possible. Histograms are the marginal posterior distributions for the shape parameters for each stock.

10.4. Specific Results

In the following section model-specific parameter estimates and projections for potential yield as a function of spawning abundance are presented. Potential yield was simulated based on the posterior distribution for model parameters, which after appropriate log-normal correction represent the expected potential yield and uncertainty in potential yield resulting from estimation uncertainty.

Model parameter estimates were consistent with those identified by Erickson et al. (2017) where specific model comparison was possible.

With respect to simulation results, the spawning abundances expected to produce maximum potential yield and estimated maximum potential yield generally agreed with findings in the most recent ADF&G escapement goal review for Upper Cook Inlet sockeye (Erickson et al. 2017). In the case of the Kenai River late-run sockeye stock the brood year interaction model was preferred based on WAIC. The estimate of the spawning abundance (escapement) producing maximum potential yield from this model was 1.201 million sockeye, with a potential yield of 3.071 million sockeye. For the Kasilof River sockeye stock the autocorrelated Ricker was the WAIC-preferred model, and predicted maximum potential yield could be obtained by an escapement of 237,000 sockeye and produce a potential yield of 706,000 sockeye.

10.4.1. Standard Ricker

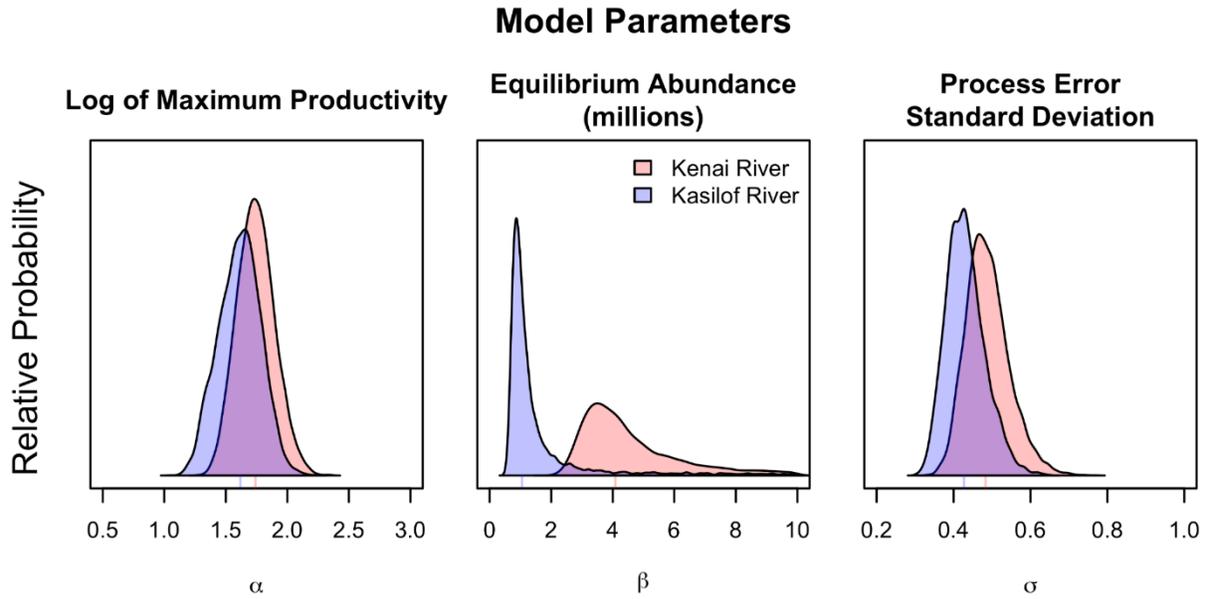


Figure 6. Posterior distributions for Ricker model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

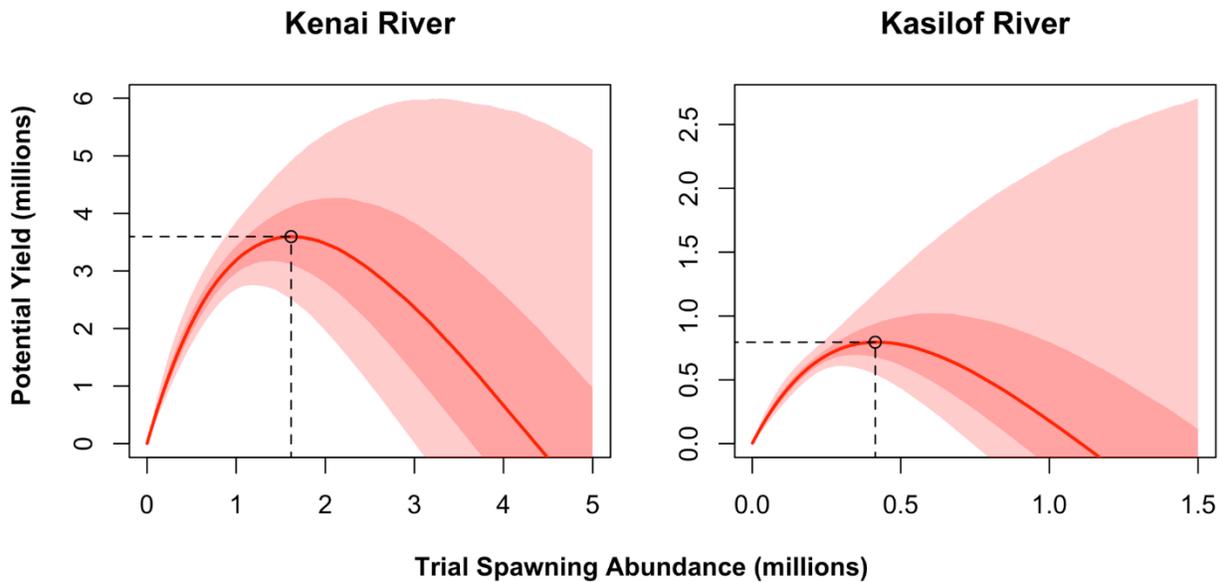


Figure 7. Simulated potential yield for the standard Ricker model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted Smsy and MSY for each stock.

10.4.2. Brood Year Interaction Ricker

Model Parameters

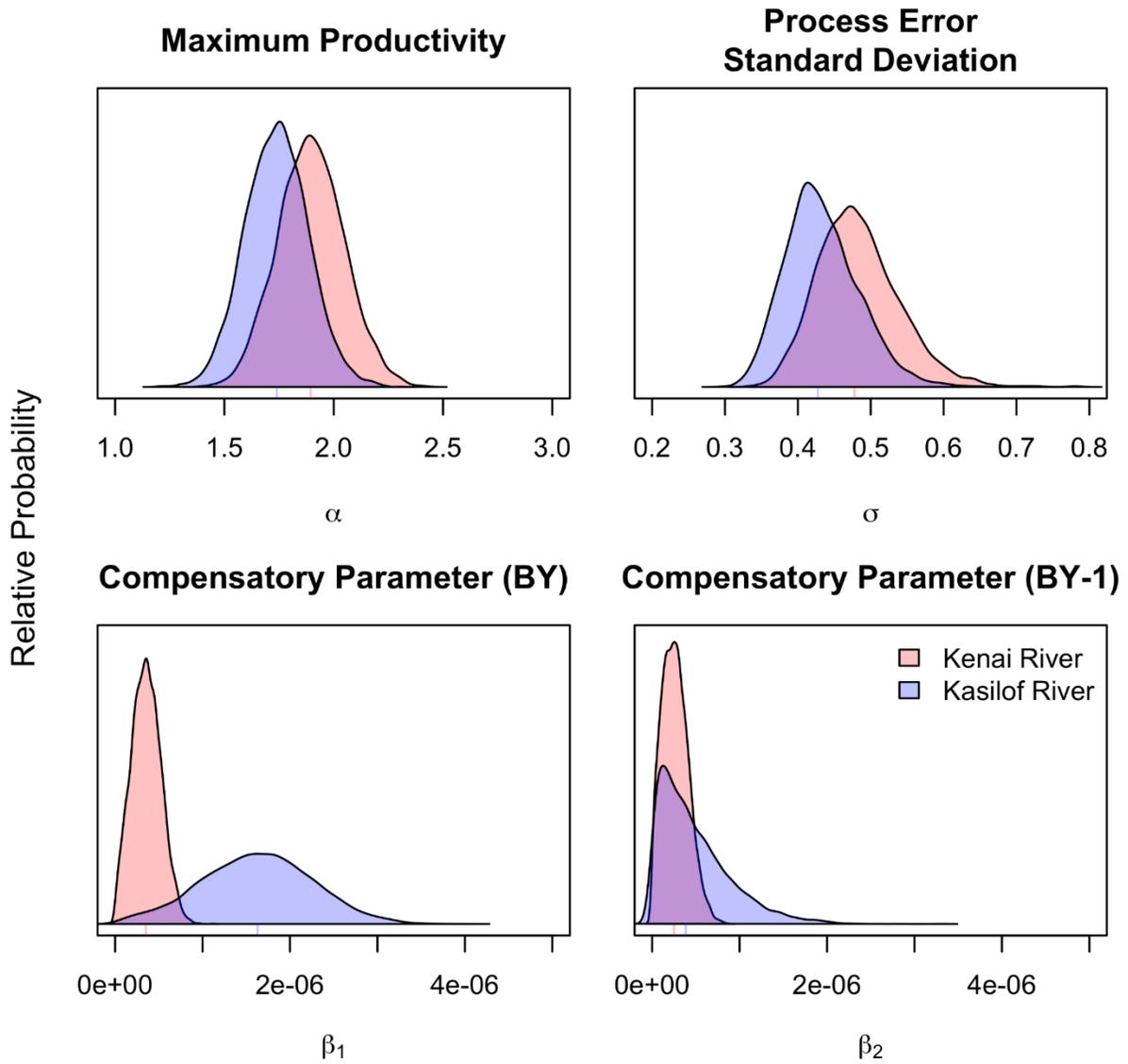


Figure 8. Posterior distributions for brood year interaction Ricker model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

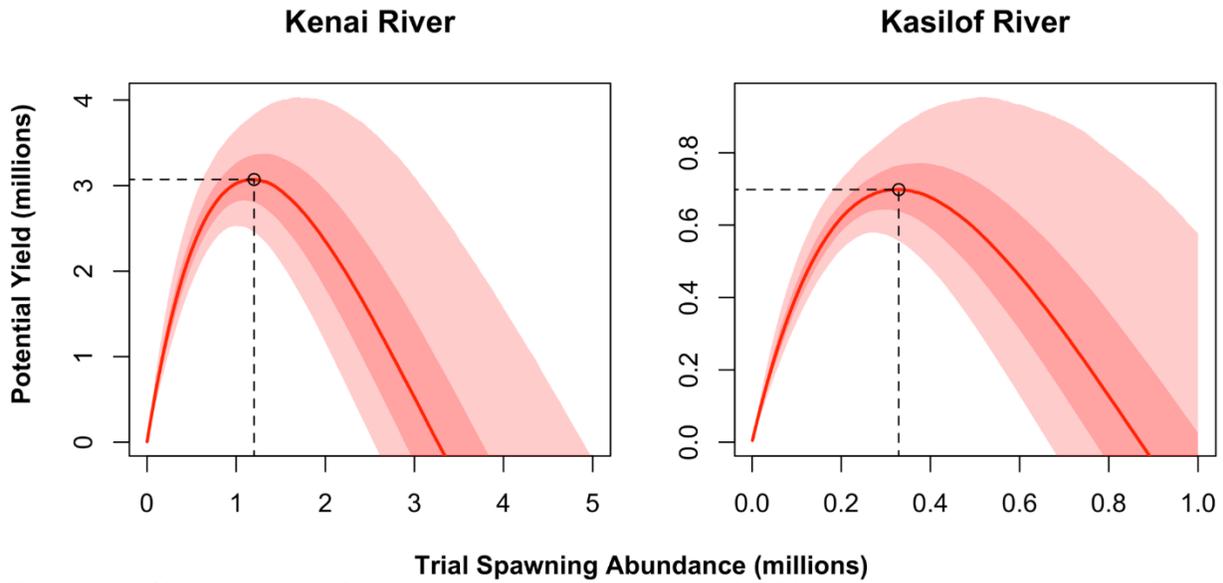


Figure 9. Simulated potential yield for the brood year interaction Ricker model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted S_{msy} and MSY for each stock.

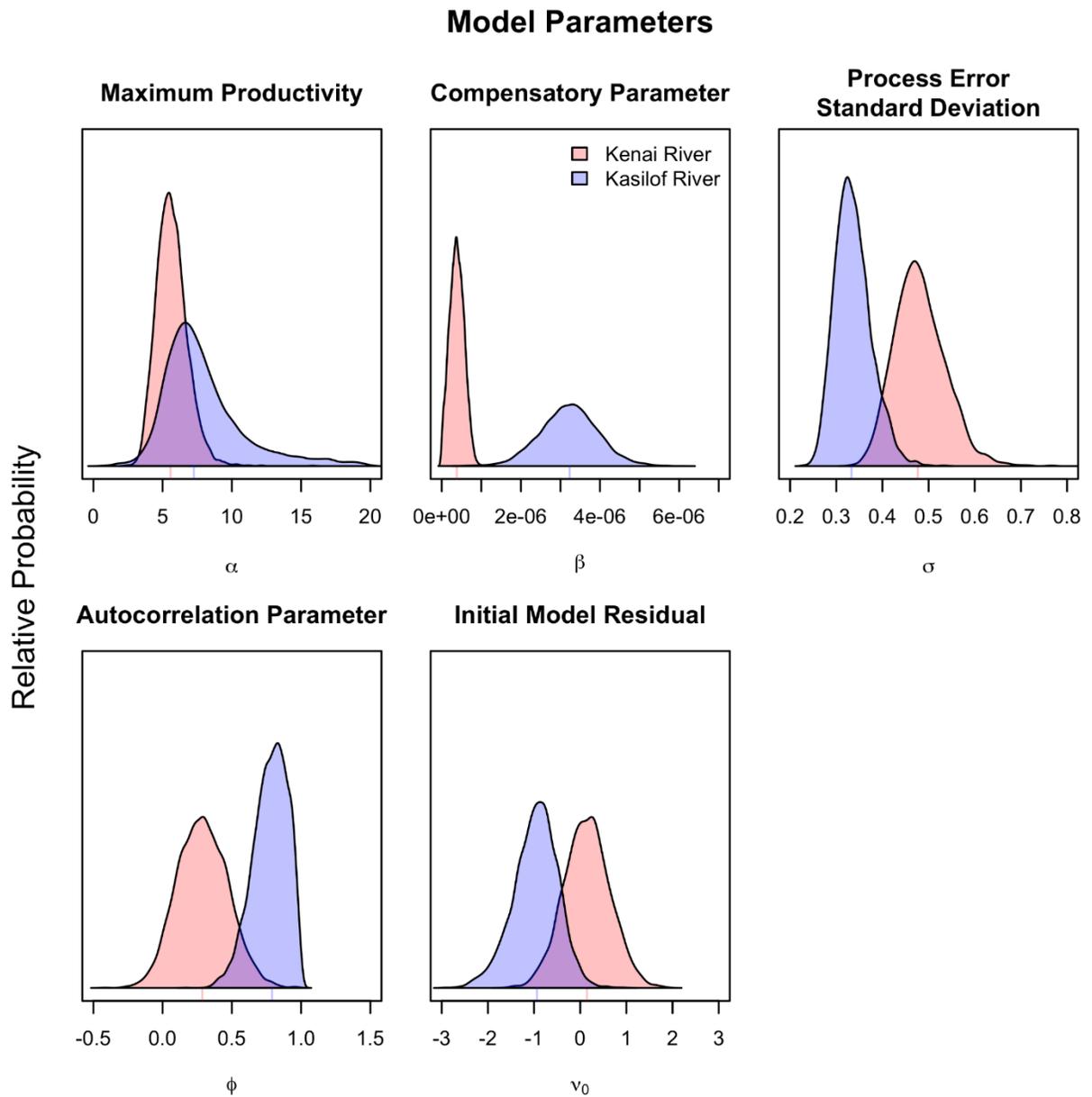


Figure 10. Posterior distributions for autoregressive Ricker model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

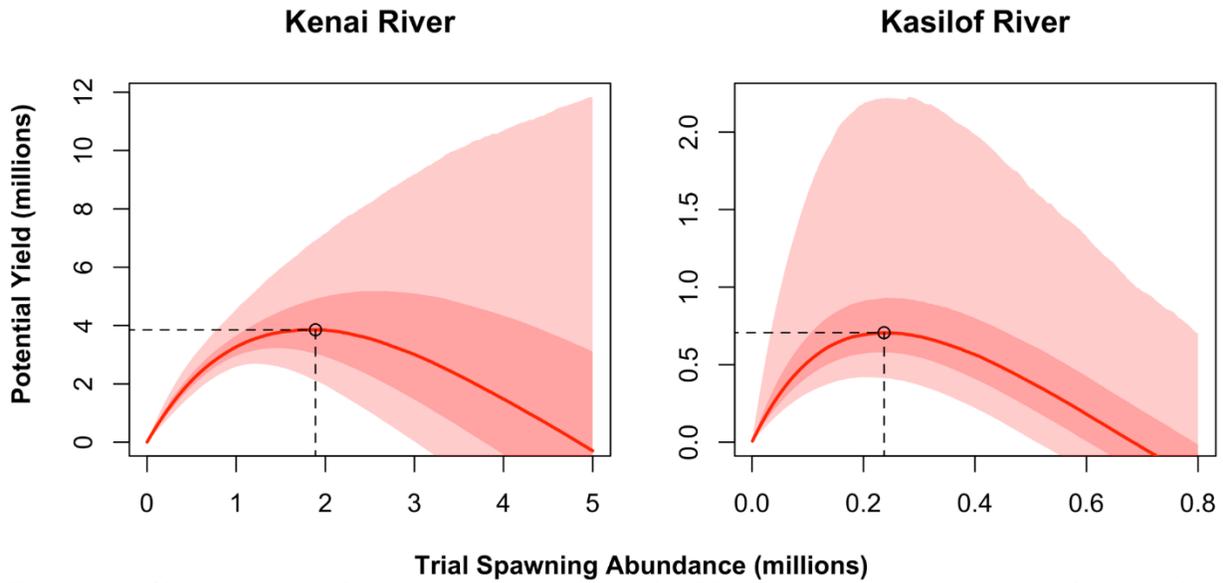


Figure 11. Simulated potential yield for the autoregressive Ricker model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted Smsy and MSY for each stock.

**10.4.3. Ricker Beverton-Holt Mixture
 Model Parameters**

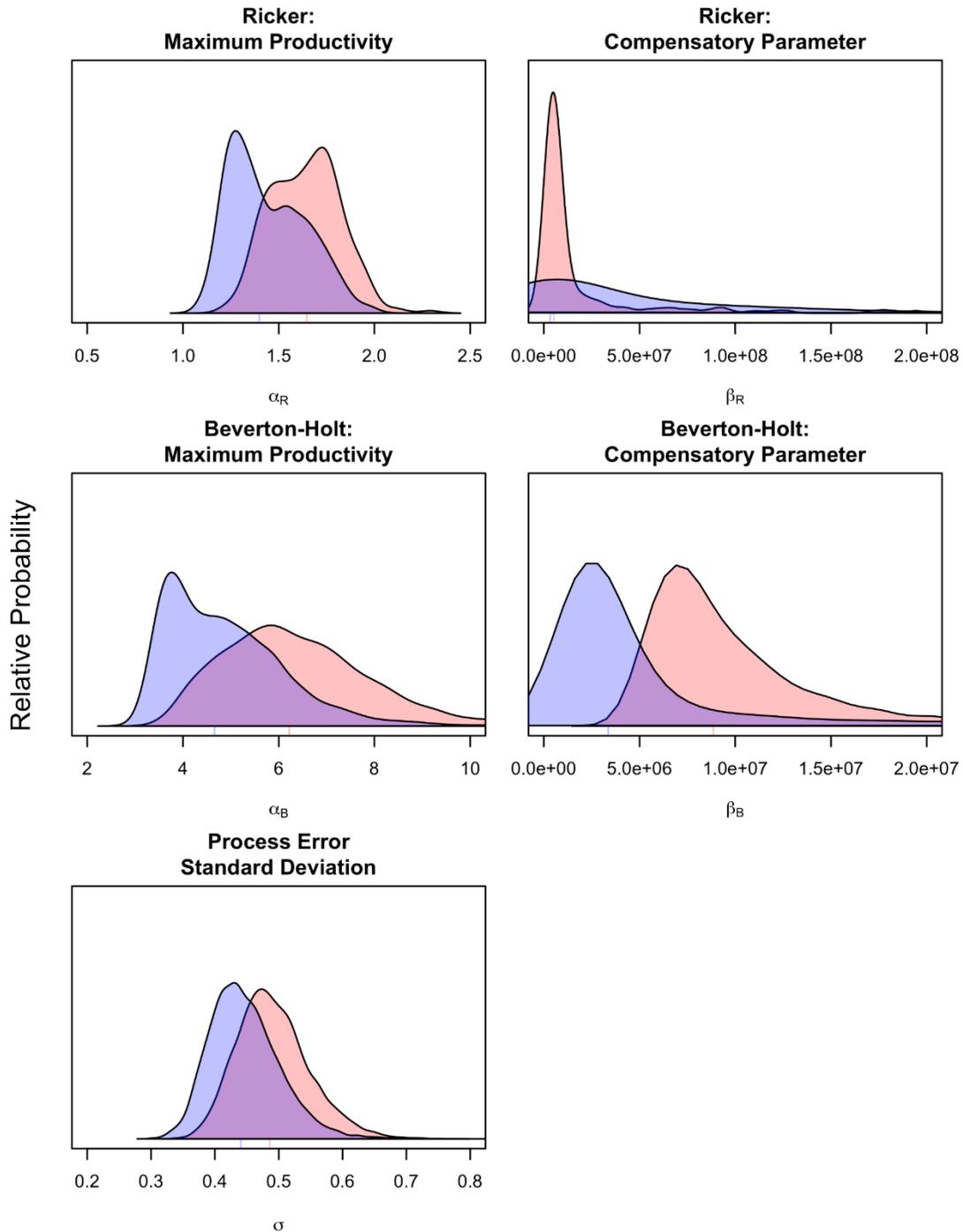


Figure 12. Posterior distributions for Ricker Beverton-Holt mixture model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

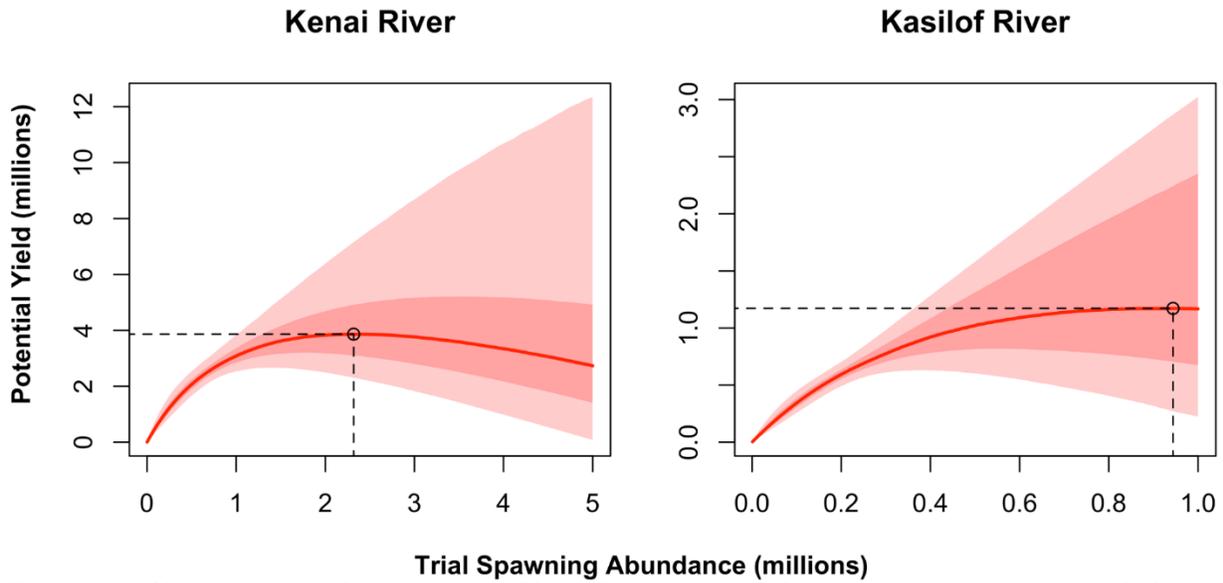


Figure 13. Simulated potential yield for the Ricker Beverton-Holt mixture model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted Smsy and MSY for each stock.

10.4.4. Deriso-Schnute

Model Parameters

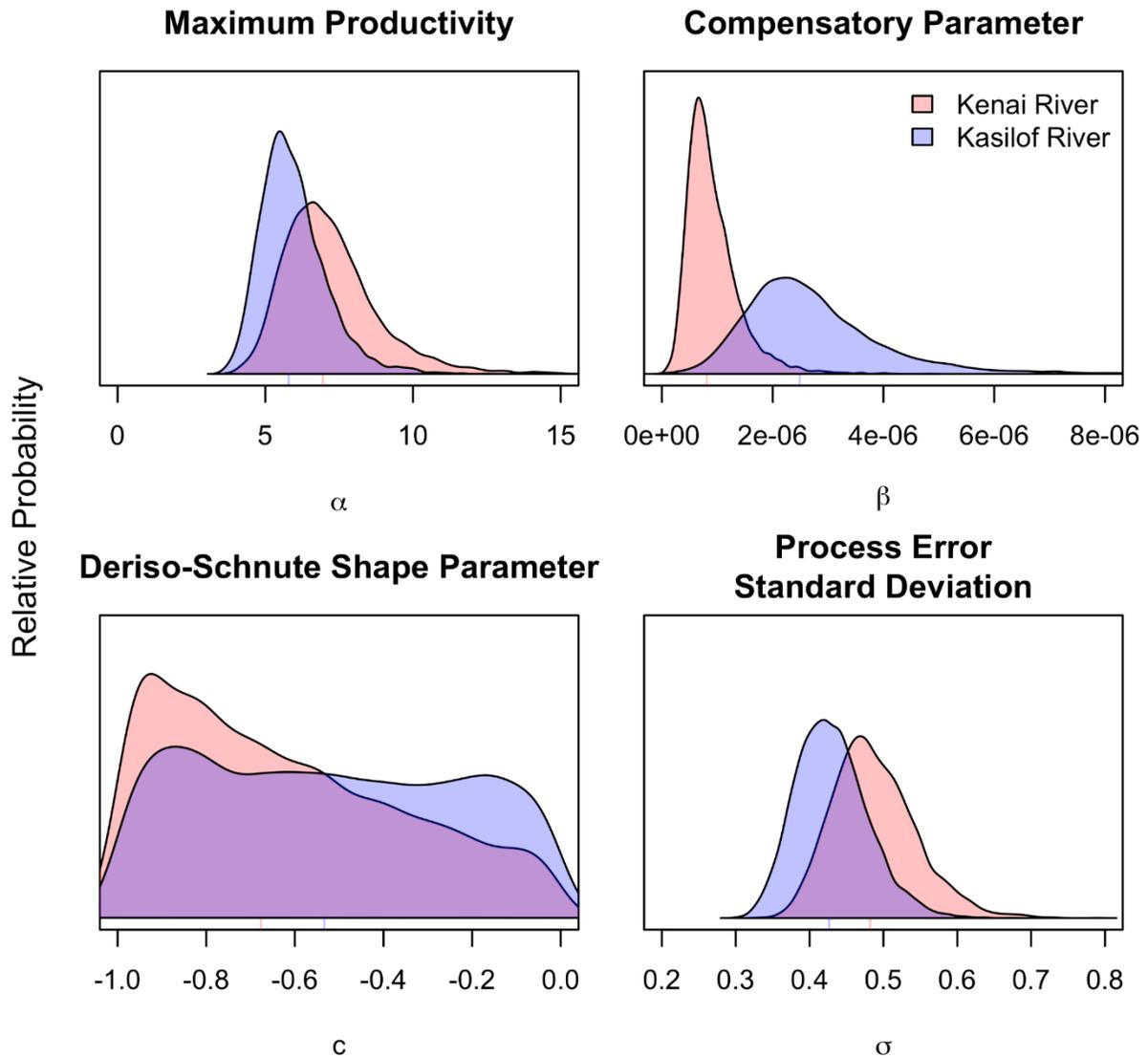


Figure 14. Posterior distributions for Deriso-Schnute model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

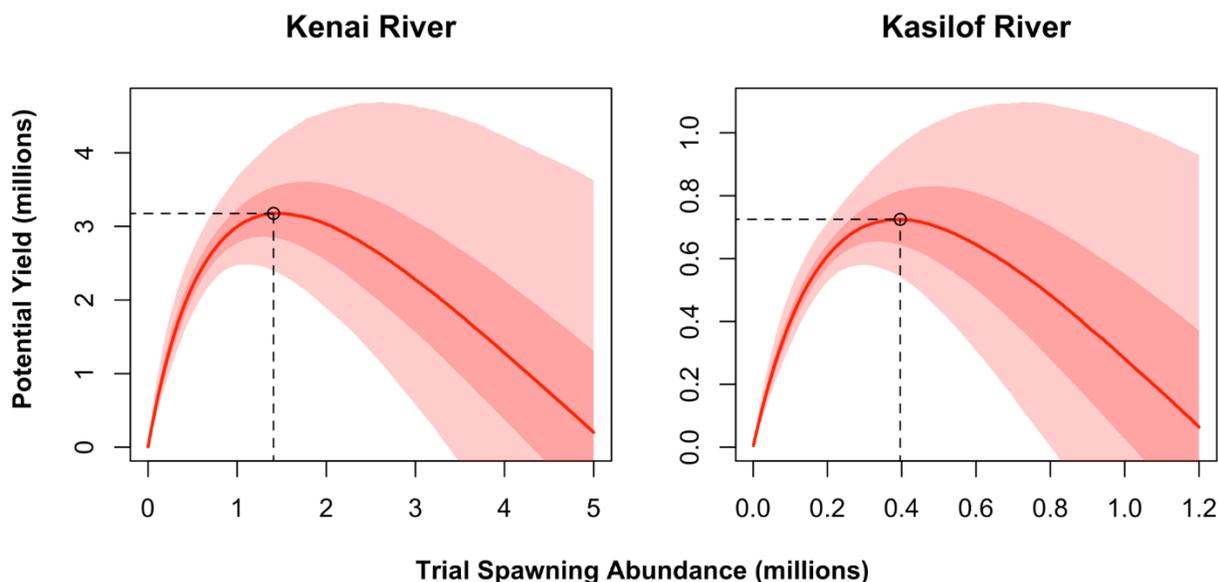


Figure 15. Simulated potential yield for the Deriso-Schnute model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted Smsy and MSY for each stock.

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**11. Appendix: United Cook Inlet Drift Association v. NMFS,
837 F.3d 1055 (9th Cir. 2016)**

12. Appendix: NOAA Office of General Counsel legal memorandum regarding “Scope of the “fishery” to be conserved and managed under the Fishery Management Plan for the Salmon Fisheries in the EEZ Off Alaska”

13. Appendix: Community Fisheries Engagement Indices of the Cook Inlet Salmon Drift Gillnet Fishery 1991–2018

This analysis¹¹⁶ adapts a framework developed by the National Marine Fisheries Service (NMFS) to create quantitative indices of fisheries engagement to help understand community well-being and participation in marine fisheries.^{117, 118} These performance metrics can be used to track fisheries participation over time using pre-existing data for all communities participating in commercial fisheries by examining the degree to which Alaska and non-Alaska communities participate in different aspects of commercial fisheries.¹¹⁹ This analysis focuses specifically on those communities engaged in Cook Inlet salmon drift gillnet harvesting and processing activities. The purpose of this analysis is to explore the degree to which communities are engaged in Cook Inlet salmon drift gillnet harvesting and processing and how their participation has changed over time. These indices can be used to provide information about the degree to which communities have sustained participation in this fishery over time to support NMFS and NPMFC decision making processes as they relate to National Standard 8.¹²⁰

Methods

Commercial Fisheries Engagement Indices

Communities were included in the analysis based on the activity of vessels that are prosecuting the Cook Inlet salmon drift gillnet fishery over the period 1991-2018. This analysis considers two somewhat distinct aspects of community engagement in commercial fisheries in Alaska: **a) commercial processing engagement** reflects activities associated with vessel landings and actual fish deliveries in the community and associated processing employment, municipal tax revenues, demand for supplies, and profits; **b) commercial harvesting engagement** reflects activities associated with the community of residence of the vessel owners engaged in this fishery as that community also benefits from the fisheries activity and associated income as well as some portion of crew and other supplies will also be procured in this location. The communities that are highly engaged in processing in Alaska are not always the same as those engaged in the harvesting, and this analysis will consider these two aspects of engagement and their impacts separately.

All communities in Alaska with activities in these fisheries are included in the analysis¹²¹, and non-Alaska communities are grouped into 5 groupings: the Seattle metropolitan statistical area (MSA), Other Washington, Oregon, California, and All Other States. Communities were included in the processing engagement analysis if any vessels using Cook Inlet salmon drift gillnet (S03H) permit made Cook Inlet salmon drift gillnet landings in the community from 1991-2018. Communities were included in the harvesting engagement analysis if the owner of a vessel which used a Cook Inlet salmon drift gillnet (S03H) permit and landed Cook Inlet salmon using drift gillnet gear (regardless of the community)

¹¹⁶ Please cite as: Kasperski, S. (2020). *Community Fisheries Engagement Indices of the Cook Inlet Salmon Drift Gillnet Fishery 1991-2018*. National Marine Fisheries Service, Alaska Fisheries Science Center. Seattle, WA

¹¹⁷ Jepson, M., & Colburn, L. L. (2013). *Development of social indicators of fishing community vulnerability and resilience in the US southeast and northeast regions*. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

¹¹⁸ A map of the most recent social indicators for coastal communities in the U.S. is available at: <https://www.st.nmfs.noaa.gov/humandimensions/social-indicators/map>

¹¹⁹ Himes-Cornell, A., & Kasperski, S. (2016). Using socioeconomic and fisheries involvement indices to understand Alaska fishing community well-being. *Coastal Management*, 44(1), 36-70.

¹²⁰ National Standard 8 States “*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 by utilizing economic and social data that meet the requirement of paragraph (2) [i.e., National Standard 2], 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.*”

¹²¹ Eagle River and Girdwood are included as part of Anchorage.

resided in the community for any year from 2010 through 2018.¹²² Processing engagement is represented by the amount of landings and associated revenues from landings in the community, the number of vessels delivering Cook Inlet salmon using drift gillnet gear in the community, and the number of processors in the community processing Cook Inlet salmon using drift gillnet gear. Harvesting engagement is represented by the Cook Inlet salmon drift gillnet landings and revenues associated with vessels owned by community residents (regardless of the location of landing), the number of vessels with Cook Inlet salmon drift gillnet landings owned by residents in the community, and the number of distinct resident vessel owners whose vessels made Cook Inlet salmon drift gillnet landings in any community. By separating commercial processing from commercial harvesting, the engagement indices highlight the importance of fisheries in communities that may not have a large amount of landings or processing in their community, but have a large number of fishermen and/or vessel owners that participate in commercial fisheries based in the community.

To examine the relative harvesting and processing engagement of each community, a separate principal components factor analysis (PCFA) was conducted each year for each category to determine a community's engagement relative to all other Alaska communities. There are 28 years in the study and two PCFAs are conducted each year (processing engagement and harvesting engagement) for a total of 56 different PCFAs summarized below.

PCFA is a variable reduction strategy that separates a large number of correlated variables into a set of fewer, linearly independent components. The first component from each PCFA, which by definition explains the most variation in the data, is used to create quantitative indices of engagement for each community by using the regression method of summing the standardized coefficient scores multiplied by their included variable values. A unique processing engagement index and harvesting engagement index value for each community in each year is created using the first un-rotated extracted factor from the PCFA, each of which resulted in single factor solutions with second factor eigenvalues below 1.00 for all 56 PCFAs. Each index is normalized to have a mean of zero and a standard deviation of one for each year across communities. These indices are relative scores in that they represent each community's engagement in commercial fisheries within a single year relative to all other communities in that year. Indices are then appended across all years to create a time series of relative engagement in these two aspects of commercial fisheries over time.

Communities that scored above one (above one standard deviation from the mean of zero) for any year are classified as highly engaged for that particular year. These communities are used in additional analyses to explore the changes in their participation for communities that were highly engaged for at least one year from 1991-2018 for Cook Inlet salmon drift gillnet processing engagement or harvesting engagement. It is important to note that since these are relative indices, a large change in the total number of active vessels over time will only cause a change in an index if one community loses a larger share of their vessels (or other commercial fisheries activities) than another community. If the change in number of active vessels (or other commercial fishing activities) are directly proportional to the existing number of vessels across communities, there will not be a change in the indices over time.

Regional Quotient

The regional quotient is a measure of the importance of the community's Cook Inlet salmon drift gillnet activities in terms of pounds landed or revenue generated from the entire Cook Inlet salmon drift gillnet fishery. It is calculated as the landings or revenue attributable to a community divided by the total landings or revenue from all communities and community groupings. The regional quotient is reported for revenue from landings in a community (similar to processing engagement). The regional quotient uses the

¹²² The owner's community is determined from the CFEC vessel registration each year.

same criteria for inclusion as the processing and harvesting engagement indices and is presented for all communities that were highly engaged for at least one year from 1991-2018.

Results

This section will report performance metrics of community participation in Alaska fisheries from 1991-2018. Data were collected for 71 communities or community groupings throughout the U.S. that had either some commercial Cook Inlet salmon drift gillnet fisheries landings or residents who owned vessels that were used in commercial Cook Inlet salmon drift gillnet fishing during this period. There were 20 communities that had some Cook Inlet salmon drift gillnet landings occurring in their community and were included in the commercial processing engagement analysis. In contrast, 64 of the 71 communities had a resident who owned a vessel that participated in commercial Cook Inlet salmon drift gillnet fishing and therefore were included in the commercial harvesting engagement analysis.

Cook Inlet Salmon Drift Gillnet Commercial Processing Engagement

The results of the commercial processing engagement PCFA analyses are shown in Table 13-1 which presents the eigenvalues, factor loadings, total variance explained, and Armor's theta reliability coefficient (Armor, 1973)¹²³ for all of the variables included in each PCFA. The results suggest very strong relationships among all variables, and that a single index based on the first extracted factor explains between 88% and 100% of the variation in each of the variables in each year. While it is uncommon to explain 100% of the variation in the variables, as only Kenai was accepting deliveries of Cook Inlet salmon from S03H permits (using drift gillnet gear) from 2005-2007, the variance is all explained by the included variables and only Kenai has a positive index score over that period.

¹²³ Armor, D.J., 1973. Theta reliability and factor scaling. *Sociological methodology*, 5, pp.17-50.

Table 13-1 Commercial Cook Inlet Salmon Drift Gillnet Processing Engagement PCFA Results.

Year	Eigenvalues				Factor Loadings				1 st Eigenvalue Percent variance explained	Armor's Theta
	1	2	3	4	Ex-vessel value	Pounds landed in community	Number of vessels delivering	Number of processors		
1991	3.83	0.16	0.01	0.00	0.99	0.94	0.99	0.99	0.96	0.98
1992	3.92	0.07	0.02	0.00	0.99	0.98	1.00	1.00	0.98	0.99
1993	3.88	0.11	0.01	0.00	0.99	0.96	0.99	0.99	0.97	0.99
1994	3.80	0.19	0.02	0.00	0.99	0.93	0.99	0.99	0.95	0.98
1995	3.85	0.15	0.00	0.00	1.00	0.94	0.99	0.99	0.96	0.99
1996	3.89	0.10	0.01	0.00	0.99	0.96	0.99	0.99	0.97	0.99
1997	3.91	0.09	0.00	0.00	1.00	0.97	0.99	0.99	0.98	0.99
1998	3.90	0.10	0.00	0.00	1.00	0.96	1.00	1.00	0.98	0.99
1999	3.86	0.13	0.01	0.00	1.00	0.95	0.99	0.99	0.97	0.99
2000	3.93	0.07	0.00	0.00	1.00	0.97	1.00	1.00	0.98	0.99
2001	3.94	0.06	0.00	0.00	1.00	0.98	1.00	1.00	0.98	0.99
2002	3.76	0.23	0.01	0.00	0.99	0.91	0.99	0.99	0.94	0.98
2003	4.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2004	3.97	0.02	0.01	0.00	0.99	0.99	1.00	1.00	0.99	1.00
2005	4.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2006	4.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2007	4.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2008	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2009	3.86	0.13	0.01	0.00	0.99	0.95	0.99	1.00	0.97	0.99
2010	3.83	0.16	0.01	0.00	0.95	0.97	1.00	1.00	0.96	0.99
2011	3.57	0.36	0.07	0.00	0.96	0.84	0.98	0.98	0.89	0.96
2012	3.83	0.17	0.00	0.00	0.99	0.93	0.99	0.99	0.96	0.98
2013	3.82	0.12	0.07	0.00	0.97	0.96	0.99	0.99	0.95	0.98
2014	3.83	0.15	0.03	0.00	0.99	0.94	0.99	0.99	0.96	0.99
2015	3.56	0.43	0.01	0.00	0.99	0.82	0.97	0.98	0.89	0.96
2016	3.56	0.43	0.00	0.00	0.99	0.80	0.98	0.98	0.89	0.96
2017	3.50	0.49	0.00	0.00	0.98	0.77	0.99	0.99	0.88	0.95
2018	3.61	0.39	0.00	0.00	0.99	0.83	0.99	0.99	0.90	0.96

In addition to the goodness of fit statistics of the analyses provided in Table 13-1, each PCFA provides an index score for each of the 20 communities included in the analyses. These index scores are presented in Table 13-2 for the six community and community groupings that were highly engaged (index score above one, which is one standard deviation above the mean of zero) for at least one year from 1991-2018. These cells are shaded in Table 13-2. The index is an indicator of the degree of participation in a community relative to the participation of other communities. It is a measure of the presence of commercial fishing activity including pounds landed, revenue, processors and the number of delivering vessels in the Cook Inlet salmon drift gillnet fishery.

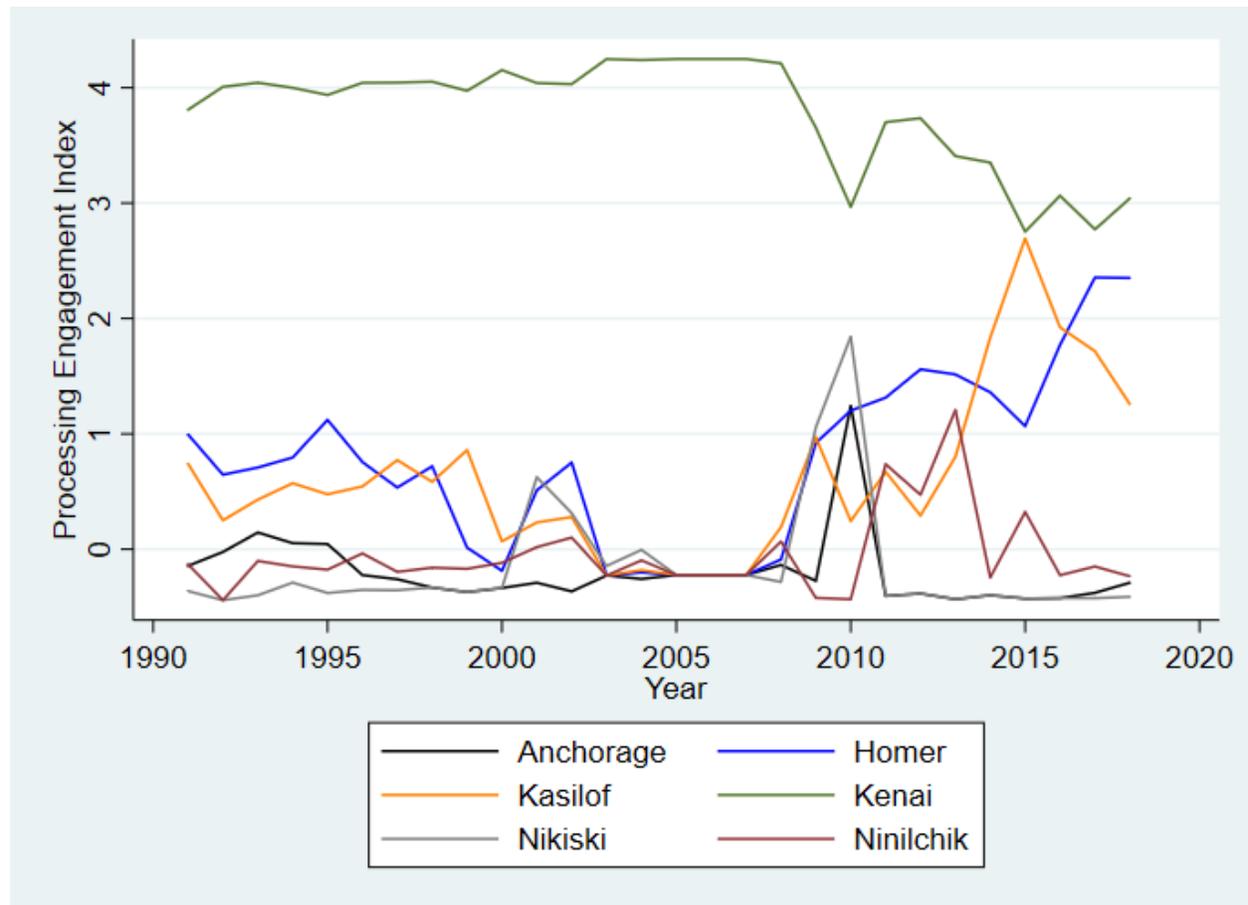
Table 13-2. Communities Highly Engaged in Cook Inlet Salmon Drift Gillnet Commercial Processing for One or More Years From 1991-2018*.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Anchorage	-0.1	0.0	0.1	0.1	0.0	-0.2	-0.3	-0.3	-0.4	-0.3	-0.3	-0.4	-0.2	-0.3	-0.2	-0.2	-0.2	-0.1	-0.3	1.2	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3
Homer	1.0	0.6	0.7	0.8	1.1	0.8	0.5	0.7	0.0	-0.2	0.5	0.8	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	0.9	1.2	1.3	1.6	1.5	1.4	1.1	1.8	2.4	2.4	
Kasilof	0.7	0.3	0.4	0.6	0.5	0.5	0.8	0.6	0.9	0.1	0.2	0.3	-0.2	-0.2	-0.2	-0.2	-0.2	0.2	1.0	0.2	0.7	0.3	0.8	1.8	2.7	1.9	1.7	1.3	
Kenai	3.8	4.0	4.0	4.0	3.9	4.0	4.0	4.1	4.0	4.2	4.0	4.0	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.0	3.7	3.7	3.4	3.4	2.8	3.1	2.8	3.0	
Nikiski	-0.4	-0.4	-0.4	-0.3	-0.4	-0.4	-0.4	-0.3	-0.4	-0.3	0.6	0.3	-0.1	0.0	-0.2	-0.2	-0.2	-0.3	1.1	1.8	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	
Ninilchik	-0.1	-0.4	-0.1	-0.1	-0.2	0.0	-0.2	-0.2	-0.2	-0.1	0.0	0.1	-0.2	-0.1	-0.2	-0.2	-0.2	0.1	-0.4	-0.4	0.7	0.5	1.2	-0.2	0.3	-0.2	-0.1	-0.2	

*Shaded cells are index scores above one (highly engaged) for at least one year from 1991-2018.

Of the six communities found in Table 13-2 and displayed in Figure 13-1, only Kenai was highly engaged in commercial processing all 28 years from 1991-2018. Kenai has the highest engagement scores over time, but declining engagement since 2009 with an increase from other processing communities. Kasilof and Homer had moderate but declining engagement throughout the 1990s until leaving the fishery in 2003-2007, but both have seen increases in their processing engagement in this fishery since 2009. Nikiski, Anchorage, and Ninilchik have had more variable engagement over time, but mostly in the 2009-2018 period, with a large increase in 2010 for Nikiski and Anchorage followed by exit from the processing sector since 2011. Ninilchik has had a higher overall level of engagement than Nikiski and Anchorage, particularly since 2011.

Figure 13-1. Index scores of communities highly engaged in commercial Cook Inlet salmon drift gillnet processing for at least 1 year from 1991-2018.



Processing Regional Quotient

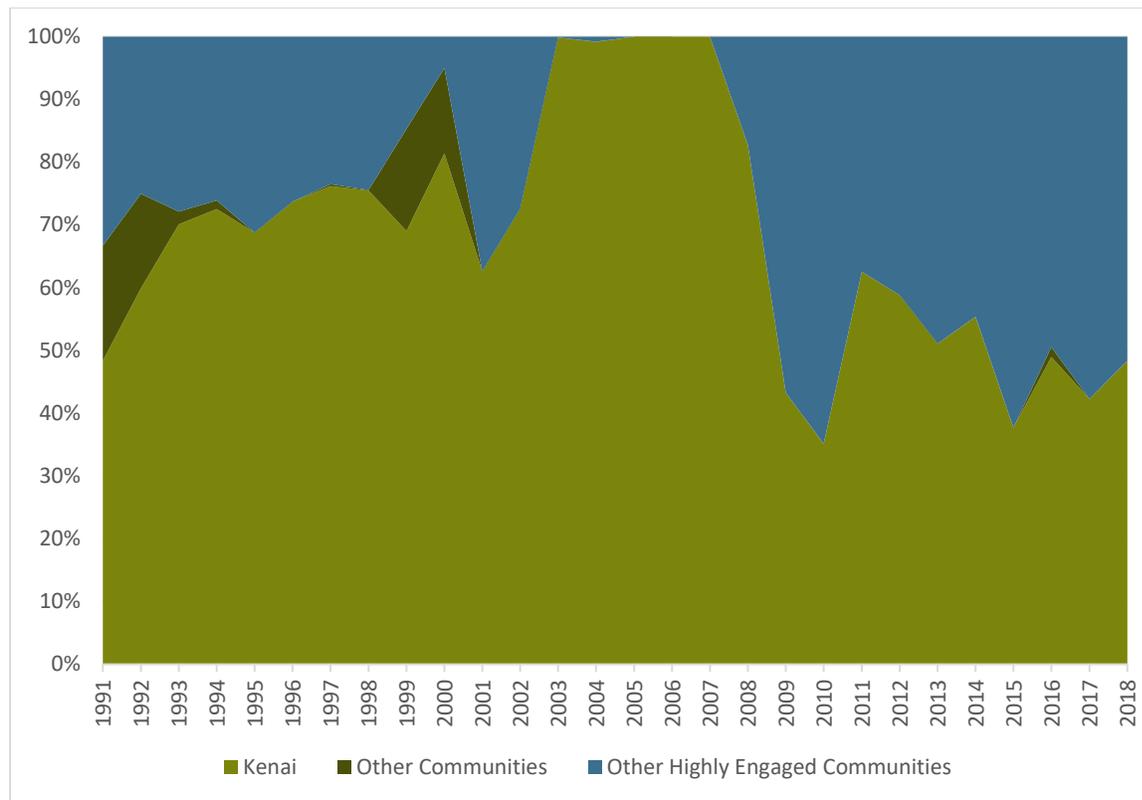
Another measure of a community’s participation in commercial Cook Inlet salmon drift gillnet fisheries is its processing regional quotient of revenues, defined as the share of commercial revenues within a community out of the total Cook Inlet salmon drift gillnet fishery revenues.¹²⁴ It is an indicator of the percentage contribution in revenue landed in that community relative the total revenue from all communities throughout the U.S. Figure 2 shows the processing regional quotient for revenue from 1991-2018. Due to confidentiality restrictions, communities are grouped into Kenai, the five “Other Highly

¹²⁴ The regional quotient for pounds is not calculated as pounds and revenues across communities are very highly correlated for a single species and does not show meaningful differences across communities, but is available upon request.

Engaged Communities” for at least one year of Anchorage, Homer, Kasilof, Nikiski, and Ninilchik, and all other communities.

The most prominent communities for processing Cook Inlet salmon drift gillnet in terms of ex-vessel revenue over this period has been Kenai and accounts for approximately 68% of the value of Cook Inlet salmon drift gillnet retained in the North Pacific on average. This is followed by Kasilof and Homer at 11.8% and 11.7%, respectively, both of which are experiencing different trends with Homer on the rise and Kasilof on the decline since its peak in 2015. Each of the other three highly engaged communities for at least one year, Anchorage, Nikiski, and Ninilchik, represented less than 3% of the total ex-vessel revenues over the period 1991-2018.

Figure 13-2. Processing regional quotient of revenue for communities highly engaged in commercial Cook Inlet salmon drift gillnet processing for at least one year from 1991-2018.



Commercial Cook Inlet Salmon Drift Gillnet Harvesting Engagement

The results of the commercial Cook Inlet salmon drift gillnet harvesting engagement PCFA analyses are shown in Table 13-3 which presents the eigenvalues, factor loadings, total variance explained, and Armor’s theta reliability coefficient (Armor, 1973)¹²⁵ for all of the variables included in each PCFA. The results suggest very strong relationships among variables and that a single index based on the first extracted factor explains over 98% of the variation in each of the variables in each year.

¹²⁵ Armor, D.J., 1973. Theta reliability and factor scaling. Sociological methodology, 5, pp.17-50.

Table 13-3 Commercial Cook Inlet Salmon Drift Gillnet Harvesting Engagement PCFA Results.

Year	Eigenvalues				Factor Loadings				1 st Eigenvalue Percent variance explained	Armor's Theta
	1	2	3	4	Ex-vessel value by resident owned vessels	Pounds landed by resident owned vessels	Number of vessels owned by residents	Number of vessel owners		
1991	3.97	0.03	0.01	0.00	0.99	1.00	1.00	1.00	0.99	1.00
1992	3.95	0.05	0.01	0.00	0.98	1.00	1.00	1.00	0.99	1.00
1993	3.97	0.03	0.00	0.00	0.99	1.00	1.00	1.00	0.99	1.00
1994	3.94	0.04	0.02	0.00	0.99	0.99	1.00	1.00	0.98	0.99
1995	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
1996	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
1997	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
1998	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
1999	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2000	3.99	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2001	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	0.99	1.00
2002	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	0.99	1.00
2003	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2004	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2005	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2006	3.90	0.10	0.00	0.00	0.99	0.98	0.99	0.99	0.98	0.99
2007	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2008	3.97	0.03	0.00	0.00	1.00	0.99	1.00	1.00	0.99	1.00
2009	3.97	0.03	0.00	0.00	1.00	0.99	1.00	1.00	0.99	1.00
2010	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2011	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2012	3.99	0.01	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
2013	3.97	0.03	0.00	0.00	1.00	0.99	1.00	1.00	0.99	1.00
2014	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	0.99	1.00
2015	3.95	0.05	0.00	0.00	1.00	0.99	0.99	0.99	0.99	1.00
2016	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	0.99	1.00
2017	3.94	0.06	0.00	0.00	0.99	0.99	0.99	0.99	0.98	0.99
2018	3.98	0.02	0.00	0.00	1.00	1.00	1.00	1.00	0.99	1.00

Index scores derived from the PCFA results are presented in Table 13-4 for the eight communities that were highly engaged (index score above one, which is one standard deviation above the mean of zero) for any year from 1991-2018. These cells are shaded in Table 13-4. The harvesting engagement index is an indicator of the degree of participation in a community relative to the participation of all other communities in the U.S. It is a measure of the presence of commercial Cook Inlet salmon drift gillnet fishing activities through residents who own commercial fishing vessels and includes Cook Inlet salmon drift gillnet pounds landed, revenue, the number of vessels harvesting Cook Inlet salmon with drift gillnet gear, and the total number of vessel owners harvesting Cook Inlet salmon using drift gillnet gear in a community.

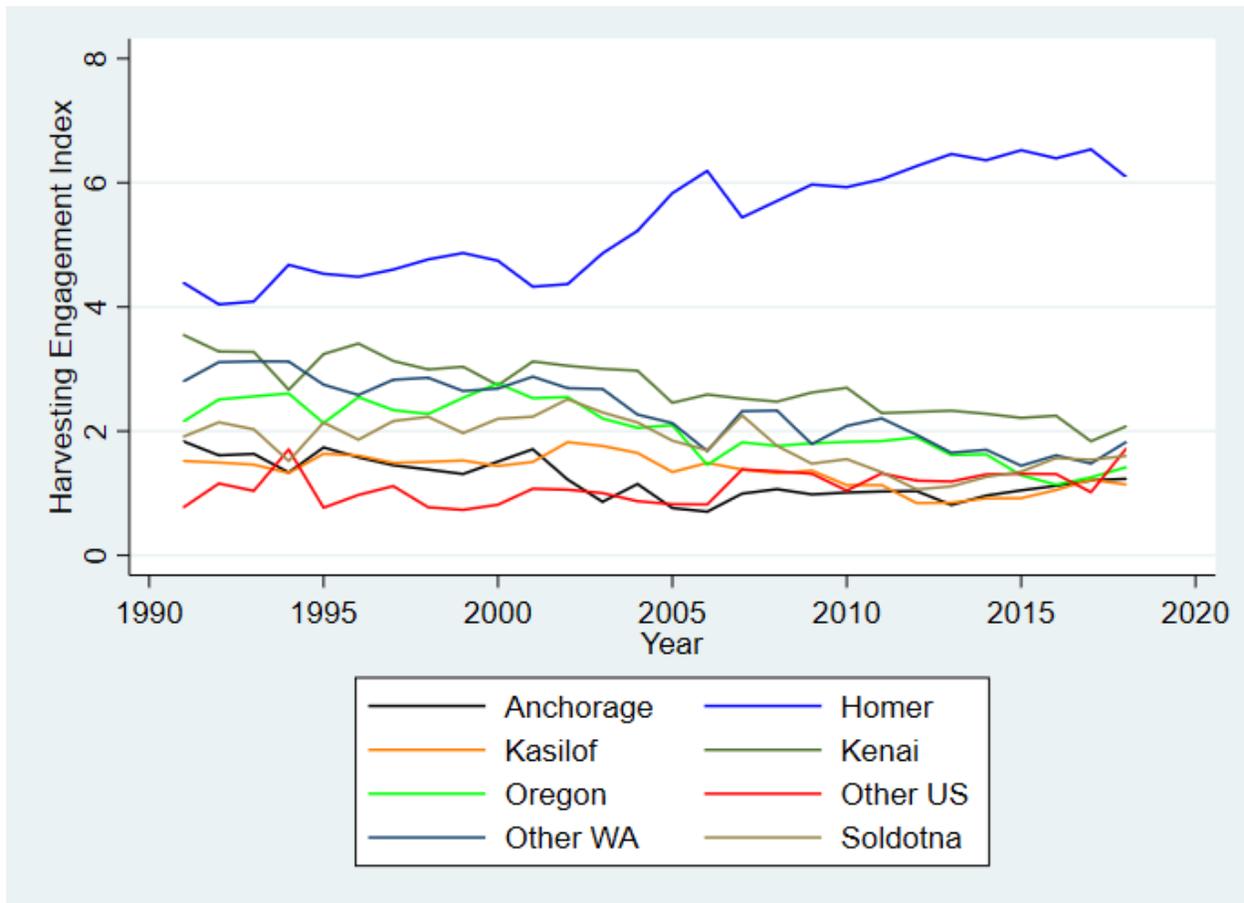
Table 13-4 Communities Highly Engaged in Cook Inlet Salmon Drift Gillnet Commercial Harvesting for One or More Years From 1991-2018*

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Anchorage	1.8	1.6	1.6	1.3	1.7	1.6	1.5	1.4	1.3	1.5	1.7	1.2	0.9	1.1	0.8	0.7	1.0	1.1	1.0	1.0	1.0	1.0	0.8	1.0	1.0	1.1	1.2	1.2
Homer	4.4	4.0	4.1	4.7	4.5	4.5	4.6	4.8	4.9	4.7	4.3	4.4	4.9	5.2	5.8	6.2	5.4	5.7	6.0	5.9	6.1	6.3	6.5	6.4	6.5	6.4	6.5	6.1
Kasilof	1.5	1.5	1.5	1.3	1.6	1.6	1.5	1.5	1.5	1.4	1.5	1.8	1.8	1.6	1.3	1.5	1.4	1.3	1.4	1.1	1.1	0.8	0.8	0.9	0.9	1.1	1.2	1.1
Kenai	3.5	3.3	3.3	2.7	3.2	3.4	3.1	3.0	3.0	2.7	3.1	3.1	3.0	3.0	2.5	2.6	2.5	2.5	2.6	2.7	2.3	2.3	2.3	2.3	2.2	2.2	1.8	2.1
Oregon	2.2	2.5	2.6	2.6	2.1	2.5	2.3	2.3	2.5	2.8	2.5	2.5	2.2	2.1	2.1	1.5	1.8	1.8	1.8	1.8	1.8	1.9	1.6	1.6	1.3	1.1	1.3	1.4
Other US	0.8	1.2	1.0	1.7	0.8	1.0	1.1	0.8	0.7	0.8	1.1	1.1	1.0	0.9	0.8	0.8	1.4	1.4	1.3	1.0	1.3	1.2	1.2	1.3	1.3	1.3	1.0	1.7
Other WA	2.8	3.1	3.1	3.1	2.7	2.6	2.8	2.9	2.6	2.7	2.9	2.7	2.7	2.3	2.1	1.7	2.3	2.3	1.8	2.1	2.2	1.9	1.7	1.7	1.4	1.6	1.5	1.8
Soldotna	1.9	2.1	2.0	1.5	2.1	1.9	2.2	2.2	2.0	2.2	2.2	2.5	2.3	2.1	1.8	1.7	2.3	1.8	1.5	1.5	1.3	1.1	1.1	1.3	1.3	1.6	1.5	1.6

*Shaded cells are index scores above one (which is one standard deviation above the mean of zero) for at least one year from 1991-2018.

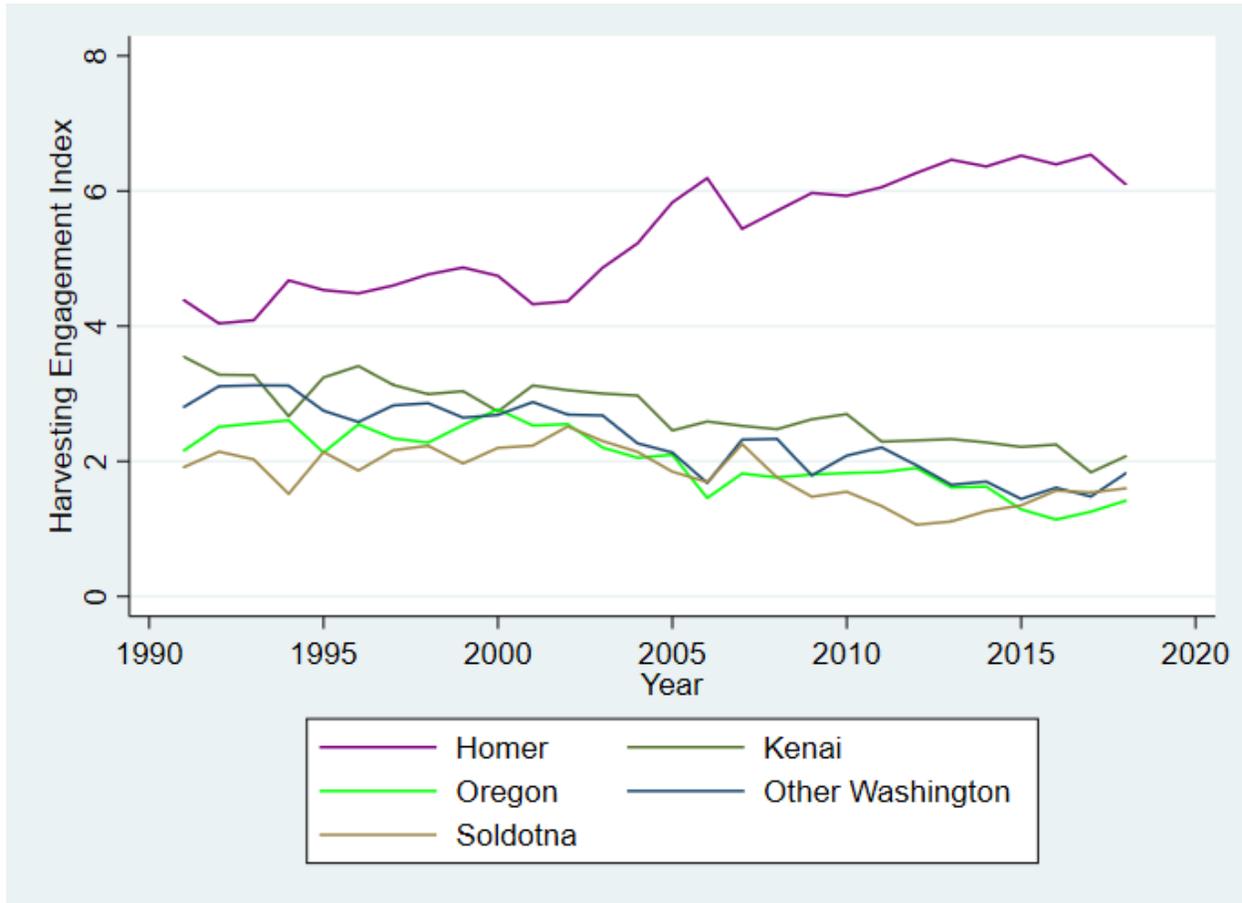
Figure 13-3 displays the commercial Cook Inlet salmon drift gillnet harvesting engagement index for the eight communities listed in Table 13-4. These trends will be explored in more detail below, but the most apparent trend from Figure 13-3 is that Homer has a substantially higher level of harvesting engagement than many of the other communities and community groupings, averaging 5.3 over the entire period while the next two highest average index scores are for Kenai and Other Washington at 2.7 and 2.3, respectively.

Figure 13-3 Index scores of communities highly engaged in commercial Cook Inlet salmon drift gillnet harvest for at least 1 year from 1991-2018.



Of the eight communities listed in Table 13-4 and shown in Figure 13-3, five communities were highly engaged in commercial harvesting for all years from 1991-2018 (Figure 13-4). They are Homer, Kenai, Oregon, Other Washington, and Soldotna. Homer has the highest commercial Cook Inlet drift gillnet salmon harvesting engagement scores over time, with an increasing index score, accelerating after 2003. All other communities that are highly engaged in the harvesting aspect of this fishery, Kenai, Oregon, Other Washington, and Soldotna have each had periods of higher and lower engagement with this fishery but have seen overall declining trends in the engagement indices over time.

Figure 13-4 Index scores of communities highly engaged in commercial Cook Inlet salmon drift gillnet harvest for all years from 1991-2018.



Participation Summary

Based on the community engagement index scores for both commercial Cook Inlet salmon drift gillnet processing and commercial Cook Inlet salmon drift gillnet harvesting engagement, communities were categorized into low (index scores below the mean of 0), medium (index scores between 0 and 0.5), medium-high (index scores between 0.50001 and 1), and high engagement (index scores above 1.00001) for each year. The number of years a community is in each category for the processing and harvesting engagement indices is presented in Table 13-4. There are 19 communities or community groupings in Table 13-4 that had medium, medium-high, or high engagement in either commercial Cook Inlet salmon drift gillnet harvesting or commercial Cook Inlet salmon drift gillnet processing engagement and 10 communities were highly engaged in one aspect of Cook Inlet salmon drift gillnet commercial fisheries in any year from 1991-2018. There were six communities that were highly engaged in commercial Cook Inlet salmon drift gillnet processing engagement and eight that were highly engaged in commercial Cook Inlet salmon drift gillnet harvesting engagement for at least one year from 1991-2018.

Table 13-5 Number of years by commercial Cook Inlet salmon drift gillnet processing and commercial Cook Inlet salmon drift gillnet harvesting engagement level. Alaska communities not listed had low commercial Cook Inlet salmon drift gillnet processing and commercial Cook Inlet salmon drift gillnet harvesting engagement in all years.

Community	Harvesting Engagement				Processing Engagement			
	Low	Medium	Medium-High	High	Low	Medium	Medium-High	High
Anchor Point	3	15	10	0	0	0	0	0
Anchorage	0	0	7	21	24	3	0	1
California	7	21	0	0	0	0	0	0
Delta Junction	27	1	0	0	0	0	0	0
Fritz Creek	27	1	0	0	0	0	0	0
Homer	0	0	0	28	7	1	10	10
Kasilof	0	0	4	24	5	9	9	5
Kenai	0	0	0	28	0	0	0	28
Kodiak	23	5	0	0	27	1	0	0
Nikiski	1	27	0	0	24	1	1	2
Nikolaevsk	20	8	0	0	0	0	0	0
Nililchik	10	18	0	0	21	5	1	1
Oregon	0	0	0	28	0	0	0	0
Other US	0	0	9	19	0	0	0	0
Other Washington	0	0	0	28	0	0	0	0
Seward	27	1	0	0	25	1	2	0
Soldotna	0	0	0	28	27	0	1	0
Sterling	12	16	0	0	0	0	0	0
Wasilla	13	15	0	0	0	0	0	0