

Discussion Paper:
**Revisions to the Fishery Management Plan for the
Salmon Fisheries in the EEZ Off Alaska**

November 6, 2018

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 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.

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Executive Summary

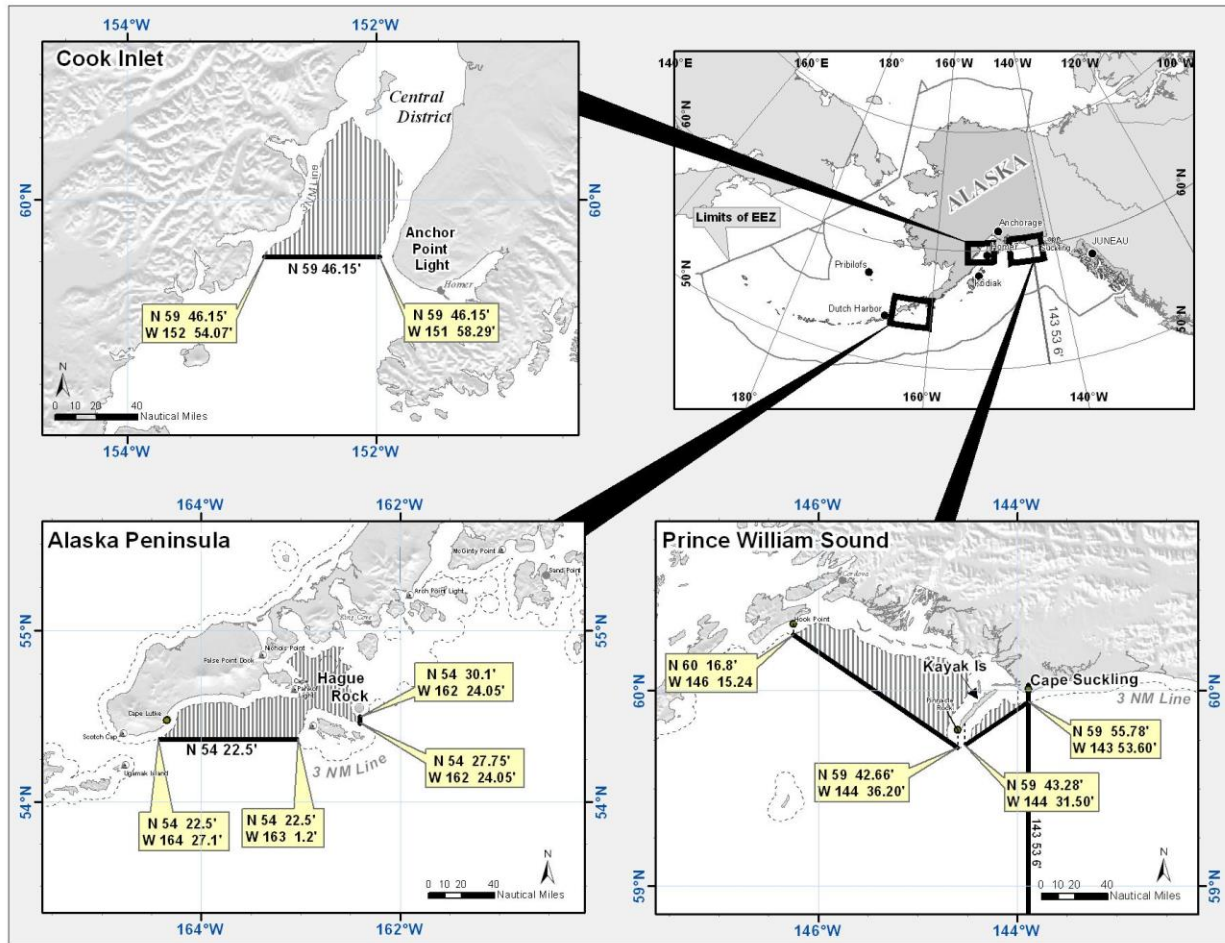
The North Pacific Fishery Management Council (Council) is considering an action that would amend the *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* (FMP) to manage the salmon fisheries that occur in Federal waters of Cook Inlet. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) 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 1990a) and in 2012 (NMFS 2012). 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 2- to 6-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 fishermen.

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 designed to specifically 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 to reflect both 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 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.

Next Steps

The Council intends to amend the FMP to manage the salmon fishery in the Cook Inlet EEZ. For this action, this discussion paper focuses on alternatives and options to apply Federal management to the commercial salmon fishery that occurs in the Cook Inlet EEZ. Federal management in an FMP must meet the Magnuson-Stevens Act required provisions for an FMP.

This discussion paper provides a discussion of possible options for each alternative to address the Magnuson-Stevens Act requirements for Council consideration at the December 2018 Council meeting. 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,
- 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.

If the Council decides to delegate specific management measures to the State in order to use existing State salmon management to the extent possible, the Council would need to identify those management functions that would be delegated and how the delegation process would operate.

The options developed for the Magnuson-Stevens Act requirements are summarized in Table ES-1 and discussed in further detail in Chapter 2. To further develop these options, the Council formed a Cook Inlet Salmon Committee.

Table ES-1 Magnuson-Stevens Act § 303 Contents of Fishery Management Plans and considerations and options to include required provisions in FMP for Cook Inlet

MSA § 303 Contents of Fishery Management Plans (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Potential Options under Alternative 2: Cooperative Management with the State of Alaska	Potential Options under Alternative 3: Federal Management
(1) contain the conservation and management measures , 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 salmon fisheries in the EEZ? Which measures should be delegated to the State under <i>MSA § 306(a)(3)(B)(3)</i> ? 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 Chapter 2.
(2) contain a description of the fishery (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. (See Chapter 4)	Not developed. Would be based on the Fishery Impact Statement in Chapter 4 but modified to reflect changes to the fishery under Federal management.
(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	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 1 guidelines at 50 CFR 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 2.6).	Would be based on the status determination criteria developed for Alternative 3.

MSA § 303 Contents of Fishery Management Plans (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Potential Options under Alternative 2: Cooperative Management with the State of Alaska	Potential Options under Alternative 3: Federal Management
<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? <i>MSA § 313(h)</i> 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>ADF&G Annual Management Report</p>	<p>SAFE Report prepared by the Salmon Plan Team</p>

MSA § 303 Contents of Fishery Management Plans (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Potential Options under Alternative 2: Cooperative Management with the State of Alaska	Potential Options under Alternative 3: Federal Management
(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		Temporary adjustments are inseason management actions delegated to the State under Category 2. (See section 2.4.2)	TBD
(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?	ADF&G Annual Management Report and other ADF&G reports	SAFE Report prepared by the Salmon Plan Team

MSA § 303 Contents of Fishery Management Plans (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Potential Options under Alternative 2: Cooperative Management with the State of Alaska	Potential Options under Alternative 3: Federal Management
<p>(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—</p> <p>(A) participants in the fisheries and fishing communities affected by the plan or amendment;</p> <p>(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</p> <p>(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.</p>	<p>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)).</p> <p><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.</p>	<p>Provided in the Fishery Impact Statement. (See Chapter 4)</p>	<p>Not developed. Would be based on the Fishery Impact Statement but modified to reflect changes to the fishery under Federal management.</p>

MSA § 303 Contents of Fishery Management Plans (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Potential Options under Alternative 2: Cooperative Management with the State of Alaska	Potential Options under Alternative 3: Federal Management
<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)</i>, <i>NS 2</i>, and the review process at <i>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 2.5.2).</p> <p>Use same annual process as used in the East Area.</p>	<p>Criteria are developed for the salmon stocks with escapement goals (See section 0) Two options: Option 1 - Specify salmon status determination criteria 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>

MSA § 303 Contents of Fishery Management Plans (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Potential Options under Alternative 2: Cooperative Management with the State of Alaska	Potential Options under Alternative 3: Federal Management
(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	What would the standardized reporting methodology be for the salmon fisheries 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> ?	Option 1- Full Retention of groundfish Option 2- Prohibit groundfish retention. <i>Reporting methods:</i> <ul style="list-style-type: none"> • VMS • Paper logbook • Electronic logbook • Electronic monitoring • Observers • eLandings 	Option 1- Full Retention of groundfish Option 2- Prohibit groundfish retention. <i>Reporting methods:</i> <ul style="list-style-type: none"> • VMS • Paper logbook • Electronic logbook • Electronic monitoring • Observers • eLandings
(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	Work with the ADF&G to compile this information for the FMP.		
(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	Work with the ADF&G to compile this information for the FMP. Could be part of the Fishery Impact Statement.	Provided in the Fishery Impact Statement. (See Chapter 4)	Not developed. Would be based on the Fishery Impact Statement but modified to reflect changes to the fishery under Federal management.

MSA § 303 Contents of Fishery Management Plans (a) REQUIRED PROVISIONS	Considerations to include required provisions in FMP	Potential Options under Alternative 2: Cooperative Management with the State of Alaska	Potential Options under Alternative 3: Federal Management
<i>(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</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 would propose rebuilding measures sufficient to comply with Magnuson-Stevens Act requirements.	TBD. This would require allocating between the EEZ harvest and state waters harvest.
<i>(15) 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)? 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).	Two options for ACLs for the salmon stocks caught in the three traditional net fishing areas. Option 1 - establish an ABC and ACL used the three tier system Option 2 – use the alternative approach for ACLs that is also used in the East Area.	Two options for ACLs for the salmon stocks caught in the three traditional net fishing areas. Option 1 - preseason ACL estimates and postseason ACL values. Option 2 - preseason forecasted run size and postseason values and species-specific 3-year geometric mean proportion of the species-specific UCI harvest occurring within Federal waters (See section 2.5)

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AAC	Alaska Administrative Code	SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpbacks
ABC	acceptable biological catch	State	State of Alaska
ACL	annual catch limit	SWHS	Statewide Harvest Survey
ADF&G	Alaska Department of Fish and Game	TAC	total allowable catch
ADOL	Alaska Department of Labor	UCI	Upper Cook Inlet
ADOR	Alaska Department of Revenue	U.S.	United States
AFSC	Alaska Fisheries Science Center	USCG	United States Coast Guard
AM	accountability measure	USFWS	United States Fish and Wildlife Service
AS	Alaska Statute	VMS	vessel monitoring system
BEG	biological escapement goal	WDPS	Western Distinct Population Segment
BiOp	biological opinion	WASSIP	Western Alaska Salmon Stock Identification Project
Board	Alaska Board of Fisheries		
BSAI	Bering Sea and Aleutian Islands		
CEQ	Council on Environmental Quality		
CFEC	Commercial Fisheries Entry Commission		
CFR	Code of Federal Regulations		
Council	North Pacific Fishery Management Council		
CPBD	catch per boat day		
CTC	Chinook Technical Committee		
CWT	coded-wire tag		
DPS	distinct population segment		
DSR	demersal shelf rockfish		
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		
FMP	fishery management plan		
FMU	fishery management unit		
FONSI	Finding of No Significant Impact		
FR	<i>Federal Register</i>		
ft	foot or feet		
GOA	Gulf of Alaska		
ITS	incidental take statement		
m	meters		
MFMT	maximum fishing mortality threshold		
MSA	Magnuson-Stevens Fishery Conservation and Management Act		
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		
NPFMC	North Pacific Fishery Management Council		
NS	National Standard		
OEG	optimal escapement goal		
OY	optimum yield		
PBR	potential biological removal		
PSC	prohibited species catch		
PWS	Prince William Sound		
RFA	Regulatory Flexibility Act		
RFFA	reasonably foreseeable future action		
SAFE	Stock Assessment and Fishery Evaluation		
SDC	Status Determination Criteria		
Secretary	Secretary of Commerce		
SEG	sustainable escapement goal		

1 History of the Salmon FMP

The North Pacific Fishery Management Council's (Council'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). 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 1990a) 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 the salmon fisheries in the EEZ, then known as the U.S. Fishery Conservation Zone. 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°53'36" 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)), and authorized commercial troll fishing in the East Area. The prohibition on commercial fishing in the West Area 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 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 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.²

With time, the 1979 FMP became outdated and some of Alaska's management measures 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 Magnuson-Stevens Act 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

¹The Salmon FMP is available at <https://www.npfmc.org/wpcontent/PDFdocuments/fmp/Salmon/SalmonFMP114.pdf>

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

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. The FMP has been amended twelve times since 1979, as detailed in Table 1-1.

On October 29, 1992, Congress repealed the 1954 Act and implemented the North Pacific Anadromous Stocks Act of 1992 (1992 Stocks Act).³ 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. 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.⁴ 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act and the National Standard 1 (NS1) Guidelines requirements for annual catch limits and accountability measures for stocks managed under an FMP. In December 2010, the Council unanimously 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.

³ The North Pacific Anadromous Stocks Act of 1992, Public Law 102-567, is codified at 16 USC. §§ 5001-5012.

⁴ 60 FR 39272, August 2, 1995.

Table 1-1 Amendments to the Salmon FMP.

Amendment	Year Approved	Pertinent Function(s)	Federal Register document
<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 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 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 FMU in the West Areas to remove Cook Inlet, Prince William Sound, and the South Alaska Peninsula. 	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

In April 2011, the Council reviewed a preliminary document that, along with a draft of the FMP that combines the 1990 FMP with all of the subsequent amendments, provides a thorough review of the amended 1990 FMP and a basic discussion of how and to what degree federal requirements are 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.

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 Salmon FMP, as amended through Amendment 12, titled *Fishery Management Plan for the Salmon Fisheries in the EEZ Off Alaska*, is referred to as the 2012 FMP in this discussion paper.

1.1 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 Magnuson-Stevens Act. 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act, including National Standards 3 and 7, the Administrative Procedure Act, and 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act was reasonable. The district court also determined that NMFS had not violated other provisions of the Magnuson-Stevens Act, 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 Magnuson-Stevens Act 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 Magnuson-Stevens Act, 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 Magnuson-Stevens Act. 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 Magnuson-Stevens Act, 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. The State of Alaska's petition to the Supreme Court does not stay the decision of the Ninth Circuit.

Because the Ninth Circuit's decision is now final, 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. 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.

1.2 Amending the FMP to address the Ninth Circuit's decision

In April 2017, the Council developed preliminary alternatives for FMP management in the three traditional net fishing areas. The alternatives include 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 Magnuson-Stevens Act and related Magnuson-Stevens Act provisions.

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 Magnuson-Stevens Act 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.

The Council directed NMFS and Council staff to initiate an analysis and work with the State of Alaska to develop alternatives to amend Salmon FMP. The Council adopted the following preliminary purpose and need and a preliminary range of alternatives.

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 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 intends 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 will be determined at a future meeting.

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 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 Magnuson-Stevens Act 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, and 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 review and appeal 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 meeting, the Council decided to amend the Salmon FMP to manage the commercial salmon fishery in the Cook Inlet EEZ. Focusing on Cook Inlet first allows the Council to design fishery management regime for Cook Inlet 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.

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 Judgment 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 Magnuson-Stevens Act and related Magnuson-Stevens Act 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,
- 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 that it intends to form a Salmon Committee for stakeholders to address the required provisions for an FMP amendment to manage the commercial fisheries 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 Magnuson-Stevens Act and related Magnuson-Stevens Act 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 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.

1.3 NPFMC Cook Inlet Salmon Committee

The Council established the Cook Inlet Salmon 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 that the Cook Inlet Salmon Committee's primary function is to (1) review and provide comments on specific, Council-identified issues; (2) develop options for fishery management measures for specific, Council-identified management needs, and (3) provide perspectives on potential social and economic impacts of proposed fishery management measures.

At the June 2018 meeting, the Council appointed five members to the Committee. The Council tasked the Committee primarily with review of issues related to management of the commercial drift gillnet salmon fishery, and so representatives from that sector currently comprise the Committee membership. Upon initial appointment of members, the Chairman provided a statement explaining his choice of committee composition, noting that the initial group of Committee members focused on Cook Inlet drift gillnet permit holders. The Chairman also noted that because management measures may affect other stakeholder groups, the composition of the Committee may change as measures are developed.

The selection of Committee members was consistent with standard Council practice and Council SOPPs, whereby names are solicited from the public for appointment by the Council Chairman who announces appointments to committees and other subsidiary bodies at the end of a given Council meeting. Selection of the initial Cook Inlet Salmon Committee members at the June Council meeting was deemed by the Chairman to allow them adequate time to prepare for review of the initial FMP analysis.

Information on the Committee meeting will be posted and distributed according to standard Council procedures, including noticing in the Federal Register.

1.4 Proposals from the public

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 Magnuson-Stevens Act and related Magnuson-Stevens Act 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 (KRSA).

The following summary lists the topics raised through the public comments/proposals. Often, several submissions converged on a particular topic. The list is broken into three parts: (1) recommended actions

to be taken during development of the amendment, (2) recommended outcomes to be affected through the amendment, and (3) perspectives on current management of salmon in Cook Inlet. For each part of the list, topics are arranged in descending order of popularity as reflected in the number of responses (number of responses indicated parenthetically). Because of its simplified nature, this list cannot capture subtle nuances in the responses that can only be appreciated by reading each letter.

Recommended actions as part of development of the FMP amendment

Overall management structure

- (12) Ensure consistency with MSA (National Standards) and other Federal laws
- (1) Model NPFMC Salmon FMP after Pacific Fishery Management Council Salmon FMP
- (1) Develop a division of Federal and State of Alaska management roles as in the FMP For Bering Sea/Aleutian Islands King and Tanner Crabs
- (1) Address observer coverage
- (1) Develop a progressive harvest structure in Cook Inlet EEZ based on projected sockeye runs in the Kenai River

Harvest specifications

- (3) Evaluate escapement-based management as a proxy for Annual Catch Limits
- (1) Reconcile Federal Optimum Yield with State Optimal Escapement Goals and Optimal Sustainable Yield

Committee representation

- (2) Ensure diverse representation on the Committee
- (2) Ensure representation of experienced, local stakeholders on the Committee
- (1) Ensure representation of young fishermen on Committee

Biological impacts analysis

- (2) Consider interactions with invasive species
- (2) Consider the effects of the Cook Inlet EEZ fishery on "stocks of concern" in Northern District and on Kodiak and Alaska Peninsula stocks
- (1) Evaluate EEZ salmon fishery impacts on Cook Inlet beluga whales
- (1) Consider impacts of EEZ fishery versus moving harvest of salmon nearer to spawning rivers

Socio-economic impacts analysis

- (1) Address social impacts, community impacts, community sustainability
- (1) Address banking and financial issues - access to capital, equity funding
- (1) Address economic issues and allocations - personal, community, borough, state
- (1) Address fishing sectors and allocation, including commercial, recreational & subsistence

Recommended outcomes

Management structure/Agency roles

- (3) Annual monitoring of State salmon management including creating a Salmon Plan Team
- (1) Delegate as much management as possible to the State (endorsement of Alt 2)

Competing Interests

- (1) Limit salmon harvest in Cook Inlet EEZ to sockeye salmon
- (1) Progressive harvest structure in Cook Inlet EEZ based on projected sockeye runs in the Kenai River
- (1) Stop all commercial fishing

Conservation

- (2) Minimizing fish waste

- (2) Sustainable salmon populations throughout range, including all of Cook Inlet drainage
- (2) In-season management that prevents under/over escapement, stabilizes harvest, allows for supplemental production
- (2) Harvest/management of "unmanaged" coho/pink/chum salmon stocks in Cook Inlet
- (1) Rebuilding timeline for "stocks of concern"

Stakeholder perspectives

Management issues

- (6) Negative characterizations of current management of salmon stocks
- (3) Access to resource is currently biased toward certain user groups
- (2) Management unit should extend from outer EEZ boundary to river headwaters
- (1) Negative characterization of commercial fishing including salmon fishery in Cook Inlet
- (1) Cannot manage Susitna salmon based on Kenai escapement
- (1) FMP amendment can/should be implemented quickly
- (1) UCIDA/CIFF have developed an updated Essential Fish Habitat impact analysis and an amended FMP that is 70-80% done

Conservation issues

- (7) Over-escapement / under-harvest is limiting salmon productivity and leading to waste
- (1) Beluga whales will return to Cook Inlet if salmon stocks increase
- (1) Invasive species impacts to spawning habitat are being ignored
- (1) Salmon movement and genetics need to be better understood

Socio-economic issues

- (1) The closing of two canneries in Ninilchik resulted in many jobs lost
- (1) Provided a historical background of Nikolaevsk and other Russian Old Believer Communities

1.5 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Act 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. These sections are excerpted below.⁵ 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 Magnuson-Stevens Act 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;

⁵ The complete Magnuson-Stevens Fishery Conservation and Management Act is available at http://www.nmfs.noaa.gov/sfa/magact/MSA_Amended_2007%20.pdf.

(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:

(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 Comparison of 1990 Salmon FMP and the 2012 Salmon FMP for Cook Inlet

The 1990 FMP contained only a few of the management measures required by the current Magnuson-Stevens Act and NS Guidelines. Importantly, the 1990 FMP's function in the three traditional net areas in the West was vague and did not reflect the Council's policy with respect to these areas. As a result, the 1990 FMP was no longer a viable FMP and it required substantive revisions. The Council developed the 2012 FMP to address these issues.

The EA prepared for Amendment 12 provides a detailed comparison of the changes from the 1990 FMP to the 2012 FMP. This section focuses on a comparison for the three traditional net fishing areas.

1.6.1 The Fishery Management Unit in the 1990 FMP

The fishery management unit of the 1990 FMP was composed of all waters of the EEZ off Alaska and the salmon fisheries that occur there (Figure 1-1).⁶ The 1979 FMP established federal authority over salmon fisheries in the EEZ but excluded that portion of the EEZ west of 175° E. longitude. Amendment 3 (1990) to the FMP extended jurisdiction to the area of the EEZ west of 175° E. longitude and expressly deferred regulation of the sport fishery and the Southeast Alaska commercial troll salmon fishery to the State. Commercial and sport salmon fisheries occurring in the EEZ were governed by State regulations.⁷ Although the Council and NMFS were removed from routine management of salmon fisheries in the EEZ, the 1990 FMP asserted and reserved federal authority and general NMFS and Council participation in and oversight of salmon management in the EEZ.

⁶ Salmon FMP, Section 2.1.

⁷ Salmon FMP, Section 2.2.

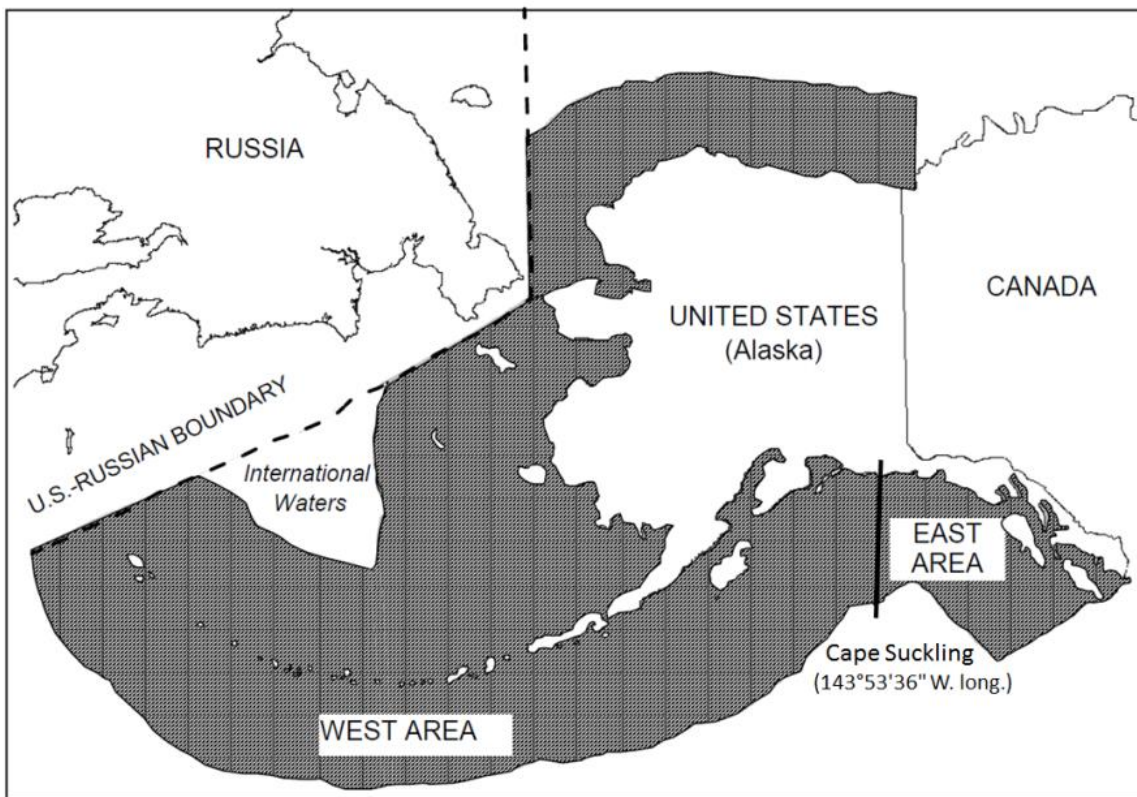
The 1990 FMP included all five species of Pacific salmon in the EEZ:

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 1990 FMP maintained the two management areas within its fishery management unit, the East Area and the West Area. The border between the two areas is at the longitude of Cape Suckling, at 143°53'36" W. longitude. The 1990 FMP addressed commercial salmon fisheries differently in the East and the West Areas, as described below.

The intended effect of the 1990 FMP was to conserve and manage the salmon resources in the North Pacific Ocean and to allow the fisheries that occur in State and EEZ waters to be managed as one fishery. The 1990 FMP explicitly delegated management of the commercial troll and sport fisheries to the State, to manage consistent with State and federal laws, including the Pacific Salmon Treaty between the United States and Canada.

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



East Area

The East Area is that portion of the EEZ off Alaska east of Cape Suckling.⁸ 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 Magnuson-Stevens Act. 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 sets 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.⁹ 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.

West Area

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. More information on these fisheries is provided in Chapter 4.

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.¹⁰ 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).¹¹ However, in 1992, Congress repealed the 1954 Act and implemented the *North Pacific Anadromous Stocks Act of 1992* (1992 Stocks Act).¹² 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*. 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*

⁸ 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).

⁹ 1990 FMP, Section 4.2, including subsections.

¹⁰ 1990 FMP, Section 2.2.2.

¹¹ 1990 FMP, Section 2.2.2.

¹² The North Pacific Anadromous Stocks Act of 1992, Public Law 102-567, is codified at 16 USC. §§ 5001-5012.

Pacific Ocean and do not extend into the U.S. EEZ as did the 1954 Act. Therefore, the other federal law that authorized State management of the net fisheries, in lieu of the 1990 FMP, no longer exists.

1.6.2 The Fishery Management Unit in the 2012 Salmon FMP

The 2012 FMP 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 Magnuson-Stevens Act. The 2012 FMP also retained all five species of Pacific salmon in the EEZ in the FMU.

The 2012 FMP 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, the 2012 FMP 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.

West Area

Amendment 12 modified the FMP's management area to remove the three traditional net areas (Figure 1-2, Figure 1-3, and Figure 1-4) from the West Area. Removing these three areas from the 2012 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 2012 FMP continued to prohibit commercial salmon fishing in the redefined West Area. The 2012 FMP 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 2012 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 2012 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 the 2012 FMP, 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 Magnuson-Stevens Act, (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 2012 FMP maintained the Council's policy for salmon management established with the original FMP in 1979.

Figure 1-2 Cook Inlet Area – The EEZ waters that are excluded from the management area are those waters north of the line from Anchor Point.

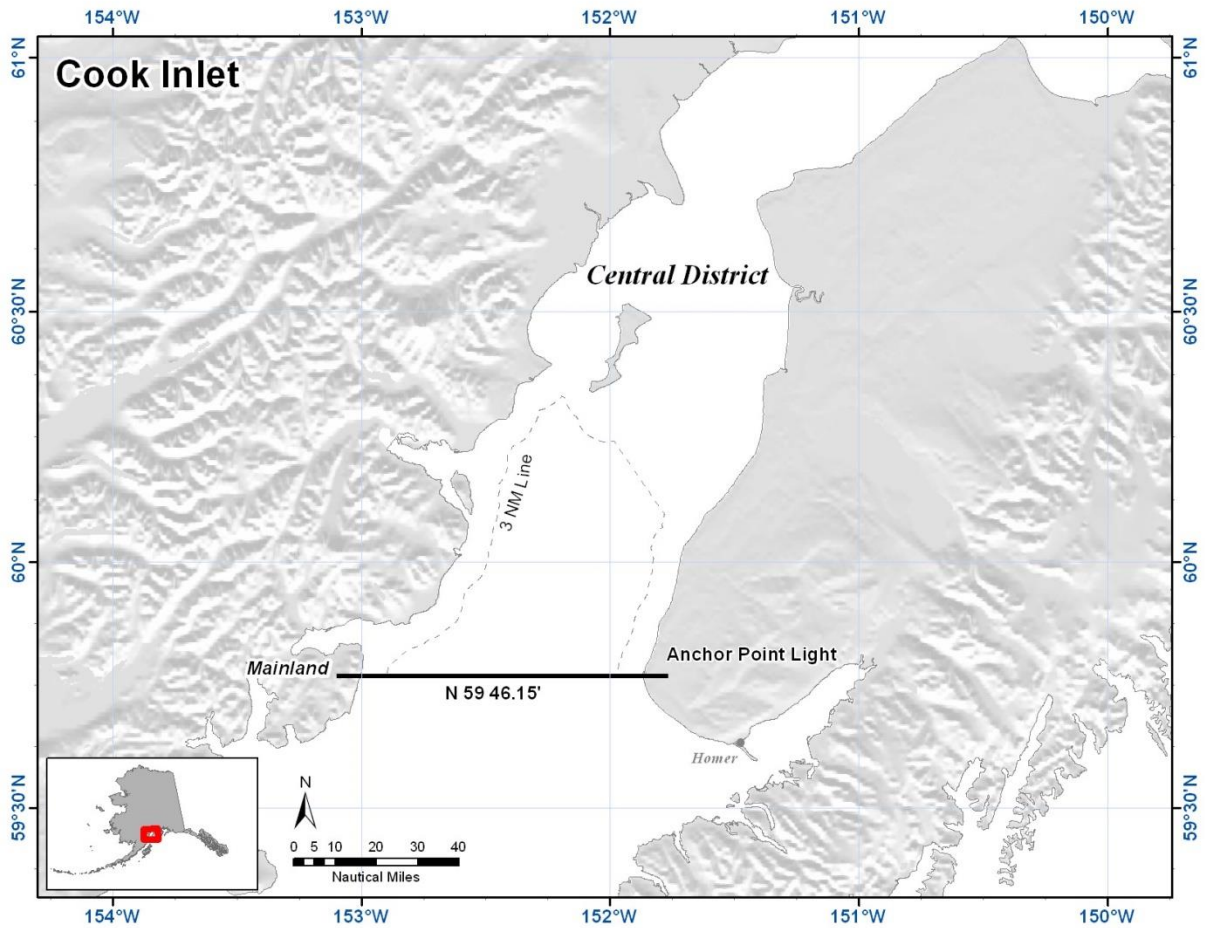


Figure 1-3 Prince William Sound Area– The EEZ waters that are excluded from the management area are shoreward of the line from 3 miles south of Hook Point to 3 miles south of Pinnacle Rock and from a line at state waters at Pinnacle Rock to 3 miles south of Cape Suckling.

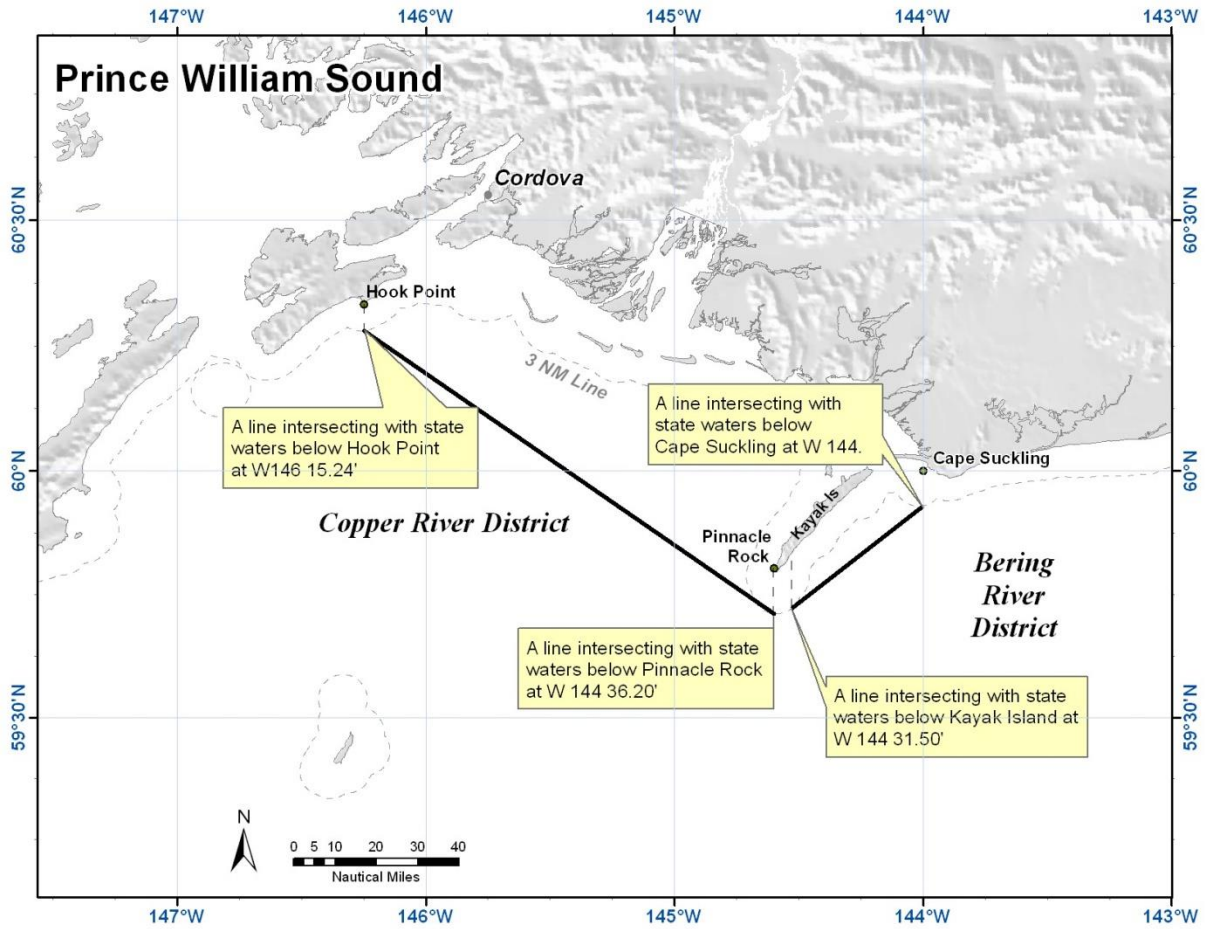
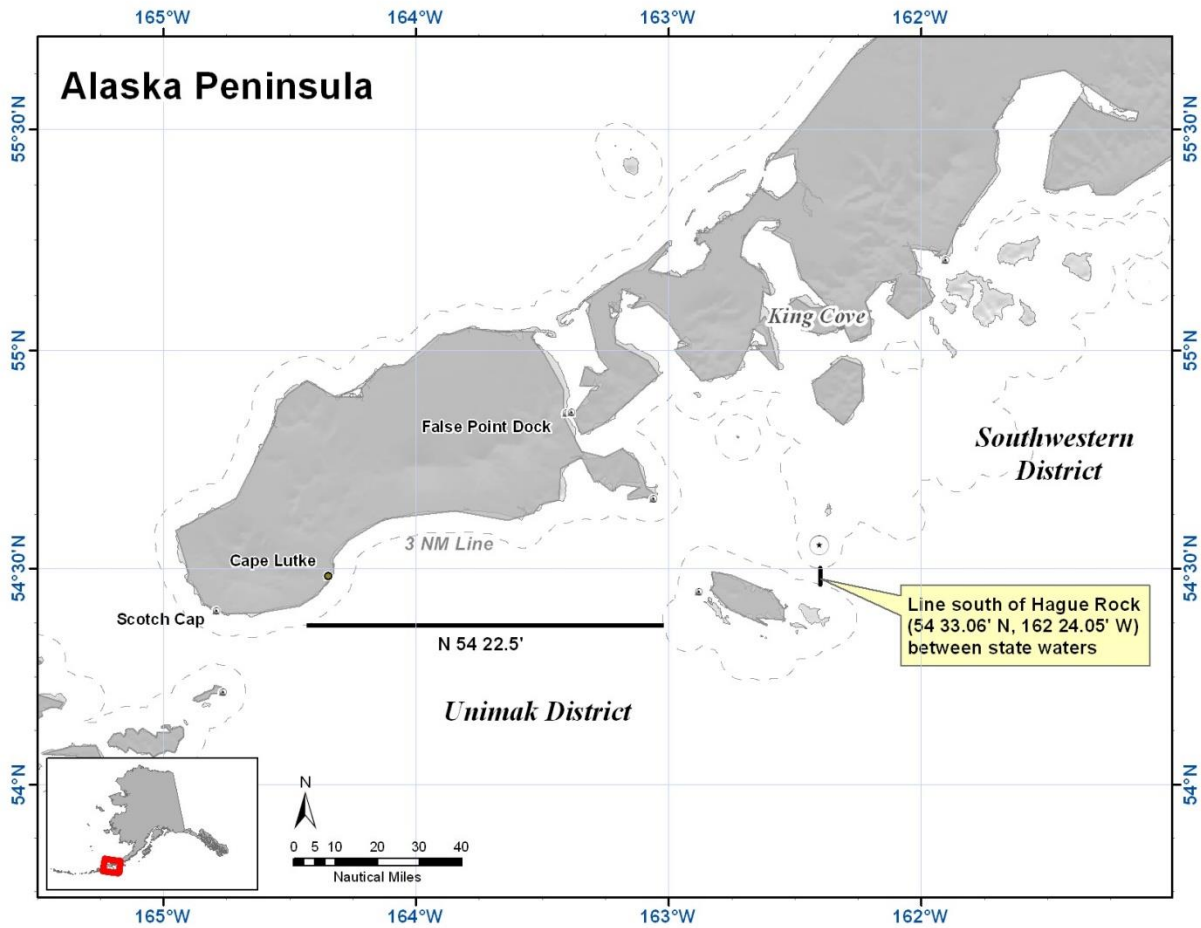


Figure 1-4 Alaska Peninsula Area – The EEZ waters that are excluded from the management area are shoreward starting from the line at 54°22.5' and a line south of Hague Rock between state waters.



2 Amending the Salmon FMP to manage the commercial salmon fisheries in the Cook Inlet EEZ

Due to 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.

The Magnuson-Stevens Act is the primary domestic legislation governing management of the nation's marine fisheries. The Magnuson-Stevens Act 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 Magnuson-Stevens Act requires a fishery management plan contain specific conservation and management measures. Section 301(a) of the Magnuson-Stevens Act 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 Magnuson-Stevens Act and its national standards, and these should be closely considered when developing options for meeting the Magnuson-Stevens Act requirements. The FMP does not address any of these requirements for the fisheries in the three traditional net fishing areas, except for Essential Fish Habitat (EFH).

Because the Salmon FMP must be amended to include the Cook Inlet EEZ and manage the commercial salmon fisheries occurring within them, this discussion paper preliminarily identifies the Magnuson-Stevens Act requirements that are not currently addressed the Cook Inlet EEZ. The FMP does not contain, among other things, status determination criteria for determining when a stock is overfished or experiencing overfishing, annual catch limits (ACLs) and accountability measures (AMs), methods to report bycatch and measures to minimize bycatch and the mortality of unavoidable bycatch, or a Fishery Impact Statement. This discussion paper also identifies next steps and decision points for Council consideration.

A new Federal/State management regime would need to be created and implemented for the salmon fisheries in Cook Inlet. Specific objectives and management measures would be required in the FMP comply with the Magnuson-Stevens Act, and to provide sufficient framework to define state and federal roles under a delegated management program in the Cook Inlet EEZ.

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 (Board). The FMP would need to be updated and revised to establish management measures that meet Magnuson-Stevens Act requirements and NS Guidelines for the Cook Inlet EEZ. This chapter initially identifies for Council consideration the following provisions as necessary to manage the Cook Inlet EEZ.

The Council will need to clarify the FMP's management policy and objectives for the commercial salmon fisheries in Cook Inlet. To address Magnuson-Stevens Act provisions, new management measures that do not currently exist 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 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 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.

FMP management would not be able to control harvests in State waters and would have to be responsive to harvests in State waters. In other words, the EEZ portion of the fishery would only occur if there was harvestable surplus after accounting for 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 a fishery occurs in both state and federal waters, federal management of the federal portion of the fishery is responsive to State management of the portion of the fishery that occurs 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) is set taking 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, Federal and State regulations are structured such that concurrent openings occur in both State and federal waters for some fisheries (e.g., parallel fisheries). However, State waters only fisheries (i.e., guideline harvest level fisheries) are still accounted and applied against Federal status determination criteria.

Pre-emption of State management in state waters

Per the Magnuson-Stevens Act, FMP management would only apply to the Cook Inlet EEZ and that portion of the commercial salmon fisheries that occur in the Cook Inlet EEZ. Under the Magnuson-Stevens Act, an FMP only has authority to manage the fisheries that occur in the EEZ. The Magnuson-Stevens Act is clear that nothing in the Magnuson-Stevens Act shall be construed as extending or diminishing the jurisdiction or authority of any state within its boundaries.¹³ Absent formal preemption in accordance with Magnuson-Stevens Act § 306(b), the Magnuson-Stevens Act does not provide authority for the Council to manage fisheries in state waters, which would be required for the Council to change escapement goals or to allocate more salmon to a specific gear group, or to direct the State to make these types of changes.

The Magnuson-Stevens Act does provide the Secretary 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 fisheries regulations require data, analysis, and an extensive process. NMFS does not have the information, expertise, or infrastructure necessary to manage Alaska salmon fisheries in federal or State waters, at present.

¹³ 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.

2.1 Preliminary Purpose and Need

In October 2017, the Council adopted the following 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.

2.2 Alternatives

The Council adopted the following preliminary range of alternatives and directed 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.

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: Cooperative management with 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 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: 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 (Section 2.3),
- conservation and management measures,
- status determination criteria (Section 2.5),
- annual catch limits and accountability measures (Section 2.5)
- methods to report bycatch and measures to minimize bycatch and the mortality of unavoidable bycatch (Section 2.8 and Section 2.9),
- the salmon plan team or other process for annually determining status of the stocks and providing stock assessment (2.7) and fishery evaluation information (Section 4), and
- the process for review and appeal of State management measures applicable under the FMP (Section 2.10).

The following sections discuss these issues and provide preliminary ideas for options for each new management measure.

2.3 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 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.

2.3.1 Alternative 1: No Action

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

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.

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 Alternative 2: Cooperative management with the State

Although the Council may want to consider the development of a new management policy and objectives specifically applicable to the Cook Inlet EEZ, one option for Council consideration is to maintain the existing management policy and objectives and have them continue to apply to all areas managed by the FMP (i.e., both the East Area and the West Area (which would include the Cook Inlet EEZ)). This approach would require some modifications to Management Objectives 1 and 2. Objectives 1 and 2 could be modified as follows—

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~~). **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 Cook Inlet** 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 **and the Cook Inlet EEZ**, ~~†This objective is achieved by delegating management of the sport and commercial troll~~ salmon fisheries ~~†~~ to the State, to manage consistent with State and Federal laws, including the Pacific Salmon Treaty. In the West Area **outside of Cook Inlet**, 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.

2.3.3 Alternative 3: Federal management

Under Alternative 3, the Council would develop a new management policy and new management objectives for the commercial 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 remaining portion of the West Area closed to commercial salmon fishing.

These management policy and objectives are based on the in the Fishery Management Plan for the Groundfish of the Bering Sea and Aleutian Islands Management Area.

Management Policy

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 Magnuson-Stevens Act 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 socially and economically viable fisheries for the 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.
- Preserve the food web.
- 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.
- Improve data quality, monitoring, and enforcement.

2.4 Procedures for FMP Implementation

Chapter 4 of the Salmon FMP establishes the roles of agencies in implementing the FMP. To amend the FMP to manage the commercial salmon fisheries in the Cook Inlet EEZ, the new FMP amendment 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.

2.4.1 Alternative 1: No Action

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 are consistent with the FMP, the Magnuson-Stevens Act, and other applicable Federal law. Chapter 9 describes the ways in which the Council and NMFS will monitor 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 Magnuson-Stevens Act, or other applicable federal law. In addition to this delegation, the FMP contains the required FMP measures under section 303(a) of the Magnuson-Stevens Act for the East Area.

The FMP directly manages the West Area. Because the Cook Inlet EEZ is not under the FMP, the FMP does not delegate management of the commercial salmon fisheries that occur in the Cook Inlet EEZ to the State and does not contain any procedures for implementing the FMP in the Cook Inlet EEZ.

2.4.2 Alternative 2: Cooperative management with the State

For the Cook Inlet EEZ, Alternative 2 would delegate certain management functions to the State and establish which specific types of management measures would be delegated to the State and requirements associated with delegated authority. The FMP would need to include transparent procedures for delegating management of the commercial salmon fisheries in the Cook Inlet EEZ. Under Alternative 2, the Council and NMFS would continue to directly manage the remainder of the EEZ in the West Area under the FMP.

Under § 306(a)(3)(B) of the Magnuson-Stevens Act, 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 1990 FMP was in place on August 1, 1996 and the 1990 FMP did not explicitly delegate management of the commercial salmon fisheries in the three traditional net fishing areas to the State as of 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.

These proposed procedures to delegate management 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. These procedures would apply to the commercial salmon fishery in the Cook Inlet EEZ.

Procedures for FMP Implementation (Federal/State)

A primary objective of the FMP is to facilitate State of Alaska salmon management for the salmon fisheries that occur in the EEZ in accordance with the Magnuson Stevens Act, Pacific Salmon Treaty, and applicable federal law. To the extent practicable, NMFS will coordinate with ADF&G to develop management measures for the salmon fisheries in the EEZ that are consistent with the objectives of the FMP and the Magnuson-Stevens Act.

The FMP would establish the following protocol which describes the roles of the Federal and State governments:

1. The Council will develop and amend the FMP to govern management of salmon fisheries in the EEZ, prescribing objectives and any management measures found by the Council and NMFS to be necessary for effective management. The State will promulgate regulations applicable to all vessels governing the fisheries in the EEZ that are consistent with the FMP, Magnuson-Stevens Act, and other applicable Federal law.

The following description of management measures is not intended to limit the State government to only these measures. However, implementation of other management measures not described in the FMP must be consistent with the FMP, the Magnuson-Stevens Act, and other applicable Federal law.

The FMP contains two categories of management measures:

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.

Category 1 (Federal)	Category 2 (State)
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	Fishing Seasons Closed Waters Management Area, District, Subdistrict, Section, and Statistical Area Boundaries Vessel Size Limits Inseason Management Legal Gear Recordkeeping and Reporting Limited Entry Permits Other

2. Representatives from the Council, NMFS, and NOAA General Counsel will coordinate with the State in the development of regulations for salmon fisheries management in the EEZ for the purpose of assisting the State in determining the extent to which proposed management measures are consistent with the FMP, Magnuson-Stevens Act, and other applicable Federal law. NMFS will review measures adopted by the State to determine if they are consistent with the FMP and the Magnuson-Stevens Act and its national standards in accordance with FMP Chapter 9.

3. Under FMP Chapter 9, the Secretary will consider only those appeals asserting that a State law is inconsistent with the Magnuson-Stevens Act, the FMP, or other applicable Federal law. If necessary, NMFS will issue Federal regulations to supersede in the EEZ any State laws that are inconsistent with the FMP, the Magnuson-Stevens Act, or other applicable Federal law.

4. ADF&G will provide the information on which to base State fishing regulations and will consult with the NMFS (Alaska Region and Alaska Fisheries Science Center), NOAA General Counsel, and other fishery management or research agencies in order to prevent duplication of effort and assure consistency with the Magnuson-Stevens Act, the FMP, 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. Interested persons may appeal these actions to the Secretary for a determination that the emergency orders are consistent with the Magnuson-Stevens Act, the FMP, and other applicable Federal law. If the Secretary determines that the State action is inconsistent with the above, the Secretary will issue a Federal regulation to supersede the State EO in the EEZ (see FMP Chapter 9).

6. The State will provide written explanations of the reasons for its decisions concerning management of salmon fisheries in the EEZ. For emergency orders, the current EO written justification provided by the State meets this requirement.

7. ADF&G will provide the Annual Management Report to the Council which discusses the status of the stocks and economic status of the fisheries, with NMFS and plan team input incorporated as appropriate. This report will be made available to the public and presented to the Board and Council on an annual basis.

8. NOAA Office of Law Enforcement and the U.S. Coast Guard shall work in cooperation with the State to enforce regulations for the salmon fisheries in the 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, some description of each type of management measure that is delegated would be needed. The following provides possible descriptions for the Category 2 management measures identified above.

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. The FMP authorizes the State to modify and adopt fishing seasons consistent with the FMP, the Magnuson-Stevens Act, 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 in order 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 fisheries 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 types of legal net gear 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 adjusting 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 emergency order.

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 and the FMP authorizes the State to modify terms of limited entry and issuance of entry permits consistent with the FMP, the Magnuson-Stevens Act, and other applicable federal law.

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.

Vessel size limits – Vessel size limits are an important tool in ensuring conservation of salmon stocks while balancing economic efficiency and fairness among fishery participants. The State has adopted a maximum length for salmon vessels using purse seine gear throughout waters of Alaska and in the West Area. The FMP authorizes the State to modify size limits for salmon vessels to achieve specific conservation, economic, and social objectives consistent with the FMP, the Magnuson-Stevens Act, and other applicable federal law.

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 Magnuson-Stevens Act, 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 the FMP.

2.4.4 Alternative 3: Federal management

Because Alternative 3 would maintain Federal management of the Cook Inlet EEZ 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 Status Determination Criteria (overfishing and overfished) and Annual Catch Limits

To achieve NS1 – prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery – the Magnuson-Stevens Act 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 (Magnuson-Stevens Act § 303(a)(10)) and (2) establish mechanisms for specifying ACLs to prevent overfishing and include AMs to prevent ACLs from being exceeded and to correct overages of the ACL if they do occur (Magnuson-Stevens Act § 303(a)(15)).¹⁴ Magnuson-Stevens Act § 302(h)(6) requires each Council to develop annual catch limits for each of its managed fisheries, and the annual catch limits cannot exceed the fishing level recommendation of its SSC or the Council’s peer review process established under subsection (g). Magnuson-Stevens Act §302(g)(1)(E) states that the Secretary and each Council may establish a peer review process for that Council for scientific information used to advise the Council about the conservation and management of the fishery. The NS 1 Guidelines provide guidance on how to meet these Magnuson-Stevens Act requirements and describe fishery management approaches to meet the objectives of NS 1.¹⁵ Under Magnuson-Stevens Act § 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 three net fishing areas in the West Area, the Council would need to develop status determination criteria for the salmon stocks caught in the fisheries in these three areas. The purpose of

¹⁴ MSA §303(a)(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.”

¹⁵ The final rule for the revised NS 1 Guidelines is available at <https://alaskafisheries.noaa.gov/sites/default/files/81fr71858.pdf>.

status 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 standard approaches to specification of reference points set forth in the NS1 Guidelines are difficult to reconcile with the existing escapement-based management structure and associated in-season monitoring and management measures for the salmon fisheries that occur in the Cook Inlet EEZ. The State salmon stock assessment and management program is dependent on biological reference points for salmon populations that are estimated based on long-term, stock specific assessment of recruits from parent escapement or from long-term assessment of escapement. Estimating biological reference points for salmon populations requires direct assessment of the spawning stock. NS1 Guidelines and status determination criteria are catch and exploitation rate based, using information available pre-season. Reference points as defined in NS1 Guidelines do not directly correspond to the biological reference points underlying the state's escapement-based management program. Escapement goals are fixed and escapement levels are monitored in-season. The allowable catch to maintain escapements within the escapement goal range or above the threshold is variable and not known pre-season.

The NMFS Alaska Fisheries Science Center reviews and certifies the 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.

2.5.1 Alternative 1: No Action

Chapter 6 of the 2012 FMP provides the status determination criteria.

East Area

The status determination criteria in section 6.1 of the 2012 FMP for the East Area are separated into three tiers for the purposes of status determination criteria. An 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 Board 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 Magnuson-Stevens Act.

For the East Area, the FMP does not establish a mechanism for specifying ACLs for Chinook salmon in the East Area because of the Magnuson-Stevens Act 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.

West Area

The 2012 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.

2.5.2 Alternative 2: Cooperative management with the State

This section provides an initial set of status determination criteria and annual catch limits for the salmon stocks harvested in the EEZ in Cook Inlet. Developing appropriate status determination criteria and annual catch limits 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. Additionally, the Council may consider an alternative approach for setting annual catch limits, which is discussed later in this section.

Salmon stocks caught in the Cook Inlet would be separated into three tiers for the purposes of status determination criteria and annual catch limits. The overfishing definitions 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 Magnuson-Stevens Act. An MSY control rule, a maximum fishery mortality threshold (MFMT), a minimum stock size threshold (MSST), and Acceptable Biological Catch (ABC) and Annual Catch Limit (ACL) are established for Tier 1 and 2. In Tier 3, the OFL is specified in terms of an average or maximum catch value over an historical time period, unless the Scientific and Statistical Committee recommends an alternative value based on the best available scientific information.

If a stock or stock complex is declared overfished or if overfishing is occurring, the Council will request that the State of Alaska conduct a formal assessment of the primary factors leading to the decline in abundance and report to the Council the management measures the State will implement 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.

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

Tier 1 stocks are salmon stocks with escapement goals and stock-specific catches. The Tier 1 approach is adapted from the Tier 2 approach in the East Area. A list of Tier 1 stocks will be established by ADF&G. Tier 1 sockeye salmon stocks could include Kasilof River and Kenai River sockeye salmon, and Kenai River late-run Chinook salmon (see Table 2-1).

(1) The MSY control rule is of the “constant escapement” form. Specifically, the catch corresponding to the control rule in any given year is equal to the amount that would result in a post-harvest run size equal to the MSY escapement goal, unless the pre-harvest run size fails to exceed the MSY escapement goal, in which case the catch corresponding to the control rule is zero:

- MSY Control Rule: $Y_t = \max(0, R_t - G_t)$, where t = run year, Y = potential yield, R = annual run size of a stock, and G = lower bound of the MSY-based escapement goal range.

(2) The fishing mortality rate for these stocks is expressed as an exploitation rate, and is computed as a weighted average of recent run-specific exploitation rates observed in the stock:

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

(3) The MFMT for these stocks is computed as a weighted average of recent run-specific exploitation rates corresponding to the MSY control rule:

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

(4) Should the fishing mortality rate exceed the MFMT in any year, it will be determined that the stock is being subjected to overfishing.

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

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

(6) ADF&G would update MFMT and MSST each year with the most current T years of G, R, C, and S.

(7) $ABC_t = ACL_t = \sum_{i=t-T+1}^t Y_i$, evaluated by comparing $\sum_{i=t-T+1}^t C_i$ with ACL, subject to the accountability measure: $S_t \geq G_t$ for individual years during the same time span.

- Preseason, the ACL can be expressed as the sum of observed potential yields from the previous T-1 years and the preseason forecast of run size minus the lower bound of the escapement goal for year T. However, the postseason ACL, using all T years of realized runs is used to determine if the ACL was met or not.

Tier 1 Example – Kenai River sockeye salmon

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 utilized to develop examples of status determination criteria and ACLs during 1999-2016 (Table 2-2). EEZ catch of Kenai sockeye salmon was assumed to be 50% of the total Central District drift catch of Kenai River sockeye salmon in each year. In this example and for all tier 1 stocks, the MFMTs and MSSTs are the estimated stock-specific exploitation rates in the EEZ and spawning escapements of sockeye salmon in the respective stocks. The lower bound of the aggregated escapement goals, total catches, catches in the EEZ, and run size accumulated over T=5 years were used to calculate the MFMT relevant to the EEZ. The MSST 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 2016 although the escapement goal was not met in 2000.

Table 2-1 Tier levels and proposed set of stocks to be assessed 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 700,000 to 1,200,000 fish. 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 160,000 to 340,000 fish. 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 fish. 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 based on weir counts for the Deshka River and the Little Susitna River that can be used as stock status indicators. Generation time is 4 years.
	Other sockeye salmon	Some stock specific catch information is calculated, but complete escapement enumeration is not available. There are Sustainable Escapement Goals based on weir counts for Chelatna, Judd, and Larson lakes; and Fish Creek that can be used as stock status indicators. 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. 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.

Tier 2: Salmon stocks managed as a complex

Tier 2 stocks are salmon stocks managed as a complex, with specific salmon stocks as indicator stocks. An indicator stock is a stock with measurable and objective status determination criteria that can be used to help manage and evaluate more poorly known stocks that are in a stock complex. Further, an indicator stock is believed to represent the typical vulnerabilities of stocks within the stock complex.

A list of Tier 2 indicator stocks would be established by ADF&G. Tier 2 indicator stocks would be Deshka River and Little Susitna River for the Upper Cook Inlet coho salmon stock; and Chelatna, Judd, and Larson lakes and Fish Creek for the ‘other’ sockeye salmon stock (see Table 2-1).

In general, management of these stocks is based on aggregate abundance. Lack of a general stock identification technique prevents assessment of run strength of individual stock groups contributing to these mixed stock fisheries. Information available on individual indicator stocks is considered in management actions.

- (1) The MSY control rule is of the “constant escapement” form. The difference with respect to Tier 1 is not the form of the control rule, but rather the level of aggregation at which it is applied.
- (2) 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 by ADF&G.

Table 2-2 Catch, catch in the EEZ, escapements, run size, lower bound of escapement goal, Status Determination Criteria and Annual Catch Limits of Kenai River sockeye salmon, 1999-2016 (in thousands).

Year	Catch	EEZ Catch	Escapement	Run	LB Goal	EEZ					EEZ		Overfishing?	Overfished?	ACL Exceeded?
						Yield	F	MFMT	MSST	S	ACL	C			
1999	2,035	504	949	2,985	700	753									
2000	1,118	234	697	1,815	700	231									
2001	1,451	329	738	2,190	700	367									
2002	2,340	578	1127	3,467	700	1,004									
2003	3,037	761	1402	4,440	700	1,463	0.162	0.256	1,750	4,913	3,819	2,406	No	No	No
2004	4,015	1,044	1691	5,705	700	2,035	0.167	0.290	1,750	5,655	5,101	2,946	No	No	No
2005	4,455	1,082	1654	6,109	700	2,036	0.173	0.315	1,750	6,612	6,906	3,794	No	No	No
2006	957	117	1892	2,849	700	1,309	0.159	0.348	1,750	7,766	7,848	3,582	No	No	No
2007	2,638	590	964	3,602	700	854	0.158	0.339	1,750	7,603	7,698	3,594	No	No	No
2008	1,374	228	709	2,082	700	237	0.150	0.318	1,750	6,910	6,472	3,062	No	No	No
2009	1,582	289	848	2,430	700	437	0.135	0.285	1,750	6,067	4,874	2,307	No	No	No
2010	2,558	566	1038	3,596	700	904	0.123	0.257	1,750	5,452	3,742	1,790	No	No	No
2011	4,982	1,243	1281	6,263	700	1,824	0.162	0.237	1,750	4,840	4,257	2,916	No	No	No
2012	3,557	1,233	1213	4,770	700	1,746	0.186	0.269	1,750	5,089	5,148	3,559	No	No	No
2013	2,648	648	980	3,628	700	928	0.192	0.282	1,750	5,360	5,839	3,979	No	No	No
2014	2,186	526	1218	3,404	700	1,044	0.195	0.298	1,750	5,731	6,446	4,216	No	No	No
2015	2,419	355	1400	3,819	700	1,055	0.183	0.301	1,750	6,092	6,597	4,005	No	No	No
2016	2,594	564	1118	3,712	700	982	0.172	0.298	1,750	5,930	5,755	3,326	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.

(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 (50 CFR §600.310(1)):

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.

In the absence of significant evidence to the contrary, satisfaction of the above conditions will be considered equivalent to the State's establishment of an "optimal escapement goal" lower than the "biological escapement goal" for the same stock.

(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.

(6) The MSST for a stock complex is equal to one-half the sum of the indicator salmon stocks' MSY escapement goals 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 more indicator stocks that do have stock-specific MSYs or suitable proxies.

Tier 2 Example – Upper Cook Inlet coho salmon

Catches in all of Upper Cook Inlet, catches 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 utilized to develop examples of status determination criteria and ACLs during 1999-2016 (Table 2-3). EEZ catch of coho salmon was assumed to be 50% of the total Central District drift catch in each year. In this example and 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 in Upper Cook Inlet. The lower bound of the aggregated escapement goals, total catches, catches in the EEZ, and indexed run size accumulated over T=4 years were used to calculate the MFMT relevant to the EEZ. 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. Based on the example, overfishing and overfished status were not observed between 2002 and 2016 although individual river escapement goals were not met in some years and the observed F was nearly equal to the MFMT in 2013.

Table 2-3 Catch, catch in the EEZ, indexed escapements, Status Determination Criteria and Annual Catch Limits of Upper Cook Inlet coho salmon, 1999-2016.

Year	Catch	EEZ Catch	Escapement			Run	EEZ					EEZ		Overfished?	Overfishing?	ACL Exceeded?	
			Deshka	Little Susitna	Total		Yield	F	MFMT	MSST	S	ACL	C				
1999	257,059	32,407	4,566	3,017	7,583	264,642	19,690										
2000	442,339	65,739	26,387	15,436	41,823	484,162	87,262										
2001	318,113	19,709	29,927	30,587	60,514	378,627	59,923										
2002	462,865	62,916	24,612	47,938	72,550	535,415	115,166	0.109	0.170	40,600	182,470	282,041	180,771	No	No	No	
2003	260,098	26,216	17,305	10,877	28,182	288,280	34,098	0.104	0.176	40,600	203,069	296,449	174,580	No	No	No	
2004	508,137	99,794	62,940	40,199	103,139	611,276	182,633	0.115	0.216	40,600	264,385	391,819	208,634	No	No	No	
2005	387,370	72,377	47,887	16,839	64,726	452,096	116,803	0.138	0.238	40,600	268,597	448,699	261,302	No	No	No	
2006	357,866	49,237	59,419	8,786	68,205	426,071	97,142	0.139	0.242	40,600	264,252	430,675	247,623	No	No	No	
2007	313,565	54,352	10,575	17,573	28,148	341,713	62,200	0.151	0.251	40,600	264,218	458,776	275,758	No	No	No	
2008	353,360	44,714	12,724	18,485	31,209	384,569	55,623	0.138	0.207	40,600	192,288	331,767	220,679	No	No	No	
2009	312,133	41,048	27,348	9,523	36,871	349,004	57,619	0.126	0.182	40,600	164,433	272,583	189,350	No	No	No	
2010	351,090	55,138	10,393	9,214	19,607	370,697	54,445	0.135	0.159	40,600	115,835	229,886	195,251	No	No	No	
2011	203,240	20,429	7,508	4,826	12,334	215,574	12,463	0.122	0.136	40,600	100,021	180,150	161,329	No	No	No	
2012	197,371	37,339	6,825	6,779	13,604	210,975	30,643	0.134	0.135	40,600	82,416	155,170	153,954	No	No	No	
2013	382,142	92,386	22,341	13,583	35,924	418,066	108,010	0.169	0.169	40,600	81,469	205,560	205,291	No	No	No	
2014	279,201	38,466	11,578	24,211	35,789	314,990	53,955	0.163	0.177	40,600	97,651	205,071	188,620	No	No	No	
2015	375,990	65,360	10,775	12,756	23,531	399,521	68,591	0.174	0.194	40,600	108,848	261,199	233,551	No	No	No	
2016	230,816	45,121	6,820	10,049	16,869	247,685	41,690	0.175	0.197	40,600	112,113	272,246	241,333	No	No	No	

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

Tier 3: Salmon stocks with no reliable estimates of escapement

Tier 3 stocks are salmon with no reliable estimates of escapement. A list of Tier 3 stocks will be established by ADF&G. Tier 3 could include Upper Cook Inlet chum salmon and Upper Cook Inlet pink salmon (see Table 2-1).

The Tier 3 approach would be based on historic average catch or maximum, similar to Tier 6 for federally managed groundfish species that are incidentally harvested. Only an OFL would be set for these stocks because it is not possible to set an MSST without an estimate of escapement.

Tier 3 is based on reliable catch history for each species. The appropriate years to use for average or maximum catch would need to be determined, but the 1999-2016 time period is used in the example below.

- OFL = the maximum catch multiplied by T years, unless an alternative value is established by ADF&G on the basis of the best available scientific information.

Tier 3 example – Upper Cook Inlet chum salmon

Total catches in Upper Cook Inlet and catches in the EEZ portion of Upper Cook Inlet were used to develop the example ACLs for 1999 through 2016 (Table 2-4). EEZ catch of chum salmon was assumed to be 50% of the total Central District drift catch in each year. In this example, the maximum catch in the EEZ during 1999-2016 was used to develop the ACL. Other time periods (prior to 1999 or shorter period within 1999-2016) and methods of summarizing the catch data could be used (e.g., average or percentile). The 1999-2016 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 chum catches independent of their stock status. The maximum catch was chosen due to the incidental nature of chum catches in Upper Cook Inlet. Based on the example, the ACL was not exceeded between 2002 and 2016.

Table 2-4 Catch, catch in the EEZ, and ACLs of Upper Cook Inlet chum salmon, 1999-2016.

Year	Catch	EEZ Catch	EEZ		ACL Exceeded?
			ACL	Catch	
1999	179,636	83,306			
2000	133,920	59,037			
2001	90,961	37,800			
2002	245,783	112,294	529,028	292,436	No
2003	126,158	53,234	529,026	262,364	No
2004	151,346	68,521	529,026	271,848	No
2005	73,992	32,836	529,026	266,884	No
2006	67,848	29,983	529,026	184,573	No
2007	79,916	37,418	529,026	168,757	No
2008	54,082	23,005	529,026	123,241	No
2009	86,817	38,537	529,026	128,942	No
2010	233,038	108,489	529,026	207,448	No
2011	134,114	55,541	529,026	225,571	No
2012	274,217	132,257	529,026	334,823	No
2013	145,038	66,086	529,026	362,372	No
2014	122,770	54,173	529,026	308,056	No
2015	281,694	126,166	529,026	378,681	No
2016	127,623	56,629	529,026	303,053	No
Maximum		132,257			

Alternative Approach for Annual Catch Limits

Magnuson-Stevens Act § 303(a)(15) requires that each FMP establish mechanisms for specifying ACLs to prevent overfishing and include AMs to prevent ACLs from being exceeded and to correct overages of the ACL if they do occur. The NS1 Guidelines contemplate limited circumstances where the standard approaches to specification of reference points, including ACLs, and management measures detailed in the guidelines may not be appropriate. The NS1 Guidelines specifically cite Pacific salmon as an example of stocks that may require an alternative approach.

Under this flexibility within the guidelines, the Council may propose an alternative approach for satisfying the ACL requirements, other than those set forth in the guidelines. The guidelines require that the Council document its rationale for proposing an alternative approach in an FMP amendment and document its consistency with the Magnuson-Stevens Act. Under Amendment 12, the Council used the alternative approach for ACLs in the East Area.

The primary function of status determination criteria, ACLs, and related requirements is to ensure that a scientifically-based approach is used for controlling catch to maintain stock abundance at the level necessary to produce MSY by ensuring that overfishing does not occur in the fishery. Therefore, an alternative approach that is consistent with the Magnuson-Stevens Act should document how the management measures used to determine stock status and control catch are scientifically-based and how they achieve the biomass level necessary to produce MSY. If the Council and NMFS determine that the State's management represents an alternative approach that satisfies the ACL requirements, then implementing ACLs, in the manner described within the NS1 Guidelines would be unnecessary.

The State's salmon escapement goal management can be used as an alternative approach for satisfying the ACL requirements of the Magnuson-Stevens Act. Escapement goals are specified annually, in terms of numbers of fish. The biology of salmon is such that escapement is the point in the species life history best suited to routine assessment and long-term monitoring. The Pacific Fishery Management Council also recommended ACLs specified on the basis of spawning escapement, which is the metric most commonly used for assessing the status of salmon stocks (Pacific Fishery Management Council 2011). The Pacific Council recognized that using spawning escapement, which is more consistent with the FMP conservation objectives, the biology of the species, and the current structure of the salmon management system requires invoking the flexibility provisions of the NS1 Guidelines. Basing ACLs on escapement goals is consistent with the long-standing practice of using spawning escapement to assess the status of salmon stocks. Note that the Pacific Council's recommended approach recognizes that Council's active role in managing salmon and its existing management process, such as its Salmon Technical Team.

The annual catch limit system is not as flexible as the State's system and could inhibit the State's current ability to respond in-season to the best available information in managing salmon stocks. For example, if the EEZ harvest level was set by NMFS pre-season, and could not be adjusted based on in-season abundance information, the EEZ harvest would be constrained when salmon returns are greater than the pre-season forecast. Including these areas in the FMP would not improve the condition of the salmon stocks since the FMP could not control harvests in State waters or ensure escapement goals are met.

The mechanisms for specifying ACLs for Tier 1 and 2 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. The State's salmon management program is based on scientifically defensible escapement goals and in-season management measures to prevent overfishing. Accountability measures include the State's in-season management measures and the escapement goal setting process that incorporates the best available information on stock abundance.

Escapement is defined as the annual estimated size of the spawning salmon stock. Quality of the escapement may be determined not only by numbers of spawners, but also by factors such as sex ratio, age composition, temporal entry into the system, and spatial distribution within salmon spawning habitat.

Alaska's salmon fisheries are managed to maintain escapement within levels that provide for MSY, escapements are assessed on an annual basis, all appropriate reference points are couched in terms of escapement level, and status determinations are made based on the stock's level of escapement. Escapement goal ranges together with real-time escapement enumeration (i.e. visual counts from towers, weir counts, aerial survey counts, sonar counts) and intensive fishery monitoring programs, have been established for most of Alaska's major salmon stocks. In cases where the salmon runs have been below forecast levels, the State of Alaska restricts and may close the fishery to achieve its escapement goals, thus preventing overfishing.

For salmon, MSY is achieved by controlling fishing to maintain the spawning escapement at levels that provide potential to maximize surplus production. Escapement goals are based on direct assessments of MSY escapement levels from stock recruit analysis or a reasonably proxy. Escapement goals are specified as a range, or a lower bound. In general escapement goal ranges are specified to produce 90% to 100% of MSY. Escapement goal ranges give managers the flexibility to moderate fishing to protect stocks of weak runs that are commonly exploited in mixed stock fisheries. Scientifically-based biological reference points for salmon populations are estimated based on long-term, stock specific assessment of recruits from parent escapement or long-term assessment of escapement. The salmon stock assessment programs employed by ADF&G are designed to monitor stock and age-specific catch and escapements. Comprehensive implementation of the ADF&G salmon stock assessment programs, over time, provides stock-recruitment data necessary for developing MSY-based escapement goals. Since the catch and escapement monitoring programs are conducted in real-time, they provide in-season assessments of run strength necessary for managers to implement ADF&G's escapement-based harvest policies.

For these salmon stocks, the State of Alaska's escapement-based management system is a more effective management system for preventing overfishing than a system that places rigid numeric limits on the number of fish that may be caught. The fundamental goal of fishery managers who employ catch limits to prevent overfishing is to ensure that the number of fish that survive to breed is sufficient to produce maximum yields over the long term. Given salmon's particular life history attributes, the preferred method to annually ensure that surviving spawners will maximize present and future yields is a system that establishes escapement goals intended to maximize surplus productivity of future runs, estimates run strength in advance and monitors actual run strength and escapement during the fishery, and utilizes in-season management measures, including fishery closures, to ensure that minimum escapement goals are achieved. Such an approach provides a more effective mechanism to prevent overfishing than a system that prescribes rigid catch limits before the season based on predictions of run strength. A catch-based system would rely on pre-season predictions of run strength and of the resulting catch that would allow the stock to meet prescribed escapement goals; however, because it would employ rigid catch limits, such a system would lack the added features of in-season monitoring to confirm actual run strength and the ability to adjust fishing pressure to ensure that escapement goals are met if pre-season predictions of run strength prove inaccurate.

Moreover, an additional advantage of the State of Alaska's escapement-based system is that it does not rely on fishermen's or managers' ability to accurately identify the particular stock to which each harvested fish belongs. There are numerous stocks of each species of Pacific salmon managed under this FMP, and fish of the same species from different breeding stocks cannot be distinguished visually.

2.5.3 Alternative 3: Federal Management

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 from all fisheries. This section provides an initial set of status determination criteria for the salmon stocks harvested in the EEZ in Cook Inlet. 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. The primary difference between status determination criteria as described in Alternative 2 and those of Alternative 3 is the accounting for catches that occur in the federal waters of the EEZ.

Generally, if the overfishing limit (OFL) was exceeded, then NMFS would apply accountability measures to prevent overfishing from occurring the next year. NMFS would only be able to apply those measures to the fishery that occurs in the EEZ. So, overfishing would be addressed by restrictive measures on the part of the fishery NMFS has authority over. In setting the allowable harvest in the EEZ, NMFS would have to consider all sources of harvest and adjust the EEZ harvest accordingly to prevent overfishing.

Option 1 - Specify salmon status determination criteria 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.

This option 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 Federal data gathering process, data inputs to support Federal management of salmon resources in Cook Inlet would be provided 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 would be necessary for the Salmon Plan Team to utilize these data in making their 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. Sub-options could be identified that would establish control rules or other arrangements for shared allocations between state and Federal fisheries. Because the Federal waters fishery occurs at the same time or earlier than the State waters 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 for pre-season planning purposes.
4. Salmon harvest reporting tools exist that 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.

Timely and accurate reporting of salmon catches in Federal waters of Cook Inlet 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 2.9.5). eLandings is used to report landings and/or production data and includes landings for 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.

The landings and production data are transmitted electronically many times a day to the NMFS Alaska Regional Office. 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, 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 2.9.5).

Establishing Status Determination Criteria under Alternative 3, Federal Management

The process for establishing status determination criteria (SDC) under Alternative 3 is very similar to that proposed under Alternative 2, with equivalent stock and tier designations as described under alternative 2. SDC definitions and evaluation process under Alternative 3 are illustrated based on two different scenarios: (a) the proportion of the total catch (by stock) for the EEZ is explicitly known, and (b) the proportion of the total catch (by stock) is not explicitly known and must be assumed.

Assuming the proportion of catch in the EEZ (by stock) is not explicitly known:

Like Alternative 2, the MSY control rule is of the “constant escapement” form. Specifically, the catch corresponding to the control rule in any given year is equal to the amount that would result in a post-harvest run size equal to the MSY escapement goal, unless the pre-harvest run size fails to exceed the MSY escapement goal, in which case the catch corresponding to the control rule is zero.

- MSY Control Rule: $Y_{EEZ,t} = \max(0, R_t - G_t - C_{state,t})$, where t = run year, Y = potential EEZ yield, R = annual run size of a stock, G = lower bound of the MSY-based escapement goal range, and C_{state} = sum of the non-EEZ drift gillnet and all set net catches in UCI.

(2) The fishing mortality rate for these stocks is expressed as an exploitation rate, and is computed as a weighted average of recent run-specific exploitation rates observed on the stock, over a period equal to the average generation time of the species:

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

(3) The MFMT for these stocks is computed as a weighted average of recent run-specific exploitation rates corresponding to the MSY control rule:

- $MFMT_t = \frac{\sum_{i=t-T+1}^t Y_{EEZ,i}}{\sum_{i=t-T+1}^t R_i}$, where R_i is the observed run size in year i .

Following each season, $F_{EEZ,t}$ is compared with the $MFMT_t$ to determine the overfishing designation.

MSST calculation and determination of overfished definitions are equivalent between Alternative 3 and Alternative 2

(4) Should the fishing mortality rate exceed the MFMT in any year, it will be determined that the stock is being subjected to overfishing.

(5) Should a stock's productive capacity fall below the MSST in any year, it will be determined that the stock is overfished. MSST is computed as:

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

(6) NMFS would update MFMT and MSST each year with the most current T years of G, R, C, and S.

Assuming the proportion of catch in the EEZ (by stock) is explicitly known:

In the event that the proportion of catch in the EEZ (by stock or stock complex) is not explicitly known, the NPFMC would need to establish an assumed value for the proportion of Upper Cook Inlet harvest that occurs within EEZ waters across years. In such cases, the above equations would be modified via the proportion parameter, α .

(1) MSY Control Rule: $Y_{EEZ,t} = \max(0, R_t - G_t - C_{total,t}(1 - \alpha))$, where t = run year, Y = potential EEZ yield, R = annual run size of a stock, G = lower bound of the MSY-based escapement goal range, C_{total} = total annual UCI catches (by stock or stock complex), and α is the proportion of stock-specific total harvest that occurs in EEZ waters (which is prosecuted only via drift gillnet).

(2) The fishing mortality rate for these stocks is expressed as an exploitation rate, and is computed as a weighted average of recent run-specific exploitation rates observed on the stock or stock complex:

- $F_{EEZ,t} = \frac{\sum_{i=t-T+1}^t C_{total,i}\alpha}{\sum_{i=t-T+1}^t R_i}$, where T = generation time in years, and C_{total} = total annual UCI catches (by stock or stock complex), and α is the proportion of total stock-specific harvest in EEZ waters.

Under this scenario, MFMT, MSST, and the determination of SDCs would be the same as steps (3) – (6) above. Comparison of catches to the ACL would be the same as that for Alternative 2.

Stock and Tier specific examples for Alternative 3 are identical to those provided for Alternative 2, in which a proportion of $\alpha=50\%$ of catches are assumed to occur in EEZ waters for the sake of illustration.

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 fully federal management of salmon resources in the EEZ portions of Cook Inlet 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 do not exist that allow the Federal catch accounting system to adequately monitor harvest and bycatch such that overfishing can be prevented.

Challenges Associated with Data Needs Under Federal Management

The availability of sufficient data may be a driving factor in consideration of a Federal only (Alternative 3) management approach for the Federal waters of Cook Inlet.

Abundance data

The State of Alaska publishes annual escapement goal ranges for a number of salmon stocks (see Table 3-1). These 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 high resolution data for estimating stock-specific reference points. Coho and chum escapement estimates are available for only four and one rivers, respectively, presenting these systems as indicator stocks for the region. The majority of existing data necessary for developing escapement goals are collected by ADF&G so Alternative 3 would adopt the tier system for escapement goals as described above for Alternative 2.

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, however, 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_t) and necessary reference points (F_{MSY} , F_{ABC} , F_{OFL}) cannot be calculated for the UCI system and species level proxies would be necessary.

Federal waters catch data

Catch data are reported in near real-time through the AKR Catch Accounting System, including the State Statistical Area in which catches were made. However, the current spatial boundaries of reporting areas (State Statistical Areas) are such that catch data cannot be precisely partitioned between State and Federal (EEZ) waters. State Statistical Areas in Federal waters also include State waters so catch reporting facilitates only estimation of an upper bound of the proportion of species-specific harvests that occurred in Federal waters. From 1991–2016, the average annual maximum percent of Cook Inlet harvests that occurred in Federal waters were 5.3%, 48.9%, 52.8%, 13.4% and 66.2% for Chinook, sockeye, coho, pink, and chum salmon, respectively (Table 2-5). **Exploitation-based status determination criteria will require estimation of harvests in Federal waters and as such, will likely require changes to either the State Statistical Area boundaries themselves, or how catches within the Federal portion of these areas are reported.**

Table 2-5 Annual Central District (CD) and total Cook Inlet (CI) drift gillnet salmon catch (in thousands of fish) and percent of the total species catch that occurred in the Central District (%). Bottom rows tally average catches for all species and the odd/even year catches for pink salmon.

Year	Chinook Salmon			Sockeye Salmon			Coho Salmon			Pink Salmon			Chum Salmon		
	CD	CI	%	CD	CI	%	CD	CI	%	CD	CI	%	CD	CI	%
1991	0.2	15	1.7	1,121	2,508	44.7	177	446	39.7	6	843	0.7	216	305	70.8
1992	0.6	20.2	3.1	6,073	9,301	65.3	268	475	56.4	424	1,176	36.1	234	298	78.5
1993	0.8	22.6	3.4	2,561	5,004	51.2	122	320	38.2	47	968	4.8	89	139	63.9
1994	0.5	21.2	2.2	1,903	3,706	51.3	311	598	52	256	2,172	11.8	250	334	74.9
1995	0.6	21.6	2.8	1,776	3,243	54.8	242	463	52.4	65	2,982	2.2	469	577	81.3
1996	0.4	15.5	2.5	2,207	4,376	50.4	172	333	51.6	123	696	17.6	141	167	84.5
1997	0.6	14.5	4.3	2,200	4,450	49.4	79	162	48.9	30	2,886	1	93	110	84.1
1998	0.3	9.2	3.7	605	1,513	40	84	176	48	202	2,011	10	89	102	87.8
1999	0.6	16.2	3.6	1,426	3,195	44.6	65	133	49	4	1,157	0.3	169	184	91.4
2000	0.3	8.5	3.2	666	1,581	42.1	134	246	54.5	96	1,540	6.3	122	204	59.7
2001	0.6	10.3	6.1	850	2,048	41.5	41	119	34.1	32	666	4.8	77	174	43.9
2002	0.4	14.3	3	1,399	3,102	45.1	130	256	50.7	248	2,441	10.2	230	286	80.2
2003	1.3	19.7	6.4	1,605	4,134	38.8	53	110	48.3	31	907	3.4	108	158	68.4
2004	1.1	28.6	4	2,540	5,068	50.1	201	320	62.7	236	2,876	8.2	138	353	38.9
2005	2	28.3	6.9	2,527	5,484	46.1	145	230	63.3	32	2,356	1.3	66	169	39.2
2006	2.8	18.8	15	787	2,428	32.4	100	209	47.7	214	1,877	11.4	61	137	44.4
2007	0.9	18.2	5	1,827	3,694	49.5	109	182	60.2	68	435	15.6	75	79	94.7
2008	0.7	13.6	4.8	986	2,805	35.1	90	175	51.8	104	675	15.4	46	226	20.5
2009	0.9	8.9	9.8	971	2,340	41.5	82	155	53.3	140	1,204	11.6	77	157	49.3
2010	0.5	10	5.4	1,590	2,928	54.3	111	209	53	164	571	28.8	218	324	67.1
2011	0.6	11.4	5.2	3,207	5,677	56.5	41	96	42.8	15	397	3.9	112	162	69.1
2012	0.2	2.7	8.2	2,936	3,333	88.1	75	108	69.7	304	727	41.8	266	327	81.4
2013	0.5	5.8	8.6	1,668	2,860	58.3	186	271	68.7	31	2,147	1.4	133	195	68.3
2014	0.4	5	7.6	1,507	2,622	57.5	78	140	55.7	419	916	45.7	109	191	57.4
2015	0.6	11.7	4.8	1,015	2,900	35	131	223	58.9	22	6,437	0.3	253	390	64.9
2016	0.6	10.9	5.5	1,269	2,660	47.7	91	150	60.6	269	508	53	114	198	57.3
Avg (all yrs)			5.3			48.9			52.8			13.4			66.2
Avg (odd yrs)												4			
Avg (even yrs)												22.8			

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 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), optimal escapement goals (OEG), and sustainable escapement goals (SEG).

A BEG specifies 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 90% or greater of MSY, and therefore requires stock-specific spawning abundance (escapement), catch, and age composition information. A 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 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. 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 in some cases. SEGs for Alaskan salmon stocks have been defined based on either the Bue and Hasbrouck 4-tier Percentile Approach (Table 2-6) and the Clark et al. (2017) 3-tier Percentile Approach (Table 2-7), although the

latter is now the preferred method. 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.

Table 2-6 Bue and Hasbrouck 4-Tier Percentile Approach for defining Sustainable Escapement Goals (SEGs). Contrast in the escapement data is defined as the maximum observed escapement divided by the minimum observed escapement.

Tier	Escapement Contrast	Exploitation	SEG Range
1	Low Contrast (<4)		15 th Percentile to maximum observation
2	Medium Contrast (4 to 8)		15 th to 85 th Percentile
3	High Contrast (>8)	Low	15 th to 75 th Percentile
4	High Contrast (>8)	High	25 th to 75 th Percentile

Table 2-7 Clark et al. (2014) 3-Tier Percentile Approach for defining Sustainable Escapement Goals (SEGs). 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

OEGs are management targets established by the Alaska Board of Fisheries 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 2-7). 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.

The Council would need to consider whether SEGs represent sufficient proxies for S_{MSY} and should be used as the basis for UCI salmon SDC development.

1. If the Council decides that S_{MSY} may be defined based on current SEGs, it would need to determine what will be used as the S_{MSY} proxy for stocks with SEG ranges.
2. If the Council decides that S_{MSY} should be defined based on formal stock-recruitment analyses (i.e., development of BEGs), it would need to identify which proxy stocks will be used to represent the status of each species harvested in UCI and the funding mechanism for the collection of additional escapement, age composition, and genetic composition of catch data necessary.

De Minimis Fishing Provisions

De minimis fishing provisions give more flexibility to the process of setting annual regulations when the conservation objectives for limiting stocks are projected not to be met, and provide opportunity to access more abundant salmon stocks that are typically available in the Council management area when the status of one stock may otherwise preclude all ocean salmon fishing in a large region, as is the case under the conservation alert actions in the current FMP. This would reduce the risk of fishery restrictions that impose severe economic consequences to local communities and states. While this action seeks to provide management flexibility in times of scarcity, there is an overriding mandate to preserve the long-term productive capacity of all stocks to ensure meaningful contributions to ocean and river fisheries in the future, and to ensure that the total fishing mortality rate does not exceed F_{MSY} .

Catches from the Central District of Cook Inlet (which includes Federal and State waters) from 1991-2016 reveal an average maximum impact rate of 5.3% (of total Cook Inlet catches) of Chinook salmon (Table 2-5). Reporting does not partition Federal and States waters catches within the Central District so this value represents a maximum impact rate within Federal waters, though the Federal waters value is inevitably less than this. This impact rate falls well below the 10% impact rate criterion for *de minimis* provisions established by the Pacific Coast Salmon Fishery Management Plan (Amendment 15). Chinook salmon in Federal waters of Cook Inlet would similarly fall within such *de minimis* criteria. Impact rate criteria may need to be adjusted for specific stocks with lower size estimates but Cook Inlet harvests of Chinook will likely be unaffected by such further adjustments.

The remainder of salmon harvests in Federal waters of Cook Inlet typically do not meet *de minimis* criteria with the exception of odd-year pink salmon runs, which regularly fall below the 10% impact rate threshold (Table 2-5). At the discretion of the Council, an alternating *de minimis* provision could be considered for pink salmon.

For each of the Cook Inlet salmon species, the *de minimis* criteria may need to be revisited once better data are available for partitioning catches between State and Federal waters, which in most cases, will reduce Federal waters impact rates.

Assuming that sufficient data exist for calculating reference points, the following SDCs would apply to Cook Inlet salmon stocks.

Overfishing

A stock would be considered subject to overfishing when the postseason estimate of F_t exceeds the MFMT, where the MFMT is generally defined as less than or equal to F_{MSY} .

$$F_t = \frac{C_{total,t}}{R_t} = \frac{C_{total,t}}{C_{total,t} + S_t}$$

$$MFMT = F_{MSY} = \frac{R_t - S_{MSY}}{R}$$

$$C_{total,t} = C_{EEZ,t} + C_{total,t}$$

Where R_t , C_t , and S_t are the run size, catch, and escapement for a stock or stock complex in a given year. Stock-specific estimates of F_{MSY} based on spawner-recruit data will be used if available, or as defined by sustainable escapement goals (SEGs) if the Council deems them appropriate. Otherwise, a species-specific proxy value will be used (e.g., $F_{MSY} = 0.78$ for Chinook based on species-specific meta-analyses [PFMC 2016]). Stock-specific overfishing determinations will be made annually and are based on exploitation during a single biological year.

Note: For stocks or stock complexes for which no spawning abundance data are collected (UCI pink salmon) or for which only a relative index of abundance is available, it will not be feasible to calculate annual exploitation rates without the collection of additional data.

Council Action

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.

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. If

overfishing occurs, 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.

Approaching an Overfished Condition

An approaching overfished determination will be made if the geometric mean of the two most recent postseason estimates of spawning escapement, and the current preseason forecast of spawning escapement, is below the MSST. Stock- (or stock complex-) specific approaching overfished determinations will be made annually following development of the preseason spawning escapement forecasts. For pink salmon (*Oncorhynchus gorbuscha*) with genetically-distinct even and odd-year brood lines, geometric means will be of spawning escapements of the same brood line (this applies to subsequent SDC considerations with geometric means as well). If NMFS identifies that a stock or stock complex is approaching an overfished condition, NMFS will report that to the Council under 304(e) of the Magnuson-Stevens Act. The Council would have two years from this notification to end overfishing and prepare a rebuilding plan. As part of the plan, the Council may structure area fisheries to avoid the stock becoming overfished and to mitigate the effects on stock status.

Overfished

A stock would be considered overfished if the 3-year geometric mean of annual spawning escapements falls below the MSST, where MSST is generally defined as $0.5 * S_{MSY}$ or $0.75 * S_{MSY}$, although there are exceptions for subsequent discussion. Overfished determinations would be made annually using the three most recently available postseason estimates of spawning escapement.

If a stock or stock complex is 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. 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 criteria set forth in subsequent SDC criteria below for determining when the stock has rebuilt,
3. recommendations for actions to rebuild the stock to S_{MSY} , including modification of control rules if appropriate, and;
4. a specified rebuilding period.

In addition, the Salmon Plan Team may consider and make recommendations to the Council or other management entities for reevaluating the current estimate of S_{MSY} , modifying methods used to forecast stock abundance or fishing impacts, improving sampling and monitoring programs, or changing hatchery practices.

Based on the results of the Salmon Plan Team's recommended rebuilding plan, the Council would adopt a rebuilding plan for recommendation to the Secretary. Adoption of a rebuilding plan would require implementation either through an FMP amendment or notice and comment rule-making process. Subject to Secretarial approval, the Council 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, 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 (two years for pink salmon, three years for coho, four years for chum; and five years for Chinook and sockeye). 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.

If sufficient recruits are not available to achieve spawning escapement at or above MSY in a particular year, the control rules could provide for the potential use of *de minimis* exploitation rates that allow continued participation of fishing communities while minimizing risk of overfishing. However, the Council should consider the specific circumstances surrounding the use of a *de minimis* control rule. Even if fishing is not the primary factor in the depression of the stock, the Council must control the exploitation rate of fisheries within its jurisdiction to prevent overfishing.

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 MSY escapement levels, 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.

In addition to the Salmon Plan Team assessment, the Council may direct its Habitat Committee (HC) to work with federal, state, and local habitat experts to review the status of the essential fish habitat affecting the overfished stock and, as appropriate, provide recommendations to the Council for restoration and enhancement measures within a suitable time frame. However, this action would be a priority only if the Salmon Plan Team evaluation concluded that freshwater survival was a significant factor leading to the overfished determination. Upon review of the report from the HC, the Council will consider appropriate actions to promote any solutions to the identified habitat problems.

Not Overfished-Rebuilding

After an overfished status determination has been triggered, once the stock’s 3-year geometric mean of spawning escapement exceeds the MSST, but remains below S_{MSY} , or other identified rebuilding criteria, the stock status will be recognized as “not overfished-rebuilding”. This status level requires no Council action, but rather is used to indicate that stock’s status has improved from the overfished level but the stock has not yet rebuilt.

Rebuilt

The default criterion for determining that an overfished stock is rebuilt is when the 3-year geometric mean spawning escapement exceeds S_{MSY} ; the Council may consider additional criteria for rebuilt status when developing a rebuilding plan and recommend such criteria, to be implemented subject to Secretarial approval.

Because abundance of salmon populations can be highly variable, it is possible for a stock to rebuild from an overfished condition to the default rebuilding criterion in as little as one year, before a proposed rebuilding plan could be brought before the Council.

In some cases, it may be important to consider other factors in determining rebuilt status, such as population structure within the stock designation. The Council may also want to specify particular strategies or priorities to achieve rebuilding objectives. Specific objectives, priorities, and implementation strategies should be detailed in the rebuilding plan.

Changes or Additions to Status Determination Criteria

Status determination criteria are defined in terms of quantifiable, biologically-based reference points, or population parameters, specifically, S_{MSY} , MFMT (F_{MSY}), and MSST. These reference points are generally regarded as fixed quantities and are also the basis for the harvest control rules, which provide the operative guidance for the annual preseason planning process used to establish salmon fishing seasons that achieve OY and are used for status determinations as described above. Changes to how these status determination criteria are defined, such as $MSST = 0.50 * S_{MSY}$, must be made through a plan amendment. However, if a comprehensive technical review of the best scientific information available provides evidence that, in the view of the SSC and the Council, justifies a modification of the estimated values of these reference points, changes to the values may be made without a plan amendment. All modifications would be documented through the Salmon Plan Team process.

Establish an ABC and ACL

Extending the Tier 1 approach to ACLs, an ABC and ACL can be determined using the cumulative sum of potential yields over the time span of a generation and comparing this to the cumulative catch over the same time span:

- $ABC_t = ACL_t = \sum_{i=t-T+1}^t Y_i$, evaluated by comparing $\sum_{i=t-T+1}^t C_i$ with ACL, subject to the accountability measure: $S_t \geq G_t$ for individual years during the same time span.
- Preseason, the ACL can be expressed as the sum of observed potential yields from the previous T-1 years and the preseason forecast of run size minus the lower bound of the escapement goal for year T. However, the postseason ACL, using all T years of realized runs is used to determine if the ACL was met or not.

ACLs and OFLs are required for all stocks or stock complexes in the fishery that are not managed under an international agreement, listed under the ESA, or designated as hatchery stocks. Similar to the SDCs described previously, establishment of ABC and ACL for Alternative 3 would be consistent with the approach under Alternative 2. The formulation of ABC above ($ABC_t = ACL_t$) would be slightly modified to account for the fraction of the total run being harvested in the EEZ portion of the Central District:

$ABC_{EEZ,t} = \hat{R}_t - \bar{F}_{state,t} \hat{R}_t - G_t = \hat{R}_t - \bar{F}_{total,t} (1 - a) \hat{R}_t - G_t$, where a is the annual proportion of the annual fishing mortality rate in EEZ waters.

This formulation can further deconstruct fishing mortality rates by fleet via $ABC_{EEZ,t} = \hat{R}_t - \bar{F}_{non-drift,t} \hat{R}_t - \bar{F}_{drift,t} (1 - \beta) \hat{R}_t - G_t$, where β is the annual proportion of the annual fishing mortality rate from drift gillnets in EEZ waters.

Note that $TAC = ABC * \text{buffer}$, buffer is scaled 0-1 and lower for Higher Tier stocks $\text{buffer}_{Tier 1} > \text{Buffer}_{Tier 2} > \text{Buffer}_{Tier 3}$

Accountability Measures

Accountability measures are required for all stocks and stock complexes in the Salmon FMP that are required to have ACLs. AMs are intended to prevent shortfalls in escapement below the S_{ACL} and to correct or mitigate them if they occur. Some AMs are implemented during the preseason planning process and in-season. 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 realized escapement being below S_{ACL} in more than one in four consecutive years.

Preseason and In-season Accountability Measures

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.

- In-season authority to manage quota fisheries allows NMFS to close fisheries on short notice when mixed stock quotas are projected to be met. Quotas are designed to ensure that ACLs and conservation objectives for component stocks are met.
- Mixed stock quota monitoring on a daily basis during the season allows projection of when quotas will be met.
- Quota partitioning among fishery sectors and port areas and time periods allows finer scale management, thereby reducing the chance that overall quota will be exceeded.
- Other provisions as needed.

A TAC 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. The TAC would be specified at a level that is expected to produce spawning abundances sufficiently above the S_{ACL} , to address uncertainty in the ability to constrain catch to the ACL (management uncertainty).

Post-season Accountability Measures

The following are the types of postseason AMs 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 realized escapement is below the postseason S_{ACL} value, an accountability measure will report on the escapement shortfall in the annual Council preseason reports and will notify state and federal managers. 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. Possible outcomes could include increased reductions from ACL to TAC (buffers) in order to account for scientific or management uncertainty.

2.6 Optimum Yield and Maximum Sustainable Yield

The Council will need to determine how to assess and specify OY for salmon stocks harvested in the three traditional net fishing areas. Magnuson-Stevens Act § 303(a)(3) requires that an FMP assess and specify the optimum yield (OY) from the fishery and include a summary of the information utilized in making such specification. Consistent with Magnuson-Stevens Act § 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 Magnuson-Stevens Act § 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.

2.6.1 Alternative 1: No Action

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 Board; 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 Board 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 Board and ADF&G in determining when to open and close the coho salmon harvest by the troll fishery.

The Magnuson-Stevens Act 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 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.

2.6.2 Alternative 2: Cooperative Management with the State

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

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 Board; 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 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 salmon stocks with escapement goals based on the MSY control rules in section 2.5. 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 salmon 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 salmon fishery reflects the biological, economic, and social factors considered by the Board and ADF&G in determining when to open and close the salmon harvest by the salmon fishery.

The Magnuson-Stevens Act 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.

2.6.3 Alternative 3: Federal Management

OY would be the ACL established under Alternative 3.

2.7 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 MFMT, OFL, and 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 Magnuson-Stevens Act 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. The Council has established plan teams for other FMPs to assist in this process and may want to establish a plan team for the Salmon FMP. The Council may be able to also consider establishing an alternative peer review process for determining the status of the salmon stocks and fishery information under § 302(g)(1)(E) of the Magnuson-Stevens Act. Whether there is a salmon plan team is directly related to the preparation of a Stock Assessment and Fishery Evaluation (SAFE) Report and related requirements for reviewing and providing fishery and scientific information to the Council.

2.7.1 Alternative 1: No Action

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 Magnuson-Stevens Act. This enables the escapement goal recommendations from the State's peer review process instead of SSC recommendations on acceptable biological catch under Magnuson-Stevens Act § 302(h)(6).

2.7.2 Alternative 2: Cooperative Management with the State

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. As part of the ACL approach under Alternative 2, the Council could consider either review by the SSC or establishing a peer review process in the FMP that utilizes the State's existing salmon expertise and processes for developing escapement goals as fishing level recommendations.

Option 1- Establish a Salmon Plan Team

Under Alternative 2, the Salmon Plan Team would function similar to the Crab Plan Team and the Scallop Plan Team. The Council would establish a Salmon Plan Team and the Plan Team would produce a Stock Assessment and Fishery Evaluation (SAFE) Report. The SSC would review the SAFE and set the OFL, ABC, ACL, and MSST for the salmon fishery in the EEZ. The State would then set the TAC for the salmon fishery in the EEZ. Additional considerations for establishing a Salmon Plan Team and then using the federal plan team process for setting the status determination criteria and annually

determining the status of salmon stocks is discussed in more detail under Alternative 3: Federal Management.

Option 2- Expand existing peer review process

The Council could choose to expand the existing 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 salmon fisheries in the EEZ. 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, would work together with the Council to implement the provisions of the Magnuson-Stevens Act. This would enable the escapement goal recommendations from the State's peer review process instead of SSC recommendations on acceptable biological catch under Magnuson-Stevens Act § 302(h)(6).

Section 3.5.1 of the EA for Amendment 12 to the FMP described the peer review process used by ADF&G in establishing escapement goals:

Initiation of Goal review

The Board convenes a scheduled regulatory meeting every three years for each of the major management regions in Alaska. In conjunction with those meetings, and according to state policy (5 AAC 39.223) ADF&G is required to review all species escapement goals for the region, establish new escapement goals, and determine if updates to existing goals are warranted based on new information. Approximately one year in advance of the board meeting, an inter-divisional escapement goal review team from commercial fisheries and sport fish divisions is assembled, which includes area, regional and headquarters fishery biologists and fishery scientists. They discuss all species goals in the region and create work assignments for analyses that will update existing goals or create new ones. A principle decision at this stage is which stocks will require modifications to existing goals based upon new data, a change in assessment method, or significant changes to the fishery for that stock.

Development or revision of goals and internal review

Preliminary analyses for new goals or goal revisions are developed by one or more individuals and brought before the escapement goal review team for further consideration and review. Over a period of approximately six months, based upon input from the review team, draft analyses for each stock under review are provided to the entire team for peer review. Following that, a final draft is created for submission to ADF&G Research and Technical Services, which initiates a formal peer review process involving appropriate department staff, especially those not involved in development of the goal. These reviews are generally provided anonymously and are independent from the work of the goal development team. After revisions are made, goal analyses are published as a separate report or included in a larger publication documenting review of all escapement goals in the region. Though recognized as a largely internal ADF&G process, inclusion of area, regional and headquarters staff from both fish divisions to review escapement goals fosters a wide variety of inputs from diverse viewpoints. When stakeholders request opportunity to present analyses for specific salmon stock escapement goals, the team is available to review and consider those alternatives.

Statewide and non-ADF&G peer review

Where analyses are particularly complex or controversial, there are two other avenues commonly available for further peer review. The statewide escapement goal review team offers diverse, inter-divisional and inter-regional expertise for review of analytical methods and specific goal development. This provides a mechanism for broad input within ADF&G and helps assure consistency. The statewide panel may include staff participating in the regional review, but also engages expertise from other state management regions.

The Policy for Statewide Salmon Escapement Goals (5 AAC 39.223(b)(7)) provides for ADF&G discretion in engaging non-ADF&G, independent peer reviews of analyses. Outside experts are occasionally enlisted for independent peer review of goal analyses, particularly where novel methods are employed or interpretations may be especially complex. The department seeks independent peer review judiciously where significant benefit can be gained from specialized expertise. A number of university level scientists with specific skills and depth have been very helpful to the department in assuring that such analyses are credible and defensible. Independent reviews of analyses in support of escapement goals are typically made available to the public.

During its regulatory meetings, the Board may also receive non-ADF&G peer reviews of ADF&G escapement goal analyses and recommendations from stakeholders and/or their scientific consultants. Stakeholders may also submit independent analyses to the board during the appropriate regulatory cycle. The Board has the authority to supplant ADF&G escapement goal recommendations with an OEG, which considers biological and allocative factors (5 AAC 39.223(f)(25)). The Board would provide an explanation of the reasons for establishing an OEG and provide, to the extent practicable, and with assistance from ADF&G, an estimate of expected differences in yield of any salmon stock, relative to MSY, resulting from implementation of an OEG (5 AAC 39.223(c)(2)). Biological factors must be considered in establishing an OEG; while these goals may differ from the SEG or BEG recommended by ADF&G, the sustainable salmon policy dictates they must also be reviewed by ADF&G and determined to be sustainable. There are currently ten OEGs in Alaska. With two exceptions, the Board determined OEG was made more conservative by raising the lower and/or upper bounds of the escapement goal ranges recommended by ADF&G. For Nushagak River and Redoubt Lake sockeye, OEGs provide a smaller lower bound to the goal range for allocative reasons. In both cases, the goals are clearly sustainable having been met or exceeded for a decade (Munro and Volk, 2011).

2.7.3 Alternative 3: Federal Management

Under Alternative 3, the annual process for the West Area would be similar to the annual process established for the BSAI and 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 Stock Assessment and Fishery Evaluation (SAFE) Report. The SSC would review the SAFE and set the OFL, ABC, and MSST, the Council would set the TAC for the salmon fishery in the EEZ, and NMFS would initiate rulemaking.

NMFS would publish proposed and final salmon harvest specifications in the **Federal Register**. Under Federal rulemaking, 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 last 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 of the final rule (March). As a result, the groundfish fisheries open on January 20 under the TAC established the previous year. This long 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.

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, MSST or escapement-based analogs. 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 in 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 Magnuson-Stevens Act.

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 (except TACs), 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 historic 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 fisheries; bycatch taken in other fisheries; state commercial, recreational, and subsistence fisheries; catches taken during scientific research; and catches taken during the prosecution of exempted fisheries.

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.

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 by means of regulations published 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 0.

The exact sequence of events within the existing Council meeting schedule would depend on the timing of availability 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, and (2) data are not available to the Plan Team until February. 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 (AMR). 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 rule 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 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 limits would not be expected to change compared to proposed limits. Because of this, final rulemaking may (or may not) be accelerated and could be effective in time for the new fishing season by June 1. Tier 3 harvest limits 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 the Secretary. The Council's recommendation would include the basis for each harvest specification. After considering the Council's recommended harvest specifications, the Secretary 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 will be a minimum of 15 days. After the April Council meeting, the Council would confirm final harvest specification recommendations to the Secretary. As soon as practicable thereafter and after considering the Council's recommendation, the Secretary would publish final harvest specifications.

If the Secretary 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), the Secretary 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 AMR 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 rulemaking 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, final Council specifications would be made at the June meeting, which would delay final 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.

2.8 Standardized Bycatch Reporting Methods

The Magnuson-Stevens Act 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 Magnuson-Stevens Act § 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.¹⁶

On January 19, 2017, NMFS published new requirements to comply with Magnuson-Stevens Act § 303(a)(11) and 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).¹⁷ Section 600.1610(a)(1) requires every FMP to identify the required procedure or procedures that constitute the SBRM for the fishery. *Such procedures may include, but are not limited to, observer programs, electronic monitoring and reporting technologies, and self-reported mechanisms.* 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 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.

¹⁶ 50 CFR 600.350(d).

¹⁷The final rule implementing SBRM is available at <https://www.federalregister.gov/documents/2017/01/19/2017-00405/standardized-bycatch-reporting-methodology>.

(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, Magnuson-Stevens Act § 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 2012 FMP does not assess economic discards in the Cook Inlet commercial salmon fisheries or contain measures to lower economic discards.

Maximum Retainable Amounts (MRAs)

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>).

2.9 Monitoring, Recordkeeping, and Reporting Requirements

The FMP does not contain management measures to monitor the Cook Inlet commercial salmon fishery or to measure total salmon catch or bycatch from EEZ waters. Magnuson-Stevens Act § 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 Magnuson-Stevens Act. NMFS and the Council monitor federally managed fisheries with a number of tools, including electronic submission of landing reports through eLandings, certified scales to weigh catch at offload, vessel monitoring systems, observers, and electronic monitoring. In addition, the FMP must establish standardized reporting methodology (SBRM) as described in the previous section.

In designing FMP and associated regulatory requirements, 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.

Approach and Federal Fishing Permits

Two general approaches could be used to assess fish discard in the Cook Inlet drift net 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. A second approach would be to allow the vessel to discard at-sea (which occurs now), with at-sea monitoring to assess discard amounts. These broad approaches under either Alternatives 2 or 3 have implications on whether a Federal Fishery Permit is required:

Option 1- Full Retention of groundfish: Require an FFP and allow vessels to retain groundfish

Option 2- Discard of groundfish at-sea: Prohibit groundfish retention, may not require an FFP (depending on monitoring tools used).

According to fish ticket data, drift gillnet vessels land very little groundfish. Between 2002 and 2015, only seven vessels made landing of groundfish and landings ranged from three pounds to 962 pounds. The amount of discard occurring at-sea is not reported.

NMFS requires a Federal Fisheries Permit (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).¹⁸ 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 a FFP endorsed for troll gear.

NMFS currently has no method to assess at-sea discards in the salmon fisheries in Federal waters. 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, the only information available is from vessels that occasionally retain non-salmon species and report those fish on a fish ticket.

Table 2-8 provides a list of the potential monitoring tools for the salmon fisheries in Federal waters under Option 1 and Option 2. Each monitoring tool is discussed in more detail in the subsequent sections, noting that tools could be combined under Alternative 2 or 3.

¹⁸§ 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.

Table 2-8 Potential monitoring tools for the salmon fisheries in Federal waters under Option 1 – Full Retention of groundfish and Option 2 – Discard groundfish at sea.

Monitoring Tool	Purpose	Relative Implementation Ease	Gaps	Application
VMS	Track movement relative to closure areas Estimation of effort	Easier	Doesn't directly provide catch or effort information	Option 1 and 2
Paper Logbook	On-the-water record of catch by location for both groundfish and salmon. Provides enforcement with on-the-water tool.	Medium (need to create logbook. Likely modify groundfish logbook)	Data not available electronically so could require costly data entry. Industry reported information- not verified except through landings and on-the-water enforcement	Option 1 and 2
Electronic Logbook	Electronically available record of catch and effort by area available to managers for both groundfish and salmon. Both on-water and off-water enforcement tool	Medium (need to create e-logbook- likely modify groundfish e-logbook)	Industry reported information- not verified except through landings and on-the-water enforcement.	Option 1 and 2
EM for Catch Accounting	camera accounting of discards, mammals, and seabirds Enforcement tool	Difficult	Needs to be further developed for gillnet vessels Expensive and logistically difficult NMFS or industry funded	Option 2
EM for Compliance Monitoring	camera monitoring of discard prohibition	Difficult, but easier than EM Catch Accounting)	Needs further development for gillnet vessels Expensive –NMFS or Industry funded	Option 1
Onboard observers	Accounting for discards (salmon and groundfish), marine mammals, and seabirds	Difficult	Expensive and logistically challenging since most boats are smaller than 40 ft LOA. NMFS or industry funded	Option 2
eLandings	Accounting of catch with industry reported discards	Easier (already in place for most processors)	May need modification to account for EEZ/state waters line	Option 2

2.9.1 Logbooks (paper and electronic)

Logbooks are an 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, and other vessel activity information. In addition, at-sea 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 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 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 is not entered into a database unless there is a specific reason to do so (e.g., enforcement case). A few 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 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. 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.

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 or Option 2 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. 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. Electronic logbooks 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 in this scenario.

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.*

2.9.2 Observers

Under section 303(b)(8) of the Magnuson-Stevens Act, 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.

Funding

Section 303(b)(8) of the Magnuson-Stevens Act does not include authority for an observer fee system so a stable funding source for an observer program in the Cook Inlet gillnet fishery would need to be developed. Two potential funding sources are (1) NMFS would pay for the observer, or (2) the vessel would pay for the observer. Currently, there is a funding shortfall in the North Pacific Observer Program so it’s unlikely NMFS would have the funding to support a gillnet observer program. Vessel operators with full coverage requirements (i.e., all days must be observed) in the groundfish fishery contract with observer providers and pay directly for coverage. This approach to funding is called “pay-as-you-go”. The average daily cost for pay-as-you-go is difficult to estimate. Currently the groundfish fishery average daily cost for full coverage is about \$400, but this likely underestimates what the daily cost would be for the gillnet fishery. The 2015 annual report (NMFS 2015) showed that shorter trips have higher costs due to travel and housing, with very short trips costing upwards of \$1,100. Further refinement on these cost estimates and its impact on the fleet would be needed if this monitoring option is pursued. An approximate estimate of days fished for the fleet (2012-2016), based on fish ticket information for fishing that occurred in Central Cook Inlet, is between 6,500 and 8,500 days (not including potential shore days and includes all vessel sizes).

Observer deployment in the Cook Inlet gillnet fishery

Since the start of randomized coverage in 2013 (i.e., the observer restructure action), at-sea observation for partial coverage vessels has not occurred on groundfish and halibut vessels less than 40 ft in length overall. This policy decision was implemented due to the logistical considerations of putting observers onto small vessels with limited space and safety issues (e.g., life raft space). The space-related logistics

associated with placing observers on vessels smaller than 40 ft are difficult. 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 EM 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 (see NMFS 2016 and 2017b).

More than three quarters of vessels fishing in the Cook Inlet drift net fishery are less than 40 ft, and all are less than 60 ft (Figure 2-1). Representative sampling across the entire gillnet fleet would likely not occur if human observers were selected as monitoring tool under Option 2. Using the groundfish observer program length criteria, vessels greater than 40 ft would provide marine mammal and fishery bycatch information. This information 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, resulting in a high risk for biased estimates on discard, and a low probability of detecting a marine mammal or seabird mortality event.

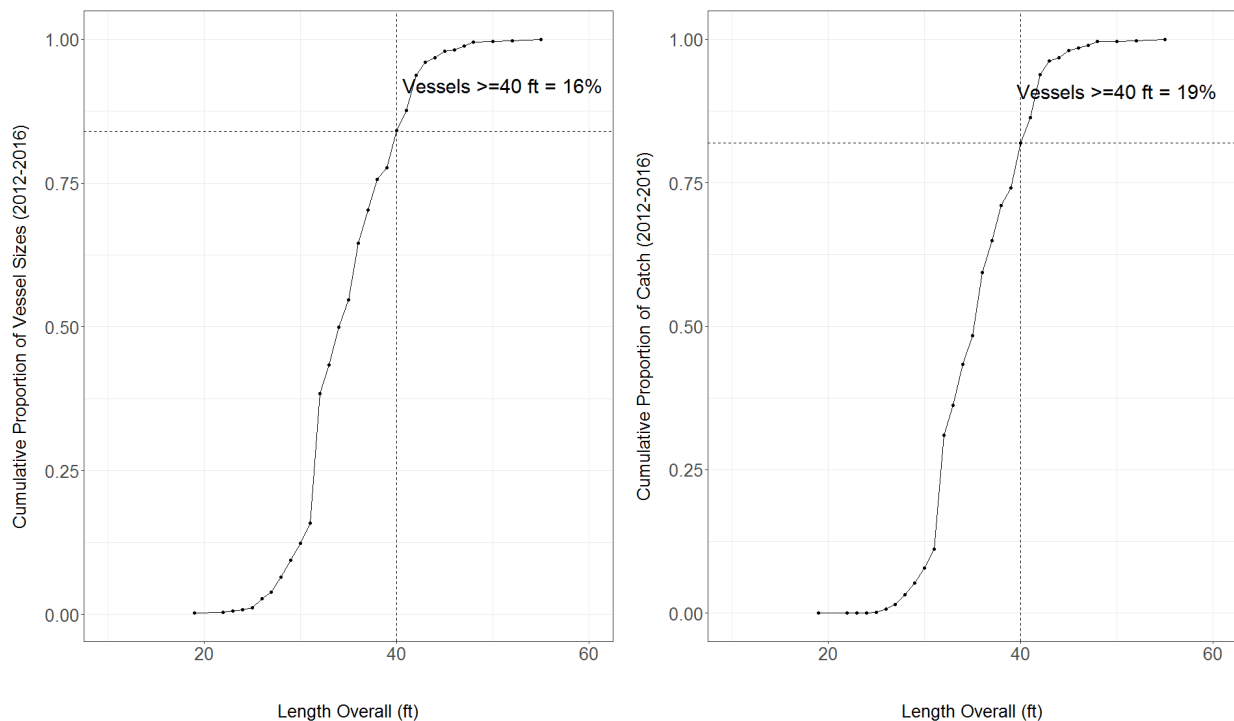


Figure 2-1 Empirical cumulative proportion of vessel sizes (left panel) and catch (right panel) for vessels that fished in the central district of Upper Cook Inlet between 2012 and 2016. The largest vessel is 55 ft. and the smallest vessel is 19 ft. Data from AKFIN and based on CFEC corrected fish ticket vessel identification for vessels with salmon landings.

2.9.3 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) 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 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 US 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.

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 could be monitored for compliance with a prohibition on discard that 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 in US and outside of Alaska are using 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.

In summary, the use of cameras for monitoring discard under either Option 1 or 2 is likely feasible from a technology standpoint. However, prior to implementation either retention option would require

work/research to develop an appropriate EM system for the gillnet fishery, including consideration of costs for the equipment and video review. As with placing human observers on vessels, funding sources would be needed, and further analysis needed as to how an EM program would be structured and implemented.

2.9.4 Electronic monitoring - Vessel Monitoring System

Another EM option could be the use of vessel monitoring system (VMS) to track vessel activity using location information that is transmitted to NOAA. The VMS system 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 in-season managers to determine when to open and close fisheries. VMS provides in-season managers with useful information about the levels of effort in both space and time. This has become very useful for gauging fishery length given total allowable catch (TAC) limits and therefore how much longer a given fishery may be kept open without either exceeding the TAC, or leaving fish unharvested.

VMS in Alaska is a relatively simple system involving a tamperproof VMS unit, set to report a vessel identification and location at fixed 30-minute intervals to the NOAA Office of Law Enforcement (NOAA OLE). Some of these units allow NOAA OLE to communicate with the unit and modify the reporting frequency. The Alaska system 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 system doesn't require the VMS unit to report on the status of other vessel sensors (in addition to the GPS units). VMS units on a vessel have the following components:

- A power source and power cabling;
- A GPS antenna to pick up satellite signals;
- 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

Estimation of the average costs of installing and operating VMS is difficult. The groundfish fleet using VMS is diverse, and there are a variety of VMS packages available. Currently, there are 4 NOAA-approved VMS units available for use in the Alaska region. There is no quantitative information about the extent to which fishermen are paying list, or a negotiated sale price, the time requirements for installation, the nature of the transmission packages they are buying, or the average number of days or months they are transmitting. The best available average cost estimates for industry are summarized in Table 2-9.

Table 2-9 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.

Current requirement for VMS in the groundfish fishery is tied to the federal fishery permit. This important regulatory connection to the permit allows NMFS to require VMS in state waters when groundfish is being harvested, regardless of whether VMS is required under State of Alaska regulations. For example, VMS is an important tool for the management of Pacific cod parallel fisheries. A vessel with this permit and fishing in the parallel fishery is required to follow Federal VMS regulations regardless if it was fishing in state or federal waters. The salmon fishery straddles state and federal waters. In order to enforce closures, NMFS would need to consider whether VMS would be required when the vessel is operating in State waters.

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 for a single delivery. If fishing is only allowed in one area (i.e., state v. 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.

An alternative tool to VMS is Automated Information System (AIS). This alternative could provide some of the location information that is provided by VMS, but 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. There are currently not enough AIS receivers around the state to provide accurate fishing locations; however, in areas like Cook Inlet and parts of Prince William Sound, this is likely not the case. U.S. Coast Guard type 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 the differences in vessel configuration and level of integration necessary for other shipboard systems.

One of the challenges associated with separate Federal and state management (Alternative 3) for salmon 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 in order for catches to be monitored and allocated to the state and EEZ waters, individually. 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 may be necessary. Such monitoring may be achieved through electronic monitoring systems that record fishing locations or through VMS (Jennings et al. 2010). VMS have been used in groundfish and crab fisheries in the Gulf of Alaska 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 scarce 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.

2.9.5 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, 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 Upper Cook Inlet (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.

The 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 shorebased processors.¹⁹ Many facilities in the Cook Inlet area were required to use the eLandings System for the first time.

Agency staff at the Soldotna office of ADF&G review of all fish ticket reports to ensure accurate documentation of all harvest from UCI. In 2016, 2,235 fish tickets were paper (15% of all tickets), and accounted for approximately 14% of the total catch in the UCI. However, paper fish ticket use in the drift gill net fishery in the central region is very low; only 1 processor used paper fish tickets in 2016 (2 tickets recorded). Nearly all paper fish tickets in the central district originate from the set net fishery, with 486 unique paper fish tickets used in 2016.

The use of paper fish tickets further declined in 2017, with Soldotna ADFG staff indicating only three small processors continue to use conventional fish tickets in the entire UCI. These three processors will likely submit less than 650 fish ticket reports in 2017, with most records occurring in the set net fishery

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). Equipment cost includes a computer, printer, and internet access (approximately \$1,000 per facility). On average, approximately 3 hours of training is required for office staff and two hours for tender crew. The time is spent viewing the videos, reviewing resource documents such as the tLandings FAQ, and completing the training scenarios. Training requirements are unique to each company and the number of tenders.

¹⁹ 5 AAC 39.130 (b)

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.

2.9.6 Combination of Monitoring Tools

The previous discussed monitoring options could also be combined under either Alternative, depending on whether the full retention or at-sea discard option is selected. For example, Option 1 (full retention) could combine VMS, logbook, and electronic monitoring for compliance, or a combination of the above options. The main difference in monitoring between Alternatives 2 and 3 is the need for NMFS to delineate catch, characterize fishing effort, salmon catch, and enforce closures relative to the EEZ. Specifically, Alternative 3 may require NMFS to make inseason management actions that would require monitoring effort and salmon catch to make decision on closures. Estimates of effort for inseason monitoring could be obtained using VMS and the eLogbook and providing EEZ specific eLandings reporting of salmon catch. In addition, salmon catch would need to be electronically available to NMFS via eLandings, thus requiring eLandings for all processors receiving catch from vessels fishing in the EEZ. We note that historical information relative to the EEZ is unavailable. Thus, for inseason management, NMFS would need these monitoring tools to establish a historical perspective on fishing activity relative to the EEZ.

2.9.7 Assessment of salmon origin

Placeholder in case we need to identify salmon caught in the EEZ for sampling. If so, this may require marking or sorting the fish so they can be counted and sampled shoreside.

2.9.8 Other issues

Alternative 3 would likely require fishers to have spatial reference to the EEZ since State of Alaska statistical areas for salmon are not specific to the EEZ. Delineation of the EEZ is needed if EEZ-specific accounting for discard or retained catch is required and/or Federal waters have different regulations than state waters (e.g., closed to fishing). Some reporting options for catch include the creation of a sub-area or areas for catch reporting, or simply reporting the proportion of a landing that occurred in the EEZ. VMS is also a useful reporting tool to verify fishing location and apportion catch between state and federal waters; however, regardless of whether VMS is used, catch would need to be reported specific to state or federal waters through another reporting tool (e.g., eLandings/eLogbook) given VMS algorithms are currently undeveloped for the salmon fishery, and spatially-specific salmon catch information is needed in the absence of VMS.

2.10 Process for Review and Appeal

Delegation of salmon fishery management authority to the State of Alaska requires the Council and NMFS to stay apprised of state management measures governing commercial and sport salmon fishing and, if necessary, to review those measures for consistency with the FMP, the Magnuson-Stevens Act, and other applicable federal law. FMPs that delegate management to the State include a process to address Magnuson-Stevens Act § 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.

2.10.1 Alternatives 1 and 3 – Appeal Process for the East Area

The 2012 FMP includes a process for the public to request that the Secretary review State salmon management actions. Secretarial review is limited to whether the State statute or regulation is consistent with the FMP, Magnuson-Stevens Act, or other applicable federal law. In 2008, NMFS received the first appeal under the FMP appeals process. State management measures include measures adopted by the Pacific Salmon Commission and the Alaska Board of Fisheries as well as other state laws, regulations, and inseason actions.

Under the 2012 FMP, the review and appeals process only apply to the East Area. The 2012 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 Magnuson-Stevens Act, 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 Magnuson-Stevens Act, 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 Magnuson-Stevens Act, or other applicable federal laws.

Under Alternative 3, no edits to Chapter 9 would be necessary because the East Area would remain the only portion of the EEZ in which management authority is delegated to the State.

2.10.2 Alternative 2 – Appeal Process for all salmon fisheries in the EEZ

Under Alternative 2, the Council would revise Chapter 9 to also apply to the salmon fisheries in the Cook Inlet EEZ. Chapter 9 is proposed to be revised as follows:

CHAPTER 9 FEDERAL 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 Cook Inlet fishery in the West Area. State management measures include measures adopted by the Pacific Salmon Commission 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 salmon fishing in the 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 EEZ salmon fisheries. These federal representatives also can advise the Board, as needed or as requested by the Board, about the extent to which proposed measures for 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 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 State Management Measures 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 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. 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 state management measures 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 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 state management measures 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 measures within the State of Alaska's judicial system as available under the provisions of the State's Administrative Procedure Act (AS 44.62). Initiation of State judicial review of a challenge to a state management measure 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 procedures with the State of Alaska. 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 regulatory 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 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. The Council and NMFS also recognize the importance of public participation during the development of fishery management measures, and exhaustion 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 measures that the person believes are 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 measures are inconsistent; (3) explain how the state management measures are inconsistent with the identified provisions of the FMP or federal law; and (4) demonstrate that the person exhausted available state administrative regulatory 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 NMFS is unable 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 Admin, NMFS Alaska Region (see <http://www.alaskafisheries.noaa.gov/contactinfo.htm> for addresses).

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, or (c) the day a denial was issued on an agenda change request. 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 NMFS will 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 the ADF&G. 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 measures being challenged. Because NMFS's review is limited to whether the measures in question 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. 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 being challenged before issuing its decision.

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.

9.4 NMFS Process Following a Determination that State Management Measures Are Inconsistent with the FMP or Federal Laws

If NMFS determines that a state management measure 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. 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 EEZ.

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.

3 Alaska Salmon Stocks

Alaska salmon fisheries are complex, and target mixed stocks of five Pacific salmon species, 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 sometimes results in foregone yield from more productive stocks. One of the primary tools used to conserve and maximize yield of Alaska salmon stocks is the escapement goal, where escapement is defined as the annual estimated spawning stock.

Table 3-1 and Table 3-2 provide 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 goal was first implemented, and recent years' escapement data for each stock. In addition, summary statistics documenting performance in achieving goals is presented.

Escapements from 2008 through 2016 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 2008 and 2016, outcomes were assessed by comparing escapement estimates with the goal and methods in place at the time of the fishery.

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 these areas. SEGs and BEGs are set by ADF&G to maximize return per spawner, while OEGs are set by the Board and may not represent a spawning escapement that maximizes return per spawner. Escapement goals are typically evaluated on a triennial basis.

Between 2008 and 2016, typically greater than 75% of lower bound escapement goals for Upper Cook Inlet were met. The proportion of escapements not meeting the lower bound of goals has generally decreased in each of these regions during this period – a pattern seen statewide.

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. 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 doesn't 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.

3.1 Salmon Stocks of Concern and Actions to Address Concerns

At this time, there are 287 established and monitored salmon stock escapement goals in Alaska, which provide benchmarks for assessing stock performance (Munro and Volk 2017, Munro 2018). Where escapements are chronically below established goal ranges or thresholds, a stock of concern designation may be recommended to the Board 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 Board 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 Board 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 the management areas that include FMP waters within the West Area are as follows:

- Chuitna, Theodore, and Lewis rivers – Chinook stocks of management concern, designation adopted 2010/11
- Alexander Creek – Chinook stock of management concern, designation adopted 2010/11
- Goose and Sheep creeks – Chinook stocks of management concern, designation adopted 2013/14
- Willow Creek – Chinook stock of yield concern, designation adopted 2010/11
- Susitna (Yentna) River – sockeye stock of yield concern, designation adopted 2008/09

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 and Lewis Rivers 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 Board, and the public to gauge success of these actions and modify action plans accordingly.

Table 3-1 Upper Cook Inlet Chinook, chum, coho, pink, and sockeye salmon escapement goals and escapements, 2009 to 2017. SEG is Sustainable Escapement Goal, BEG is Biological Escapement Goal, and OEG is Optimal Escapement Goal.

System	2017 Goal Range		Type	Initial Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
	Lower	Upper											
CHINOOK SALMON													
Alexander Creek	2,100	6,000	SEG	2002	275	177	343	181	588	911	1,117	754	170
Campbell Creek	380		LB SEG	2011	554	290	260	NS	NS	274	654	544	475
Chuitna River	1,200	2,900	SEG	2002	1,040	735	719	502	1,690	1,398	1,965	1,372	235
Chulitna River	1,800	5,100	SEG	2002	2,093	1,052	1,875	667	1,262	1,011	3,137	1,151	NC
Clear (ChuniIna) Creek	950	3,400	SEG	2002	1,205	903	512	1,177	1,471	1,390	1,205	NS	780
Crooked Creek	650	1,700	SEG	2002	617	1,088	654	631	1,103	1,411	1,459	1,747	911
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
Goose Creek	250	650	SEG	2002	65	76	80	57	62	232	NC	NC	148
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
	2,800	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
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
Lewis River	250	800	SEG	2002	111	56	92	107	61	61	5 ^b	0	0 ^b
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
Little Susitna River (Weir)	2,300	3,900	SEG	2017									2,531
Little Willow Creek	450	1,800	SEG	2002	776	468	713	494	858	684	788	675	840
Montana Creek	1,100	3,100	SEG	2002	1,460	755	494	416	1,304	953	1,416	692	603
Peters Creek	1,000	2,600	SEG	2002	1,283	NC	1,103	459	1,643	1,443	1,514	1,122	307
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
Sheep Creek	600	1,200	SEG	2002	500	NC	350	363	NC	262	NC	NC	NC
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
Theodore River	500	1,700	SEG	2002	352	202	327	179	476	312	426	68	21
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
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
COHO SALMON													
Deshka River	10,200	24,100	SEG	2017									36,869
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
Jim Creek	450	1,400	SEG	2014	1,331	242	229	213	663	122	571	106	5,646
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
PINK SALMON													
There are no pink salmon stocks with escapement goals in Upper Cook Inlet.													

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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
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
	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	
	700,000	1,200,000	SEG	2011									NA
Packers Creek	15,000	30,000	SEG	2008	16,473	NS	NS	NS	NA	19,242	28,072	NA	17,164
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
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
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
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
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

Source: Munro 2018.

- 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 3-2 Summary of Upper Cook Inlet salmon escapements compared against escapement goals for the years 2009 to 2017.

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

Source: Munro 2018.

4 Fishery Impact Statement

A fishery impact statement is required by the Magnuson-Stevens Act, § 303(a)(9). The fishery impact statement must assess, specify, and analyze any likely effects (including cumulative conservation, economic, and social impacts) of the conservation and management measures on the following:

- (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.

Additionally, the fishery impact statement must consider possible measures for mitigating any adverse impacts. This fishery impact statement also addresses the Magnuson-Stevens Act's related requirements for fishery information: (1) 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, actual and potential revenues from the fishery, any recreational interest in the fishery; (2) a specification of the present and probable future condition of the fishery and 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, including their economic impact, and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors.

The NS Guidelines provide direction on the types of information to include in a Fishery Impact Statement. For example, the NS8 Guidelines state that FMPs must examine the social and economic importance of fisheries to communities potentially affected by management measures.

The fishery management unit of the current *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* (FMP) is comprised of all waters of the EEZ off Alaska. The FMP establishes two management areas within its fishery management unit: The East Area and the West Area with the border between these two areas at the longitude of Cape Suckling. The proposed action concerns the application of federal management in addition to the existing State management for the commercial salmon fishery in the Cook Inlet EEZ.

Under Alternative 1, the FMP asserts and reserves federal authority and oversight of salmon management in the East Area EEZ salmon fishery and delegates day-to-day management of the East Area EEZ salmon fisheries to the State. The three traditional West Area EEZ salmon net fishery areas were removed from the FMP under Amendment 12 and are managed solely by the State, while commercial salmon fishing is prohibited in the remainder of the West Area. Therefore, the Salmon FMP's Fishery Impact Statement only provides information on the salmon fishery in the East Area.

Alternative 2 would delegate management of commercial salmon fishery in the Cook Inlet EEZ to the State under federal oversight while under Alternative 3, commercial salmon fishery in the Cook Inlet EEZ would be managed by the federal government, which represents a substantial change to management of commercial salmon fishery in the Cook Inlet EEZ. Under Alternatives 2 and 3, a Fishery Impact Statement for the commercial salmon fishery in the Cook Inlet EEZ would be added to the Salmon FMP.

This Fishery Impact Statement provides fishery information for the commercial salmon fishery that occurs in the EEZ waters in Cook Inlet. The fishery information in this chapter was provided by the ADF&G and largely summarized from publicly available ADF&G reports. **This section contains data**

up through 2016. This section will be updated with the most recent information for the Council's initial review analysis.

4.1 State of Alaska salmon management

The State manages subsistence, sport, commercial, and personal use harvests of salmon in waters throughout Alaska. The first priority for management is to meet spawning escapement goals in order to sustain salmon resources for future generations. The highest priority use is for subsistence, under both state and federal law. Salmon surplus above escapement needs and subsistence needs are made available for other uses. Throughout the state salmon are a fully allocated resource; multi-use salmon fisheries (commercial, sport, subsistence, and personal use) share a finite resource. Commercial salmon fisheries occurring in EEZ waters are only one component of this multi-use scenario for which competing goals and interests must be managed. While commercial salmon fisheries occur in both state and federal waters, personal use and subsistence salmon fisheries occur entirely in the waters of the State (within three nautical miles). As such, this Fishery Impact Statement provides information on the commercial fisheries subject to the FMP and does not address the fisheries that only occur in State waters.

In the State's Policy for the Management of Mixed Stock Salmon Fisheries (5AAC 39.220), conservation of wild salmon stocks, consistent with sustained yield is given the highest priority. In the absence of a regulatory management plan that allocates or restricts harvest, and when it is necessary to restrict fisheries on stocks where there are known conservation problems, the burden of conservation shall be shared among all fisheries in close proportion to their respective harvest on the stock of concern. Assigning conservation burdens in mixed stock fisheries is accomplished through the application of specific fishery management plans set out in regulation. To this end, management plans are adopted by the State that work to both minimize and maximize allocations of specific salmon stocks, depending upon the conservation need identified. As such, management plans incorporate conservation burden and allocation of harvest opportunity that affects all users of the resource in Alaska. Management plan provisions such as net mesh size restrictions, weekly fishing periods, and size limits work to reduce the incidental catch of non-target salmon species in the salmon fishery so that stocks are able to achieve their established escapement goals.

The State manages salmon through the Alaska Board of Fisheries (Board), ADF&G, and the Alaska Commercial Fisheries Entry Commission (CFEC).

- The Board is responsible for considering and adopting regulations through a public process to conserve and allocate fisheries resources to various user groups; establishing fish reserves and conservation areas, fishing seasons, quotas, bag limits and size restrictions; methods and means; habitat protection; stock enhancement; and developing commercial, subsistence, sport and personal use fisheries.
- ADF&G is responsible for the protection, management, conservation, and restoration of Alaska's fish and game resources.
- CFEC helps to conserve and maintain the economic health of Alaska's commercial fisheries. Its primary duties are limiting the number of participating fishermen and issuing permits and vessel licenses to qualified individuals in both limited and unlimited fisheries.

The priorities of management are to first ensure adequate escapement to sustain future runs; second, provide reasonable opportunity for subsistence fishermen to meet their needs; and third, provide opportunity to commercial, sport, and personal use fishermen, to harvest fish in excess of escapement and subsistence needs. Through its public process, the Board strives to manage for the potential conflicts that arise from the nature of competing interests in such a diverse fishery. The Board has adopted regulations that control the time, area of operation, and efficiency of salmon fisheries to address the unique challenges of managing mixed-stock resources.

ADF&G uses an adaptive management process to achieve these priorities that starts with development of management strategies based on pre-season forecasts, then transitions into evaluation of run strength in season, and adjusting management strategy implementation based on in-season performance of annual salmon runs. While forecasts and pre-season management strategies are made each year, these are frequently revised based on in-season run assessments. For example, the structure and implementation of fishing windows may be adjusted in-season by Emergency Order based on run strength and run timing estimates derived from in-season run assessment programs. Management decisions often need to be made before fish have reached the affected areas, districts, or communities. Managers use test fisheries, escapement monitoring projects, genetic stock identification and age-sex-length composition, and in-season harvest reports to assess and project salmon run timing and run strength in-season to inform management decisions.

Commercial Management

Commercial fishing is defined by the State as the taking of fish with the intent of disposing of them for profit, or by sale, barter, trade, or in commercial channels (AS 16.05.940 (5)). The State manages a large number of commercial salmon fisheries in waters from Southeast Alaska to the Bering Strait. Management of the commercial salmon fisheries is the responsibility of the ADF&G Division of Commercial Fisheries, under the direction of the Board. The fisheries are managed under a limited entry system; participants need to hold a limited entry permit for a limited fishery in order to fish. The CFEC limits the number of permits for each limited fishery. The CFEC originally issued permits using a points system that allocated permits to persons based on their history of participation in the fishery and their economic dependence on the fishery. CFEC limited entry permits can be sold on the open market inherited, or given away; thus, new persons have entered into the commercial fishery, since the original limitation program was implemented by buying permits on the open market.

Alaska's commercial salmon fisheries are administered through the use of management areas throughout the State. The value of the commercial salmon harvest varies with the size of the runs, fish size, market conditions, and with foreign currency exchange rates. Because of the magnitude of salmon commercial fisheries, ADF&G biologists collect extensive inseason, biological, and harvest data to support management decisions.

Commercial salmon fisheries are defined by gear type (i.e., troll, drift gillnet, purse seine, set gillnet) and area (i.e., Southeast, Cook Inlet, etc.). In any given area, ADF&G manages different commercial fisheries that target mixed salmon stocks. In the West Area, the only commercial fisheries in the EEZ are the drift gillnet and purse seine fisheries.

4.2 West Area Commercial Salmon Fisheries in the EEZ

The West Area under the Salmon FMP comprises the area of the EEZ off Alaska, west of Cape Suckling. The FMP prohibits commercial salmon fishing in the West Area, except in three traditional net areas (Cook Inlet, Prince William Sound, and the South Alaska Peninsula).

The State-Federal boundary has not been relevant to active salmon management in the three traditional net fisheries in the West Area because fisheries in these areas are managed by district, subdistricts, and sections, which are comprised of salmon statistical areas that overlap both State and federal waters. Historical analysis of only the federal waters portion of the catch is not possible. Collection of catch data in these net fisheries has, to date, included no provision for spatial segregation within the salmon statistical areas and the larger units by which the fisheries are managed. As a result, harvest and participation data in tables throughout this section, for districts that include EEZ waters and the gear groups that participate in those waters, represent the maximum level of activity that may have occurred in the EEZ. In each area, available data overestimate EEZ waters activity.

Harvest and participation data presented in this section are taken from ADF&G fish ticket data with participation and gross earnings estimates data compiled by the CFEC. To show the relative contribution of salmon harvests in the EEZ compared to total harvests within management districts, the harvest and participation data for the gear group(s) in the district(s) where the fishing area extends into EEZ waters are compared to harvest and participation data for all salmon taken by directed salmon fisheries in the full management area. The districts that include EEZ waters are the Central District of the Cook Inlet Area, the Bering River and Copper River districts in the Prince William Sound Area, and the Southwestern and Unimak districts in the Alaska Peninsula Area. In the Cook Inlet and Prince William Sound areas, only drift gillnet permit holders may harvest salmon in the EEZ, whereas in the Alaska Peninsula Area drift gillnet and purse seine permit holders may fish for salmon in the EEZ. Two tables show total annual salmon removals associated with commercial fishing in Cook Inlet that include EEZ waters and with the gear group(s) that participate in EEZ waters of those districts compared to removals associated with the entire management area and all gear groups. Table 4-4 shows participation, harvests, and estimated gross earnings associated with salmon retained for commercial sale from districts that include EEZ waters and taken by gear group(s) that participate in EEZ waters of those districts. For comparison, these tables also include estimated gross earnings for the respective gear types in the entire management area and estimated gross earnings for all gear types in the management area.

Drift gillnet is the primary gear used in West Area EEZ salmon fisheries. Drift gillnet gear works by entangling the fish as they attempt to swim through the net. The drift gillnet fleet utilizes a mix of stern and bow picker vessels; drift gillnet vessels deploy and retrieve a gillnet from either the stern or bow of the vessel. Drift gillnets longer than 200 fathoms are not currently allowed in EEZ salmon fisheries and are up to 90 meshes deep, depending on local regulations. As the gillnet is fished, the duration of sets can vary from 20 minutes to four or more hours, depending on fishing conditions and other variables, with often up to 20 sets per day.

4.2.1 Upper Cook Inlet (Central District)

In the Cook Inlet Area commercial salmon fishing in the EEZ only occurs in the Central District which consists of that portion of Cook Inlet north of the latitude of the Anchor Point Light and south of Boulder Point. The Central District is approximately 75 miles long, averages 32 miles in width, and is divided into six subdistricts and six sections, with a total area of approximately 2,267 square miles. While both set and drift gillnets are permitted in Central District, set gillnets may only be operated up to 1.5 miles from shore, therefore only the drift gillnet fleet operates in the EEZ. Because ADF&G statistical areas do not perfectly match the EEZ boundary only an estimate of EEZ salmon harvest is possible. ADF&G estimates that in recent years that, at the most, approximately 50% to 60% of the drift gillnet fleet's salmon harvest comes from waters of the EEZ. The drift gillnet fleet primarily harvests sockeye salmon, but also harvests coho and chum and, to a lesser degree, pink and Chinook salmon.

In terms of economic value to the drift gillnet fleet in Cook Inlet; sockeye salmon are the most important component of the catch, followed by coho, chum, pink, and Chinook salmon. Since 1966, on an average annual basis, the drift gillnet fishery has taken approximately 7% of Chinook salmon, 56% of sockeye salmon, 48% of coho salmon, 45% of pink salmon, and 89% of chum salmon harvested in Upper Cook Inlet. From 2005 to 2016, the proportion of total annual Chinook, coho, pink, and chum salmon harvest taken by the drift gillnet fleet has increased, but the average annual drift gillnet proportion of total sockeye salmon harvest has not changed.

Management of the salmon fishery integrates information received from a variety of programs, including: offshore test fishing; escapement enumeration by sonar, weir, remote camera, and mark-recapture studies; comparative analyses of historical commercial harvest and effort levels; genetic stock identification; and age composition studies. Analyses of the age composition of sockeye salmon escapement into the principal watersheds of UCI provides information necessary for in-season estimates of the stock

contribution in various commercial fisheries by comparing age and size data in the escapement with that in the commercial harvest.

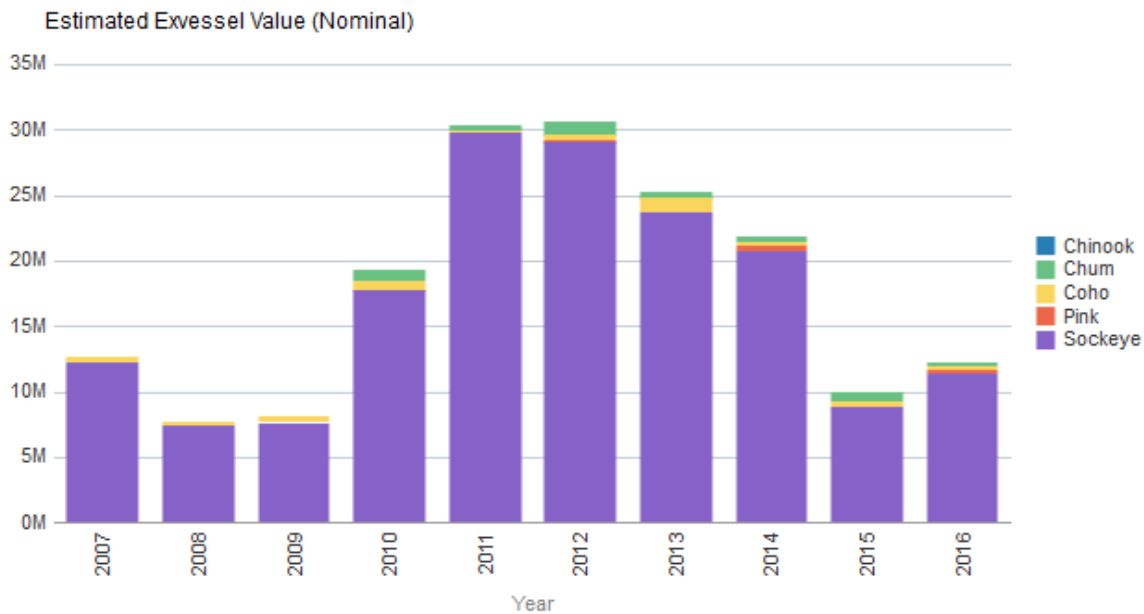


Figure 4-1 Estimated exvessel value for the Cook Inlet salmon drift gillnet fishery for 2007 through 2016.

In general salmon fisheries in the Central District are managed using two regular weekly periods lasting 12 hours each Monday and Thursday. The Central District drift gillnet fishery begins with the first regular period on or after June 19 and extends into early September. Additional fishing time beyond the two regular fishing periods may be allowed by emergency order depending on strength of the Kenai River late-run sockeye, Kasilof River sockeye, Susitna River sockeye, and Matanuska and Susitna river coho salmon returns. ADF&G manages the drift gillnet fleet to meet escapement goals for these stocks by regulating time and area of fishing.

The 2016 UCI commercial harvest of 3.5 million salmon was approximately 14% less than the 1966–2015 average annual harvest of 4.1 million fish. The 2016 sockeye salmon harvest estimate of 2.7 million fish was 7% less than the 1966–2015 average annual harvest of 2.9 million fish. The estimated exvessel value of the 2016 UCI commercial fishery of \$23.8 million was approximately 18% less than the 2006–2015 average annual exvessel value of \$28.9 million, and just above the average annual exvessel value of \$23.7 million from 1966 to 2015.

Estimating average annual price paid per pound for UCI salmon is challenging because an increasing number of fishermen are selling some or all of their harvest to niche markets, where they often receive higher prices than those paid by traditional markets. In addition, a trend observed for the past few seasons continued; early-season pricing for Chinook and sockeye salmon is much higher than what is paid later in the season. The price per pound paid for sockeye salmon in 2016 was estimated to be \$1.50, which was very close to the average price of \$1.52 from the previous 10 years (2006–2015).

Incidental catch

In Cook Inlet, groundfish taken by drift gillnet gear targeting salmon may be legally retained and sold (5 AAC 28.330(b)). Groundfish sold, or retained but not sold, are required to be recorded on ADF&G fish tickets (5 AAC 39.130(c)(10)). Groundfish species are present in very low abundance in areas where salmon fishing with drift gillnets occurs in the EEZ. As a result, groundfish bycatch landings in the EEZ salmon fishery are rare with no landings occurring most years. In years when groundfish bycatch landings have occurred total annual harvest has been less than 1,000 pounds in all but a single year.

Table 4-1 Central District (Upper Cook Inlet) drift gillnet salmon harvests compared to total Cook Inlet salmon harvests associated with directed commercial fisheries, 1997-2016 (in numbers of fish).

Year	Chinook salmon			Sockeye salmon			Coho salmon			Pink salmon			Chum salmon			Salmon total		
	Central District drift gillnet	Total Cook Inlet	Pct. of total	Central District drift gillnet	Total Cook Inlet	Pct. of total	Central District drift gillnet	Total Cook Inlet	Pct. of total	Central District drift gillnet	Total Cook Inlet	Pct. of total	Central District drift gillnet	Total Cook Inlet	Pct. of total	Central District drift gillnet	Total Cook Inlet	Pct. of total
1997	632	14,540	4.3%	2,199,933	4,449,536	49.4%	79,094	161,856	48.9%	30,100	2,885,557	1.0%	92,546	110,021	84.1%	2,402,305	7,621,510	31.5%
1998	338	9,198	3.7%	604,852	1,512,583	40.0%	84,301	175,754	48.0%	201,830	2,011,008	10.0%	89,158	101,535	87.8%	980,479	3,810,078	25.7%
1999	582	16,154	3.6%	1,425,750	3,194,605	44.6%	65,429	133,483	49.0%	3,588	1,156,700	0.3%	168,526	184,409	91.4%	1,663,875	4,685,351	35.5%
2000	274	8,542	3.2%	665,869	1,581,086	42.1%	134,226	246,148	54.5%	96,499	1,539,780	6.3%	121,981	204,230	59.7%	1,018,849	3,579,786	28.5%
2001	631	10,295	6.1%	849,656	2,047,600	41.5%	40,627	119,032	34.1%	31,730	666,002	4.8%	76,545	174,409	43.9%	999,189	3,017,338	33.1%
2002	422	14,278	3.0%	1,399,306	3,101,775	45.1%	129,600	255,717	50.7%	248,185	2,441,407	10.2%	229,825	286,451	80.2%	2,007,338	6,099,628	32.9%
2003	1,255	19,711	6.4%	1,604,682	4,134,388	38.8%	53,012	109,821	48.3%	30,679	906,563	3.4%	108,064	158,049	68.4%	1,797,692	5,328,532	33.7%
2004	1,138	28,616	4.0%	2,540,319	5,067,942	50.1%	200,682	320,189	62.7%	236,115	2,876,094	8.2%	137,661	353,468	38.9%	3,115,915	8,646,309	36.0%
2005	1,963	28,303	6.9%	2,526,824	5,483,530	46.1%	145,306	229,586	63.3%	31,509	2,355,670	1.3%	66,201	168,880	39.2%	2,771,803	8,265,969	33.5%
2006	2,791	18,781	14.9%	786,764	2,428,000	32.4%	99,831	209,259	47.7%	213,692	1,876,646	11.4%	60,712	136,754	44.4%	1,163,790	4,669,440	24.9%
2007	914	18,160	5.0%	1,827,332	3,693,857	49.5%	109,340	181,539	60.2%	67,729	434,778	15.6%	75,213	79,394	94.7%	2,080,528	4,407,728	47.2%
2008	654	13,626	4.8%	985,735	2,804,722	35.1%	90,447	174,638	51.8%	104,172	675,416	15.4%	46,405	226,446	20.5%	1,227,413	3,894,848	31.5%
2009	868	8,887	9.8%	971,375	2,340,382	41.5%	82,483	154,764	53.3%	140,304	1,204,388	11.6%	77,433	157,178	49.3%	1,272,463	3,865,599	32.9%
2010	539	9,990	5.4%	1,590,428	2,928,105	54.3%	110,695	208,785	53.0%	164,199	571,111	28.8%	217,787	324,431	67.1%	2,083,648	4,042,422	51.5%
2011	594	11,390	5.2%	3,206,695	5,677,071	56.5%	41,217	96,274	42.8%	15,422	396,605	3.9%	111,843	161,886	69.1%	3,375,771	6,343,226	53.2%
2012	219	2,665	8.2%	2,935,915	3,332,805	88.1%	75,098	107,796	69.7%	304,212	727,184	41.8%	266,422	327,108	81.4%	3,581,866	4,497,558	79.6%
2013	498	5,794	8.6%	1,667,844	2,859,927	58.3%	186,054	270,733	68.7%	30,812	2,147,167	1.4%	132,996	194,591	68.3%	2,018,204	5,478,212	36.8%
2014	382	5,028	7.6%	1,506,761	2,622,083	57.5%	78,035	139,984	55.7%	419,154	916,314	45.7%	109,378	190,675	57.4%	2,113,710	3,874,084	54.6%
2015	561	11,674	4.8%	1,015,035	2,899,591	35.0%	131,069	222,653	58.9%	21,748	6,436,882	0.3%	253,344	390,442	64.9%	1,421,757	9,961,242	14.3%
2016	607	10,947	5.5%	1,268,842	2,659,548	47.7%	90,672	149,557	60.6%	269,222	507,982	53.0%	113,621	198,317	57.3%	1,742,964	3,526,351	49.4%
Total	15,862	266,579	6.0%	31,579,917	64,819,136	48.7%	2,027,218	3,667,568	55.3%	2,660,901	32,733,254	8.1%	2,555,661	4,128,674	61.9%	38,839,559	105,615,211	36.8%

Note: Central District drift gillnet harvest reflects harvest recorded in Central District ADF&G salmon statistical areas by vessels fishing with Cook Inlet salmon drift gillnet (S03H) permits. This represents the maximum amount of harvest that has been taken from EEZ waters. Total Cook Inlet harvest is associated with the following CFEC permit types: Cook Inlet salmon purse seine (S01H), Cook Inlet salmon drift gillnet (S03H), Cook Inlet salmon set gillnet (S04H), and Cook Inlet salmon special harvest area (S77H), a hatchery permit. All salmon associated with commercial activity are included, regardless of disposition, and including test fishing and hatchery cost recovery. With the exception of commercially sold sport fish derby harvest, no other harvest is excluded based on the disposition of the salmon.

4.3 Economic and Community Impacts of Salmon Fishing

For analytical purposes, it is convenient to divide the EEZ salmon fishery contributions to regional employment and income into direct, indirect, and induced effects.²⁰ The direct effects are those reflected in jobs and income directly attributable to participation in the fisheries. In this case, these include the direct employment of the crew of the salmon trollers, gillnetters, and seiners and direct income to various participants in the fishing firms (crew shares, vessel shares, or shares for Alaska limited entry permit holders).

The indirect effects are those generated in other businesses, by the purchases or sales of the salmon fishing firms. Indirect effects would accrue to businesses supplying fuel and supplies, fishing gear and fishing gear repairs, ship construction and repairs, insurance, banking, legal, and accounting services, lobbying, and consulting. The goods and services above are “backward” linkages. Jobs and income may also be associated with “forward” linkages, in processing firms, and in firms providing transportation, warehousing, cold storage, brokering, and other distribution services.

Induced effects are those generated when directly or indirectly employed persons spend their income. Employment and income are created when people receiving income from fisheries spend their money on such things as groceries, gas, cars, car repairs, rent, home repairs, home construction, insurance, and so on.

It is customary to think of these regional economic contributions in terms of *multipliers* showing the total indirect and induced employment and income associated with direct employment and income. Multiplier estimates depend in part on the size of the community under consideration, because the smaller the community, the greater the “leakage,” as more labor, goods, and services are purchased outside of the community.

Multipliers for fishing activity within Alaska tend to be relatively low, compared to those for other Alaskan industries. Significant portions of the management and labor in fisheries and fish processing, tend to originate outside of the state. Significant portions of productive inputs tend to be purchased outside of the state (see Seung’s analysis of Alaska seafood processing, Seung 2008: 102). Because of this, direct, indirect, and induced effects tend to be divided between Alaska, and the places of origin for these inputs.

4.3.1 Employment

The direct employment contribution of EEZ fishing activity is the employment of persons on the fishing vessels. The Alaska Department of Labor (ADOL) surveys permit holders in Alaska’s fisheries and uses the responses to estimate crew factors in Alaska’s commercial fisheries.²¹ The crew factor for a fishery is equal to the estimated average size of vessel crews in the fishery, excluding the skipper. Using the ADOL crew factor estimates from its 2010 survey, and adjusting them to account for skippers, it is possible to estimate the number of separate job positions available in fisheries in a year.²² This is done by assuming that each permit fished corresponds to a separate fishing operation, incrementing the ADOL crew factor for the fishery by one, to account for the skipper, and multiplying the number of permits fished by the

²⁰This discussion addresses the employment and income contributions of the salmon fisheries taking place in federal waters off of Alaska. This is not a discussion of the fishery contribution to net economic welfare at the community, state, or national level.

²¹ The ADOL crew size estimates based on surveys of the Alaska permit holder.

²²The ADOL crew size estimates are used courtesy of the Research and Analysis Division of the Alaska Department of Labor and Workforce Development.

adjusted crew factor. The number of separate persons active is likely to be larger, due to turnover in positions. The survey does not collect information about the place of residence of crewmembers.

It is not possible to estimate the numbers of permit holders active *only* in the EEZ. Thus, the Cook Inlet positions, reported below, correspond to the numbers of permits fished in the relevant districts from Table 4-1 and overstate the number of positions attributable to salmon fishing in the EEZ.

In treating the number of permits fished from 1997 to 2016 as a guide to the distribution of permits normally fished and multiplying the number of permits fished by the estimated average vessel crew size, the median number of positions active in Cook Inlet District would be 1,075. As noted, the estimates for the Cook Inlet are not EEZ-specific, but also cover any vessels that fished in the district.²³

Table 4-2 Crew size estimates for the Cook Inlet drift gillnet fishery from 1997 through 2016 (source: ADOL).

Year	Cook Inlet Drift Gillnet Crew Estimate
1997	1,316
1998	1,214
1999	1,120
2000	1,180
2001	1,074
2002	941
2003	961
2004	1,012
2005	1,083
2006	911
2007	959
2008	980
2009	929
2010	869
2011	1,063
2012	1,141
2013	1,141
2014	1,141
2015	1,132
2016	1,076
Median	1,075
Mean	1,062

4.3.2 Residency

The share of fishing activity conducted by Alaskan residents differs by fishery. The fisheries that are affected by this action require limited entry permits issued by the State. Alaska tracks permit issuance;

²³ Vessel crew sizes (ADOL crew factors plus one) were 2.3 persons in each of the drift gill net fisheries.

permits fished, and permit production and revenue by state of residence of the permit holder. The percentage of permits fished by Alaska residents varies by permit fishery.²⁴

In the Cook Inlet drift gillnet fishery, about 74.8% of the permits fished, accounting for 77.0% of the revenues, were Alaskan residents in 2016 (CFEC 2017).

Alaska residents are found in smaller proportions in the seafood processing sector than in the fishing sector. The Alaska Department of Labor (ADOL) estimates seafood processing workforce participation by residency.²⁵ From a statewide perspective, ADOL estimates that 28.5% of the seafood processing workforce are Alaska residents and 71.5% are non-residents.

Seung and Waters report that the seafood processing industry's output multiplier is among the lowest for Alaska industries, because much of the income earned in the industry is earned by non-residents, and because a large proportion of intermediate inputs are purchased from out of state. They estimate that about 60% of labor earnings in seafood processing leave Alaska, and that about 69% of intermediate inputs is imported (Seung and Waters 2006: 347-348).²⁶

4.3.3 Fisheries Taxes

Alaska's fisheries taxes, some of which are shared with communities or enhancement operations local to fisheries, are another source of indirect salmon fishery effect. "Fish" tax receipts shared with a community may be associated with increased community spending on goods and services within the community, smaller community sales tax or property tax assessments, purchases of goods and services outside the community, or some combination of these. Costs recovered for salmon aquaculture may be a source of local employment and income, as well.

The salmon fisheries that occur, in part, in the waters of the EEZ²⁷ may be subject to different combinations of five separate State fisheries taxes.²⁸ These are listed in **Table 4-3**. The taxes and rates applicable to the salmon fisheries in the EEZ are:

- **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 or not 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 shore-based processors and direct marketers (3%), floating processors (5%), or salmon canneries (4.5%). Half the tax revenues are shared with communities where the processing takes place. Revenue sharing is

²⁴ This discussion of the residency of permit holders is based on an examination of Basic Information Tables prepared by Alaska's CFEC, and available at its web site at <http://www.cfec.state.ak.us/bit/MNUSALM.htm>. These tables were downloaded on July 25, 2017. In Alaska, there should be one limited entry permit holder present with each fishing operation. The number of crew present on an operation will normally be larger than this. For the percentages reported here to be indicative of the place of origin for the crew as a whole, it is necessary to assume that permit holders hire crew from their own state of residence.

²⁵ [November 2016 Trends](#)

²⁶ These relate to all seafood processing. The numbers specific to the regions under consideration in this analysis, or to salmon processing, are unknown, but may differ from the overall statewide numbers. The largest category of imported intermediate inputs is raw fish caught by catcher vessels owned by nonresidents but landed for processing in Alaska. This includes significant volumes of groundfish and crab, and the proportion of intermediate inputs in these fisheries may differ from that for salmon processing.

²⁷ These are the troll fisheries off of Southeast Alaska, the drift gillnet fisheries off of the Copper River and in central Cook Inlet, and the drift gill net and seine fisheries on the south side of the Alaska Peninsula.

²⁸ In addition to the taxes discussed here, municipalities may impose their own taxes, and commercial fishing operations contribute a share of the fuel tax revenues collected by Alaska. These are not discussed

based on fishery harvests one year before, thus this tax is calculated and distributed to the municipalities in 2017 for fishing that took place in 2016.

- **Fishery Resource Landing Tax:** This tax is levied on fishery resources processed outside the three-mile limit and first landed in Alaska, or on fish processed subject to section 210(f) of the American Fisheries Act. The tax is levied on the average unprocessed value of the fish. This tax would not be levied on drift gill net vessels or seine vessels, which do not process salmon on-board.
- **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. This revenue is not shared with communities affected by the fisheries.
- **Salmon Enhancement Tax.** Salmon fishermen 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 limited entry permit holders when they sell their salmon. Limited entry 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.

Regional Seafood Development Tax: Groups of Alaska fishermen may organize to form regional fisheries development associations for marketing, infrastructure, or other development purposes. Fishermen may vote to assess themselves to fund these activities. Among the groups of salmon fishermen operating at times in the EEZ, only the Prince William Sound drift gill net fishermen have voted to assess themselves for this purpose; these voted to assess 1% of their gross revenues.

Table 4-3 summarizes the tax rate information for the fisheries taking place partly in the EEZ. In these fisheries, salmon from the EEZ make a contribution to state tax revenues.

Table 4-3 Summary of State of Alaska fisheries taxes and the incidence on salmon fisheries occurring in the Cook Inlet EEZ. (Source ADOR)

	Fisheries Business Tax	Fishery Resource Landing Tax	Seafood Marketing Assessment	Salmon Enhancement Tax	Regional Seafood Development Tax
Cook Inlet drift gillnet	3.0%, 4.5%, or 5% depending on processor type	0.0%	0.5%	2.0%	0.0%
Statute	AS 43.75	AS 43.77	AS 16.51	AS 43.76.001	AS 43.76.350
Regulations	15 AAC 75	15 AAC 77	15 AAC 116	15 AAC 76	Not applicable

4.3.4 Impacts of EEZ Harvests in Upper Cook Inlet

Table 4-4 highlights earnings from salmon commercially harvested using drift gillnet gear in the Central District of UCI. In 2016, the estimated gross earnings from salmon (all species) harvested using drift gillnet gear were \$12.3 million, which represents 51.6% of the total earnings grossed by all commercial fisheries (purse seine, set gillnet, and drift gillnet combined) throughout Cook Inlet. Between 1997 and 2016, earnings from salmon commercially harvested using drift gillnet gear in the Central District represented at the maximum (2012) 89.3% of the total all-gear gross earnings, and at the minimum (2006) 33.7% of the total all-gear gross earnings. On average, from 1991 to 2010, earnings from salmon commercially harvested by drift gillnet gear in the Central District were 53.0% of the total Cook Inlet all-gear gross earnings.

For the time period 1997 through 2016, the majority of commercially retained salmon harvested using drift gillnet gear in the Central District of UCI was delivered to the port of Kenai, except for 2015 when the port of Kasilof received slightly more. The average amount of salmon (all species combined) delivered to Kenai (from drift gillnet vessels fishing in the Central District) over this time period was 8,547,951 pounds with an average estimated gross ex-vessel value of \$8,547,951. Salmon accounts for the majority of seafood processing in Kenai. Other ports taking deliveries of salmon in Cook Inlet include Nikishka/Nikiski, Homer, Kasilof, and Anchorage.

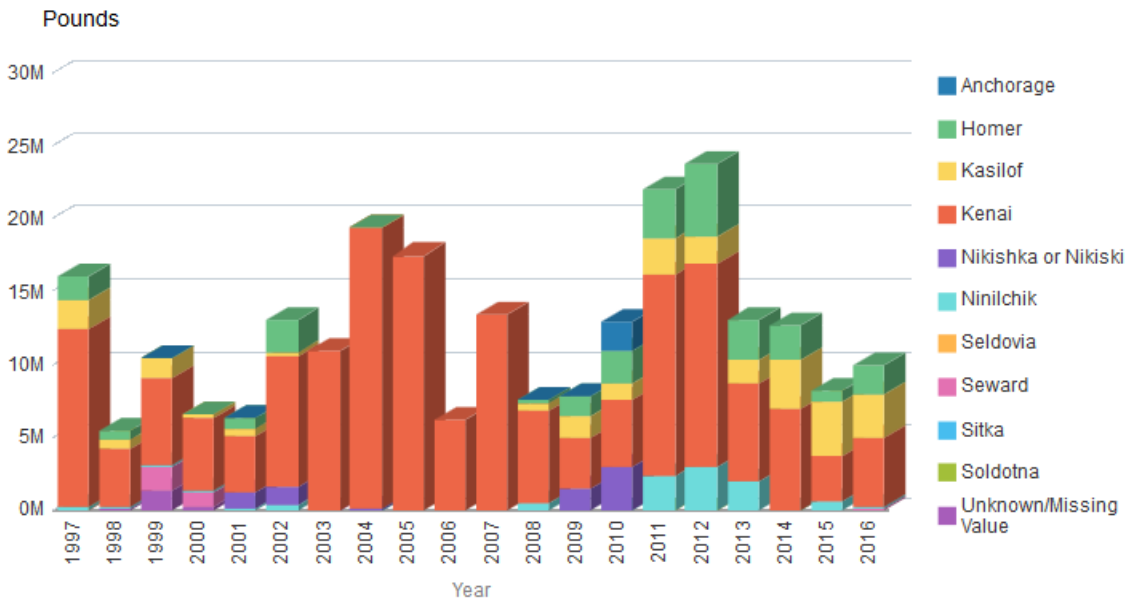


Figure 4-2 Port Deliveries of S03H Salmon Caught in the Central District in Pounds.

Homer is the primary community of residence for drift gillnet permit holders operating in Central District of UCI. For the time period 1997 through 2016, an average of 100 Homer drift gillnet permit holders were active in the Central District, with a combined annual average estimated gross earnings of \$3,144,153 from harvests in the Central District. Other main Alaska communities of residence for drift gillnet permit holders operating in the Central District include Kenai, Soldotna, and Kasilof, and Anchorage. Communities of residence outside of Alaska associated with this activity include Astoria, Oregon and Cathlamet, Washington.

Cook Inlet Drift Gillnet Commercial Fisheries Entry Commission Limited Entry Permit Value

In Alaska salmon fisheries the value of CFEC limited entry permits provides an index of fishery economic condition. Similar to other Alaska salmon fisheries, S03H (Cook Inlet Salmon Drift Gillnet) permit value experienced a sharp rise in value in the late 1980s through the early 1990s concomitant with high salmon exvessel prices and earnings (Figure 4-3). Beginning in the 1990s and continuing into the early 2000s 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. In nominal terms, the S03H permit had an apex value of \$202,058 in 1990 and reached a nadir in 2002 at \$11,700. While S03H permit value has increased since the early 2000s rising to \$83,100 in 2013, permit prices have since fallen to \$52,500 in 2016.

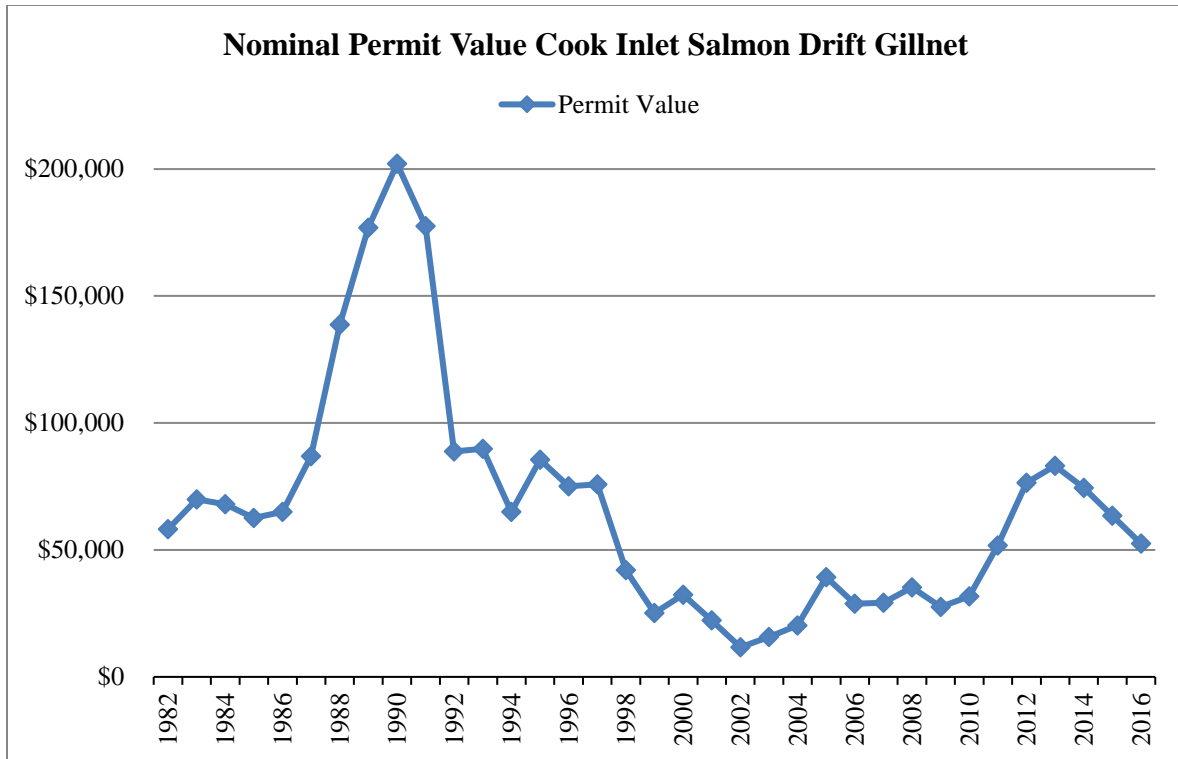


Figure 4-3 Nominal value of permits in the Cook Inlet salmon drift gillnet fishery from 1982 through 2016 (Source CFEC).

Table 4-4 Central District (Upper Cook Inlet) drift gillnet participation and estimated gross earnings from commercially retained salmon (all species) compared to total Cook Inlet estimated gross earnings across all salmon permit types, 1997-2016.

Year	Central District drift gillnet commercial salmon harvests						Estimated gross earnings by all permit types in Central District	Total Cook Inlet estimated gross earnings, all permit types	Central District drift gillnet earnings as pct. of total Cook Inlet earnings
	Number of salmon	Pounds of salmon	Estimated gross earnings	Avg. estimated earnings per permit	Permit count	Processor facility/platform count			
1997	2,398,105	16,021,059	\$17,448,194	\$30,504	572	24	\$31,592,156	\$33,861,060	51.5%
1998	971,289	5,401,864	\$4,296,966	\$8,138	528	18	\$7,732,908	\$9,717,632	44.2%
1999	1,648,851	10,395,737	\$12,134,809	\$24,917	487	17	\$20,878,866	\$24,040,441	50.5%
2000	995,989	6,414,163	\$4,438,593	\$8,652	513	18	\$7,753,849	\$9,788,168	45.3%
2001	990,291	6,256,255	\$3,711,269	\$7,947	467	23	\$7,217,029	\$8,516,376	43.6%
2002	1,938,185	12,635,291	\$5,686,012	\$13,902	409	19	\$10,697,859	\$12,057,334	47.2%
2003	1,780,707	10,891,761	\$6,329,162	\$15,142	418	21	\$13,650,133	\$15,979,498	39.6%
2004	3,097,739	19,335,647	\$11,798,105	\$26,814	440	23	\$22,264,897	\$23,639,876	49.9%
2005	2,717,322	17,141,891	\$15,251,702	\$32,382	471	27	\$29,802,766	\$31,442,246	48.5%
2006	1,157,744	6,124,173	\$5,158,809	\$13,027	396	28	\$12,990,092	\$15,313,750	33.7%
2007	2,073,769	13,409,028	\$12,759,634	\$30,599	417	27	\$21,992,110	\$24,071,974	53.0%
2008	1,222,270	7,574,575	\$7,823,008	\$18,364	426	27	\$17,983,298	\$22,643,337	34.5%
2009	1,265,009	7,755,827	\$8,200,391	\$20,298	404	28	\$15,770,983	\$18,588,144	44.1%
2010	2,078,153	12,897,283	\$19,300,530	\$51,060	378	26	\$31,912,945	\$34,470,900	56.0%
2011	3,363,839	21,982,454	\$30,378,044	\$65,753	462	25	\$48,906,745	\$52,571,823	57.8%
2012	3,561,850	23,684,009	\$30,546,478	\$61,586	496	21	\$32,091,929	\$34,206,521	89.3%
2013	2,006,959	13,040,140	\$25,230,345	\$50,868	496	27	\$37,655,449	\$42,862,831	58.9%
2014	2,099,996	12,638,888	\$21,897,306	\$44,148	496	26	\$31,235,697	\$34,173,535	64.1%
2015	1,412,523	8,128,669	\$9,917,636	\$20,158	492	33	\$22,067,207	\$27,123,331	36.6%
2016	1,734,190	9,878,434	\$12,279,641	\$26,239	468	27	\$21,869,678	\$23,781,294	51.6%

Note: Only commercially retained harvest is included. Earnings estimates and average earnings estimates are based on CFEC gross earnings data. Central District drift gillnet harvest reflects harvest recorded in Central District ADF&G salmon statistical areas by vessels fishing with Cook Inlet salmon drift gillnet (S03H) permits. Total Cook Inlet harvest is associated with the following CFEC permit types: Cook Inlet salmon purse seine (S01H), Cook Inlet salmon drift gillnet (S03H), and Cook Inlet salmon set gillnet (S04H). Cook Inlet salmon special harvest area (S77H) permits are not included. Earnings estimates and average earnings estimates per permit are based on CFEC gross earnings data.

4.4 Sport Salmon Fisheries

The ADF&G Division of Sport Fish 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 which is held in the hand or closely attended, or by other means defined by the Board (AS 16.05.940(30)). Further information on state management of sport fisheries can be found on the ADF&G website at: www.adfg.alaska.gov/index.cfm?adfg=fishingSport.main.

Under criteria adopted by the Board, the Commissioner may increase or decrease sport fish bag limits or modify methods of harvest for sport fish by means of emergency orders. An emergency order has the force and effect of law after field announcement by the Commissioner or an authorized designee. These changes may not reduce the allocation of harvest among other user groups. An emergency order may not supersede bag and possession limits or methods and means established in regulatory management plans established by the Board.

The ADF&G Commissioner or an authorized designee may decrease sport fish bag and possession limits and restrict methods and means of harvest by emergency order when (A) the total escapement of a species of anadromous fish is projected to be less than the escapement goal or the lower limit of the escapement range for that species listed in management plans that have been adopted by the Board of Fisheries or established by ADF&G; or (B) the sport harvest must be curtailed in any fishery for conservation reasons. ADF&G may issue a "catch-and-release only" emergency order when the estimated hooking mortality is not projected to reduce the population of fish below the number required for spawning escapement or, in the case of resident species, below the level required for maintenance of the desired age and size distribution of the population. "Catch-and-release" as a tool to address conservation shall be labeled "conservation catch-and-release" to differentiate from catch-and-release regulations adopted by the Board for special management to create diversity in sport fisheries.

The ADF&G Commissioner or an authorized designee may increase sport fish bag and possession limits and liberalize methods and means of harvest by emergency order when (A) the total escapement of a species of anadromous fish is projected to exceed the escapement goal or the upper limit of the escapement range for that species listed in management plans that have been adopted by the Board or established by ADF&G, if the total harvest under the increased bag and possession limit will not reduce the escapement below the optimum escapement goal or the upper limit of the escapement range; or (B) hatchery-produced fish escape through existing fisheries to designated harvest areas in numbers that exceed brood stock needs, any natural spawning requirements, or cost recovery goals of private nonprofit hatcheries. The intent of these provisions is to allow harvest when there are no other competing user groups.

The Division of Sport Fish has conducted a mail survey (Statewide Harvest Survey [SWHS]) to estimate sport fishing annual effort (angler-days), harvest (fish kept) since 1977, and total catch (fish kept plus fish released) since 1990. Harvest and catch estimates are available for species commonly targeted by sport anglers. Effort, harvest, and catch estimates are available by region and area, but are not specifically available for the EEZ.

For the West Area, logbook data, which provides an estimate of effort, harvest, and catch (see Sport Fishing Guide Operations section below), can be used to derive the proportion of the guided harvest that occurred in the EEZ for each species and year. Those proportions can then be applied to the annual SWHS estimates for each species and year. This approach assumes that guided and unguided fisheries have equal proportions of harvest in federal (versus State) waters. Given the available data for sport

fishing activity, harvest estimates for the EEZ can be provided for the time period 2004 through 2016 for Chinook, sockeye, and coho salmon.

EEZ sport harvest of salmon was calculated by multiplying the percentage of harvest that occurred in federal waters by SWHS estimates. The percentage of harvest from federal waters was calculated using logbook data in the West Area. As such, sport harvest estimates from the EEZ include both guided charter vessels and unguided anglers. The percentage of federal waters harvest was applied only to boat harvest estimates from the SWHS; all shore harvest was assumed to be in state waters.

4.4.1 Sport Salmon Harvest in the West Area

Sport harvest of Chinook salmon in the EEZ waters of the West Area averaged 5.0% of the total saltwater sport harvest from 2004 through 2016 (Table 4-5, Figure 4-4). Most of this harvest, an annual average of approximately 1,100 Chinook salmon, came from the EEZ adjacent to Cook Inlet. An estimated average of 190 Chinook salmon are harvested annually from the EEZ waters of Prince William Sound and North Gulf (SWHS statistical Area J).

Sport harvest of Coho salmon in the EEZ waters of the West Area averaged 5.1% of the total saltwater sport harvest for 2004 through 2016 (Table 4-5). An average of nearly 5,100 coho salmon were taken in Cook Inlet annually and the remainder, an average of 4,300 coho salmon, were harvested in Prince William Sound and North Gulf (SWHS statistical area J).

Sport harvest of sockeye salmon in the EEZ waters of the West Area averaged 8.0% of the total saltwater sport harvest from 2004 through 2016 (Table 4-5). The vast majority of this sport harvest was from Cook Inlet with an annual average of 1,700 sockeye salmon harvested in the EEZ during the 2004 through 2016 time period.

Most salmon harvested in the West Area were offloaded in Homer followed by Seward, Anchor Point, and Deep Creek. Coho salmon was the species most often landed in those ports. Sockeye were offloaded most often in the ports of Homer, Seward, and Anchor Point.

Table 4-5 Comparison of State and federal (EEZ) saltwater sport fishery harvests of Chinook, coho, and sockeye salmon (numbers of fish) in the West Area, 2004 through 2016.

Year	Chinook		Coho		Sockeye	
	Federal	State	Federal	State	Federal	State
2004	654	34,574	18,159	249,285	1,220	15,554
2005	1,119	32,356	12,042	298,973	988	18,811
2006	742	34,057	10,459	200,307	2,540	12,563
2007	1,002	29,490	10,066	261,670	2,586	24,052
2008	698	23,205	7,197	191,886	572	23,706
2009	663	20,775	10,430	180,541	4,043	25,223
2010	2,514	18,362	6,667	182,367	652	23,281
2011	866	18,819	8,263	177,237	2,452	22,946
2012	538	16,572	5,800	77,792	5,436	16,299
2013	1,137	24,178	7,709	174,394	1,471	28,746
2014	2,319	22,408	8,406	121,208	584	28,447
2015	4,245	27,372	14,898	193,731	1,209	23,719
2016	295	34,840	2,725	55,647	137	27,267

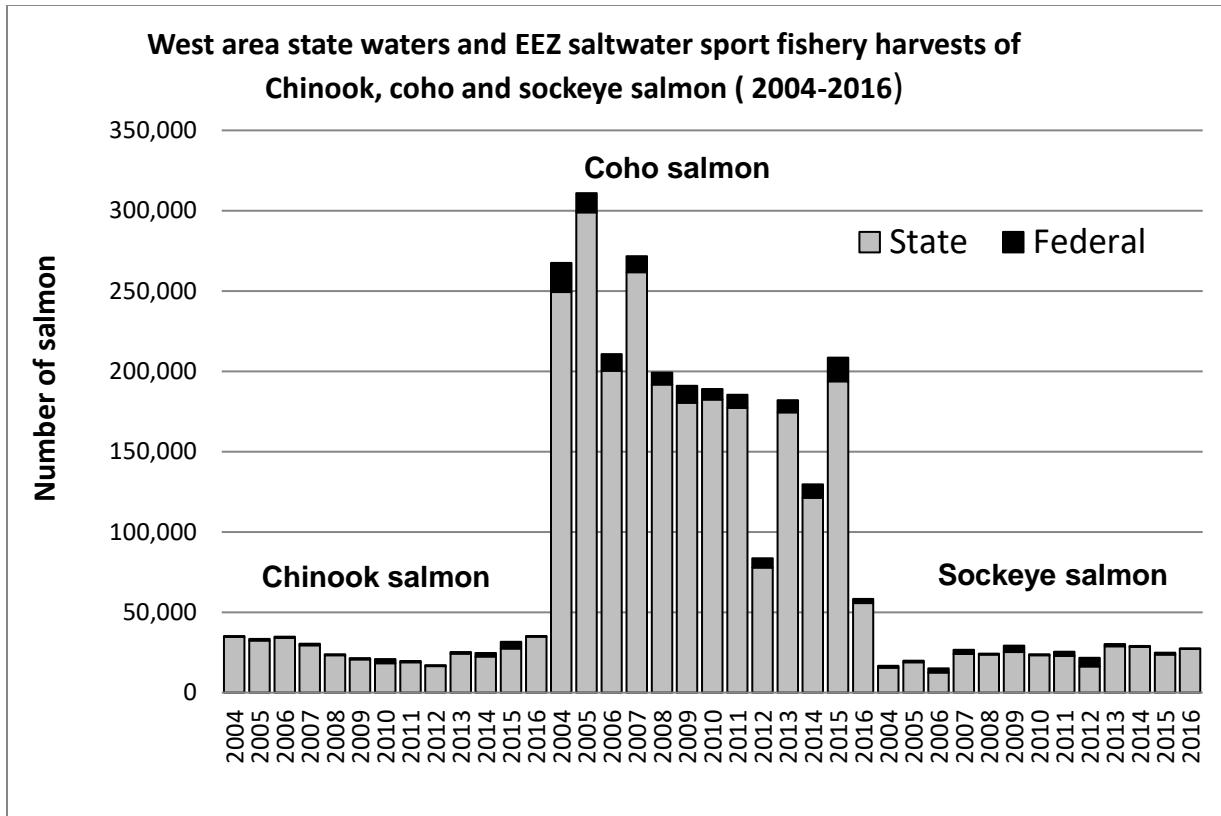


Figure 4-4 Comparison of State and federal (EEZ) saltwater sport fishery harvests of Chinook, coho, and sockeye salmon (numbers of fish) in the West Area, 2004 through 2016 (data from Table 4-5).

4.4.2 Sport Fishing Guide Operations

Per Alaska regulation (5 AAC 75.075), the ADF&G, Division of Sport Fish is responsible for overseeing the annual licensing and/or registration of sport fish businesses and guides. A ‘salt water sport fishing guide’ means a person who is licensed to provide salt water sport fishing guide services to persons who are engaged in sport fishing (AS 16.40.300). ‘Salt water sport fishing guide services’ means providing 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 on salt water during any part of a sport fishing trip. Salmon are one of the primary species targeted in the states’ sport fisheries. All saltwater and freshwater sport fishing charter vessels must be registered through ADF&G.

In addition, all freshwater and saltwater sport fishing guide operators are required to maintain an ADF&G-issued logbook of their clients’ catch. The Division of Sport Fish conducts a program to issue Saltwater and Freshwater Charter Logbooks, which provides comprehensive effort, harvest, and catch estimates for guided anglers. Logbook data are available specifically for State and federal waters in Southcentral Alaska since 1998.

4.4.3 Impacts of Sport Fishing in the EEZ

The documented amount of effort from marine waters within the West Area is minor in comparison to state waters; however, it does represent some level of economic impact to communities adjacent to the West Area. The number of vessels harvesting salmon in EEZ waters is approximately one-quarter to one-third of the number of vessels harvesting salmon within state waters over the time series; however, the number of trips made into EEZ waters is much less, at under ten% over the time series (Figure 4-5 and Table 4-6).

The ports likely benefitting are: Homer, Seward and Anchor Point given the number of trips observed offloading fish in those ports. The marine component of the Economic Impacts and Contributions of Sport Fishing in Alaska, 2007, shows that saltwater anglers contributed over \$203.5 million dollars from direct expenditures for trip related and package spending in communities of Southcentral Alaska. This suggests that part of the contributions to communities from those expenditures are associated with fish harvested from federal waters in the West Area and could certainly be upwards of several million dollars annually. However, there is no way to directly measure the monetary contributions for fish harvested in the West Area of the EEZ using the existing information, and to do so would require additional surveys to collect that information.

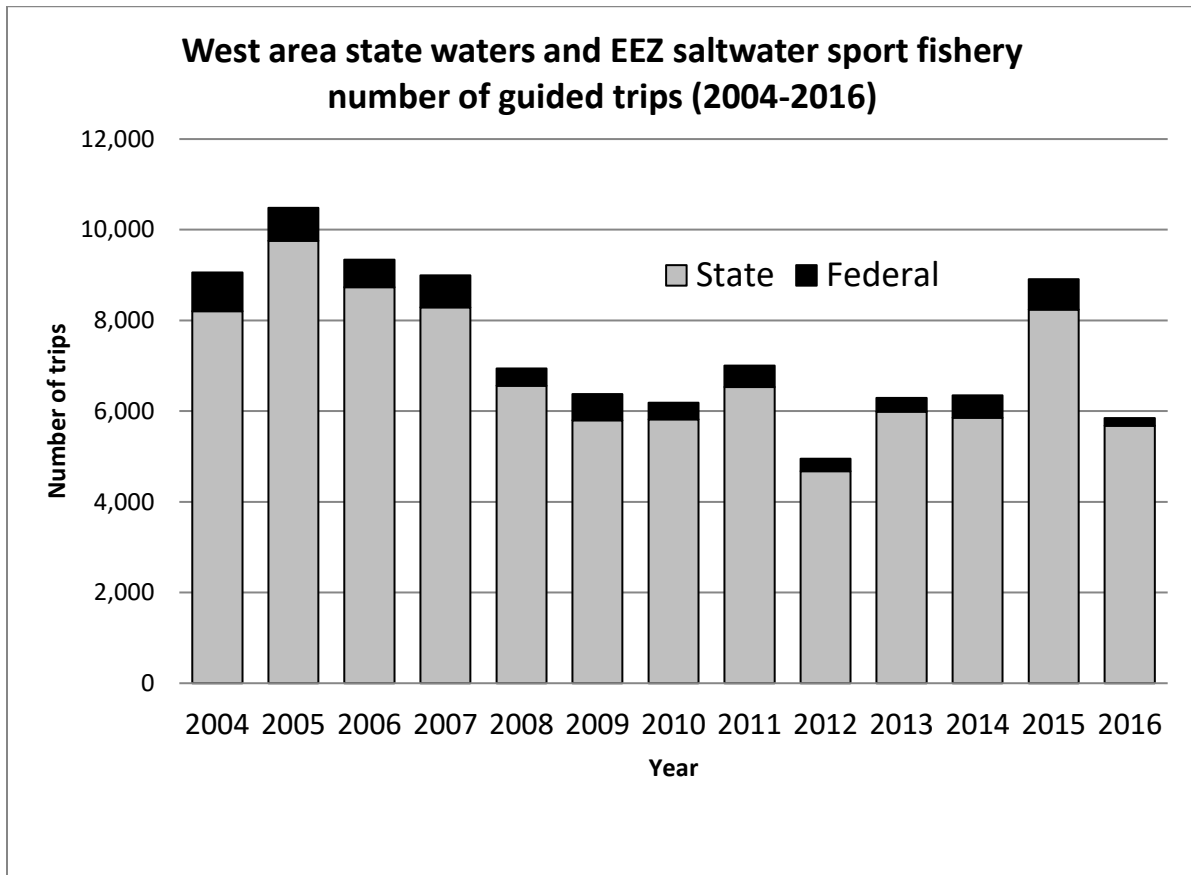


Figure 4-5 Comparison of State and federal (EEZ) saltwater guided sport fishery salmon trips during 2004-2016. Data source: ADF&G Saltwater Logbooks

Table 4-6 Comparison of State and federal (EEZ) saltwater sport fishery effort, 2004-2016 (vessels and trips).
 Data source: ADF&G Saltwater Logbooks.

Year	Vessels		Trips	
	Federal	State	Federal	State
2004	149	447	850	8,207
2005	159	476	722	9,759
2006	165	512	605	8,733
2007	156	494	703	8,290
2008	112	437	380	6,558
2009	126	405	581	5,797
2010	91	380	370	5,819
2011	110	376	471	6,535
2012	74	319	273	4,677
2013	81	324	310	5,985
2014	112	335	493	5,857
2015	105	357	671	8,238
2016	55	329	164	5,680

5 Additional Issues

The chapter provides some background information on issues that will be analyzed in the National Environmental Policy Act (NEPA) document prepared for the proposed action and its alternatives.

5.1 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 program is administered by NMFS (for most marine mammal species, marine and anadromous fish species, and marine plants species) and by the United States Fish and Wildlife Service (USFWS; for bird species, some marine mammals, and terrestrial and freshwater wildlife and plant species). 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 (Secretary), 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 they are not undertaking actions that are likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat.

The key sections of the ESA relevant to non-federal actions are section 9 and section 10. Section 9 prohibits the taking of endangered species of fish and wildlife. Section 10 provides exceptions to the section 9 prohibition by allowing NMFS or USFWS to issue a permit to take listed species incidental to otherwise legal activity. Specifically, Section 10(a)(1)(B) allows non-federal parties planning activities that have no federal nexus, but which could result in the incidental taking of listed animals, to apply for an incidental take permit.

For federal fishery actions, NMFS-Sustainable Fisheries Division is the action agency that initiates the section 7 consultation. The North Pacific Fishery Management Council (Council) may be invited to participate in the compilation, review, and analysis of data used in the consultations. 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, however, is the responsibility of the appropriate consulting agency (NMFS Protected Resources Division or USFWS). If the action is determined to result in jeopardy, the resulting BiOp includes reasonable and prudent measures that are necessary to alter the action so that jeopardy is avoided. If an incidental take of a listed species is

expected to occur under normal promulgation of the action, an incidental take statement is appended to the BiOp.

Section 7 consultations have been done for the Southeast Alaska troll fishery and ESA-listed species, some individually and some as groups. In 2008, NMFS issued the *Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Approval of Revised Regimes under the Pacific Salmon Treaty and the Deferral of Management to Alaska of Certain Fisheries Included in those Regimes* (2008 BiOp, NMFS 2008a).²⁹ The 2008 BiOp analyzed the potential effects on 28 salmon and steelhead species that are listed currently as threatened or endangered under the ESA and killer whales, green sturgeon, and Steller sea lions. The subsequent sections summarize the findings of that consultation and provide any relevant new information.

Section 7 consultations have 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 Biological Opinion* (2010 BiOp, NMFS 2010). The information on the interactions between these FMP salmon fisheries and ESA-listed Pacific salmon, marine mammals, and seabirds was provided in the EA for Amendment 12 and summarized in the following sections along with any relevant new information.

NMFS Sustainable Fisheries Division conducted informal section 7 consultations prior to the decision to approve Amendment 12. The action to manage the commercial salmon fishery in Cook Inlet would also require NMFS to conduct section 7 consultations. Any adverse effects of the commercial salmon fishery in Cook Inlet on listed species or critical habitat and any takings that may occur are subject to an ESA section 7 consultation. This is a primary distinction between the 2012 Salmon FMP and a new FMP that manages the commercial salmon fishery in Cook Inlet. The 2012 FMP eliminated federal discretion or control over salmon fishing activities in the EEZ within the traditional net fishing areas that may affect listed species or critical habitat, and thus removed the federal nexus that triggers ESA section 7 consultation. Persons participating in salmon fisheries within these areas are still subject to ESA § 9 prohibition on the taking of listed species. ESA § 10 would allow the Secretary to grant incidental take permits to persons who take listed species incidentally as part of their lawful fishing activities as long as they mitigate the risk of take. 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. A new FMP that manages the commercial salmon fishery in Cook Inlet would reestablish the federal nexus that triggers ESA section 7 consultation for the action to approve the FMP amendment and any future actions where there is potential to affect listed species or critical habitat.

5.2 ESA-listed Pacific Salmon

No species of Pacific salmon originating from freshwater habitat 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. At least some of the listed salmon and steelhead are presumed to range into marine waters off Alaska during ocean migration and growth to maturity phases of their anadromous life history. During ocean migration to the Pacific marine waters a small (undetermined) portion of the stock go into the Gulf of Alaska (GOA) as far east as the Aleutian Islands (Weitkamp 2011). 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 the other, 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

²⁹ Available on the NMFS Alaska Region website at <http://www.alaskafisheries.noaa.gov/analyses/salmon/salmonbiop122208.pdf>

nearshore waters, they may also incidentally take ESA-listed salmon. A new FMP that manages the commercial salmon fishery in Cook Inlet would reestablish the federal nexus that triggers an ESA section 7 consultation for the salmon fisheries impacts on ESA listed Pacific salmon.

The consultation would analyze new information on the potential for take of ESA listed salmon in the fisheries that operate in EEZ waters. ADF&G has released new information on the genetic stock composition of the commercial and sport harvest of Chinook salmon in the Westward region, 2014–2016 (Shedd et al 2016). The following is excerpted from the abstract –

The primary goal of this study was to estimate the stock of origin, age, size, and sex composition of Chinook salmon, *Oncorhynchus tshawytscha*, harvested in Westward Region commercial and Kodiak area sport fisheries during 2014–2016 as part of the larger statewide Chinook Salmon Research Initiative. Chinook salmon commercial and sport harvest in the Kodiak area were sampled from 2014 to 2016; however, budgetary constraints limited sampling of North Peninsula, South Peninsula, and Chignik commercial harvest to 2014. A total of 10,154 Chinook salmon tissue samples were collected from 4 commercial fishery areas and sport fisheries in the Kodiak area. Of these, 8,829 samples were genotyped to represent 25 spatiotemporal strata. Stock compositions were estimated with genetic mixed stock analysis for all strata using a comprehensive, coastwide Chinook salmon baseline with important local stocks defined as separate reporting groups, to the extent possible. Harvests in both the commercial and marine sport fisheries were dominated by British Columbia and West Coast U.S. stocks, followed by smaller contributions from Southeast Alaska/Northeast Gulf of Alaska, Cook Inlet, and Kodiak. Stock composition estimates were consistent among strata within commercial and marine sport harvests, although there were differences between these fisheries. In the annual commercial harvest, over 50% of the fish were from British Columbia and over 30% of the fish were from the West Coast U.S. In the marine sport fishery, the relative abundance of British Columbia and West Coast U.S. fish varied, but jointly represented over 80% of annual harvest. In both the commercial and sport fisheries, the annual harvest of Kodiak-origin Chinook salmon was below 5% of the total harvest. These results provide the most comprehensive estimates of stock composition and stock-specific harvests of Chinook salmon in the Kodiak area, supplement previous studies, and should inform fishery management and regulatory decision makers.

5.3 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 5-2 provides a summary of the status of the marine mammals potentially affected by these salmon fisheries. The 2015 marine mammal stock assessment report³⁰ provides background information, population estimates, population trends, and estimates of the potential biological removal levels for each stock.

Interactions between marine mammal species and the salmon fishery occur when fishing vessels disturb marine mammals, marine mammals prey on hooked salmon, and marine mammals become snagged or entangled in fishing gear. The term incidental take in regards to commercial fishing refers to the catch or

³⁰The 2015 Marine Mammal Stock Assessment Report (Muto et al. 2015) is available at http://www.nmfs.noaa.gov/pr/sars/pdf/alaska2015_final_corrected_.pdf.

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 FMP salmon fisheries and the reported incidental takes are detailed in the EA for Amendment 12.

Humpback whales, beluga whales, killer whales, seals, Northern fur seals, and Steller sea lions eat salmon. Salmon is primarily a summer prey species for Steller sea lions, resident killer whales, spotted seals, beluga whales, and northern fur seals (NPFMC 2011b). Salmon harvested in the commercial salmon fisheries may otherwise be available as prey for marine mammals.

Table 5-1 Marine Mammals that eat 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 2011b

This section provides a preliminary analysis of the commercial salmon fishery in the Cook Inlet EEZ and the potential for interactions with identified marine mammal species. A complete analysis of the interactions between the Cook Inlet commercial salmon fishery in the EEZ with marine mammals would be conducted in the environmental assessment prepared for the proposed action.

5.3.1 Cook Inlet Drift Gillnet Fishery

The Cook Inlet drift gillnet fishery is classified as category II fisheries under the MMPA. A fishery that has occasional incidental mortality or serious injury of marine mammals is placed in category II. Fishermen participating in a category II fishery are required to accommodate an Alaska Marine Mammal Observer Program (AMMPO) 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 this observer data is 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. Fishermen participating in a category II fishery are required to comply with any applicable take reduction plans. NMFS has not developed a take reduction plan for these fisheries. Additionally, each vessel fishing in a category II fishery must have a NMFS-issued certificate 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 are irrespective of whether the fishery is under state or Federal jurisdiction. For example, NMFS deployed marine mammal observers on vessels participating in the state-managed Southeast Alaska gillnet fishery in 2012 and 2013.

Table 5-2 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 DPS	Endangered (WDPS)	Depleted & a strategic stock	There is strong evidence that non-pup counts of western stock Steller sea lions in Alaska increased between 2000 and 2014. However, there are strong regional differences across the range in Alaska. Regional variation in trends in pup counts in 2000-2014 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 all 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 AK 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.
Harbor seal – Gulf of Alaska	None	None	Moderate to large population declines have occurred in the Gulf of Alaska stocks. <i>Cook Inlet/Shelikof Strait</i> : a 38% probability that the stock is decreasing.	GOA stock found primarily in the coastal waters and may cross over into the Bering Sea coastal waters between islands.
Harbor porpoise	None	Strategic	Reliable data on population trends are unavailable.	Primarily in coastal waters in the GOA, usually less than 100 m.
Pacific white-sided dolphin	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 71% in 30 years with 375 animals estimated in 2008.	Cook Inlet belugas remain in Cook Inlet year round and eat salmon.
<p><i>Source: Muto et al. 2015 and List of Fisheries for 2017 (82 FR 3655, January 12, 2017). Northern fur seal pup data available from http://www.alaskafisheries.noaa.gov/newsreleases/2007/fursealpups020207.htm. Northern sea otter information from http://www.nmfs.noaa.gov/pr/pdfs/sars/seaotter2008_ak_sw.pdf and 74 FR 51988, October 8, 2009.</i></p>				

According to the List of Fisheries³¹, 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*). The reported interactions between this fishery and marine mammals are shown in Table 5-3. This fishery was categorized as a Category II based on logbook data. Observer coverage levels were inadequate to determine mortality and serious injury levels across all fisheries, but available data suggested that, if observer data were available, the data would likely indicate that serious injury and mortality were more than 10% of the Potential Biological Removal (PBR) for at least one stock with which this fishery interacts. Data suggests that levels of mortality and serious injury would be similar to those in other Category II drift gillnet fisheries which interact with similar marine mammal species.

A marine mammal observer program for the Cook Inlet salmon drift gillnet fisheries 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 these fisheries (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. 2015).

³¹The 2017 List of Fisheries is available at <https://www.gpo.gov/fdsys/pkg/FR-2017-01-12/pdf/2017-00250.pdf>.

Table 5-3 Reported interactions between the Cook Inlet drift gillnet fishery and marine mammals. (Source: 2017 List of Fisheries, Muto et al 2015, and Helker et al 2017)

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.				
Unidentified small cetacean	An unidentified small cetacean was caught and killed in drift gillnet gear in 2011.				

5.3.2 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). In 2010, NMFS estimated the Cook Inlet beluga whale population to be 340 individuals, up from the 2009 estimate of 321 whales, although the 10-year annual trend is still declining 1.1% per year. Historical abundance is estimated at approximately 1,300 whales (NMFS 2008b). Cook Inlet belugas primarily occur in the northern portion of Cook Inlet. Beluga whales do not normally transit outside of Cook Inlet.

Based on the best scientific data 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 63080³²):

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.

³²<http://www.fakr.noaa.gov/prules/74fr63080.pdf>

NMFS has identified more than one third of Cook Inlet as critical habitat (Figure 5-1, 76 FR 20180, April 11, 2011). Pacific salmon constitute one of the primary constituent elements for the Cook Inlet beluga whale's critical habitat. When designating critical habitat under the ESA, NMFS is required to identify specific areas, within the geographical area occupied by the species, on which are found those physical or biological features (i) essential to the conservation of the species and (ii) which may require special management considerations or protection.³³ As a primary constituent element, NMFS concluded that salmon are essential to the conservation of the Cook Inlet beluga whale and may require special management considerations or protection in the future. The term "special" does not necessarily mean "beyond existing". This conclusion does not mean that salmon are presently impaired or limiting, or that existing laws and regulations managing salmon are not sufficient. NMFS continues to work with the State to ensure that Cook Inlet Beluga whales are considered in fish management planning for Cook Inlet.

This analysis focuses on incidental take of belugas and reduction of prey, as these were the two areas identified in the Conservation Plan for the Cook Inlet beluga whale that are impacted by salmon fisheries (NMFS 2008b). 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 EEZ. Operation times change depending upon 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) during June through September, when the salmon fisheries occur.

Incidental Take NMFS designed a rotational observer program to identify potential interaction 'hot spots' among commercial fisheries operations in Alaska. With the heightened concern in Cook Inlet, the program observed two Cook Inlet fisheries, salmon drift gillnet and upper and lower Cook Inlet set gill net, in 1999 and 2000. Manly (2006) reported that the Cook Inlet drift net 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). The Conservation Plan for the Cook Inlet beluga whale concluded that the current rate of direct mortality from commercial fisheries in Cook Inlet appears to be insignificant and should not delay recovery of these whales (NMFS 2008b). The proposed action would not change the likelihood of incidental takes in the Cook Inlet drift gillnet fishery.

Reduction of Prey Aside from direct mortality and injury from 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 Conservation Plan for the Cook Inlet beluga whale (NMFS 2008b). 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. Any diminishment in the ability of beluga whales to reach or utilize spring/summer feeding habitat, or any 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.

Any escapement necessary to meet the needs of wild belugas would have to consider the feeding efficiency of these whales (which is unknown). The amount of fish required to sustain this population is unknown. However, data from captive beluga whales show daily consumption rates of 4-7% of body

³³16 U.S.C. § 1532(5)(A)(i) and § 1533(b)(6)(C).

weight per day. Additional research, such as continued stomach and fatty acid analyses, may shed more light on feeding and prey requirements for beluga whales.

The current State salmon management plan oversees Cook Inlet fisheries in the lower, middle, and northern districts. Most of fisheries occur “upstream” of the river mouths and estuaries where beluga whales typically feed. However, the Cook Inlet drift gillnet fishery occurs in the off-shore waters of Cook Inlet. Whether the escapement into these rivers, having passed the gauntlet of the commercial fisheries, is sufficient for the wellbeing of Cook Inlet beluga whales is unknown.

However, 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. Even if large salmon runs must be present for a beluga whale to efficiently capture a single fish, this would still be a small fraction of the total salmon return. The State carefully manages the salmon fisheries to meet escapement goals for various waters, and fisheries open and close throughout the season, presenting many opportunities for adequate numbers of salmon to reach their spawning streams. There also are salmon hatcheries operating in Cook Inlet, which have measurably added to the numbers of adult fish returning to the upper Inlet.

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). While the Conservation Plan for the Cook Inlet beluga whale concluded that it is unknown whether competition with commercial fishing operations for prey resources is having any significant or measurable effect on Cook Inlet beluga whales (NMFS 2008b), NMFS has no information to suggest prey availability is or has been a factor in the decline or is in need of improvement to promote the recovery of the Cook Inlet beluga whale (76 FR 20180, April 11, 2011). New information is provided in the Recovery Plan for the Cook Inlet Beluga Whale (NMFS 2016).

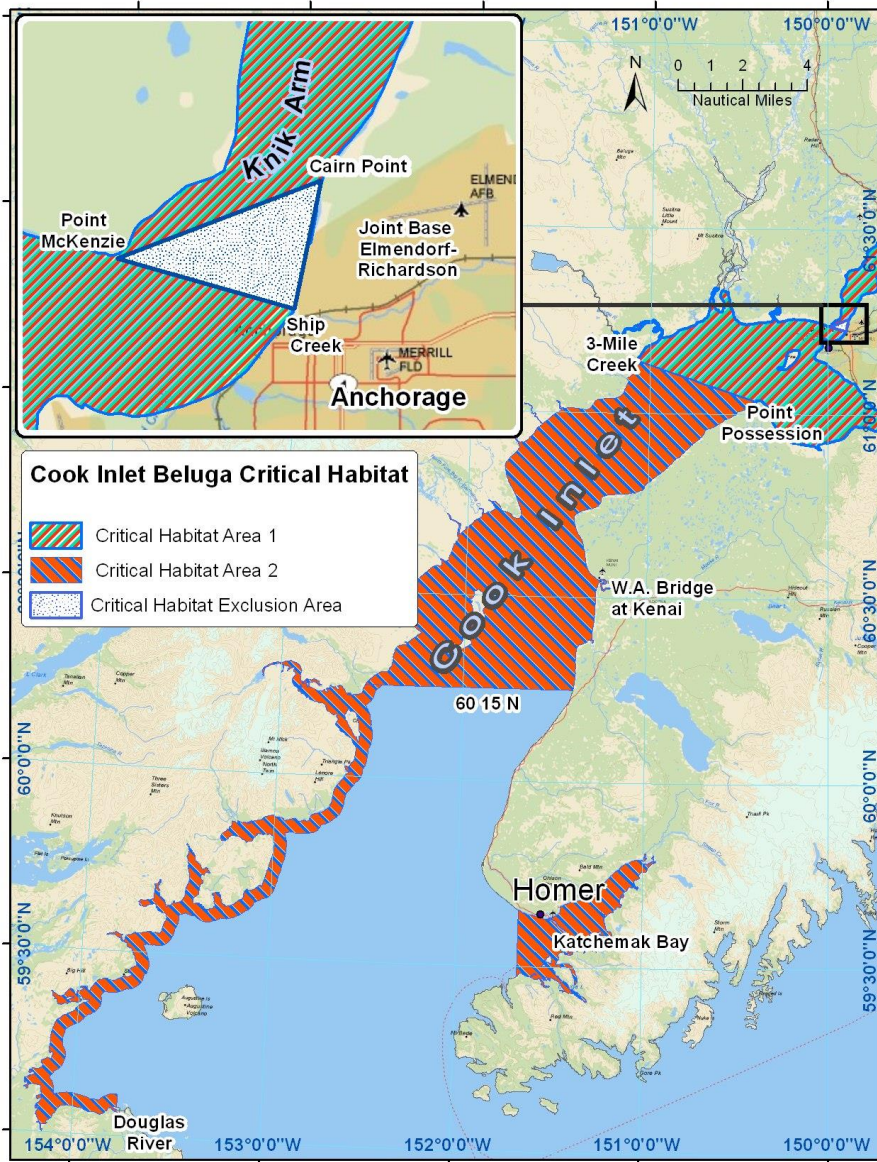


Figure 5-1 Cook Inlet Beluga Critical Habitat. NMFS Alaska Region

5.3.3 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 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.

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).

Drift Gillnet Fisheries in Cook Inlet

The Cook Inlet drift gillnet fisheries occur in the western 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 fisheries is summarized from the 2015 Alaska Marine Mammal Stock Assessment (Muto et al 2015) 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.

Incidental Take No incidental takes of Steller sea lions have been observed in the Cook Inlet drift gillnet fishery. 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 5-3, 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 important components (at least seasonally) 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, SSL 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 lions decline across all regions or all years, which disappeared at a regional scale. Soboleff (2005) felt this could be plausible as salmon fisheries occur near Steller sea lions 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.

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 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 abundance of salmon biomass increased dramatically during the time period that the WDPS of Steller sea lion has been 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). Nevertheless, many of these fisheries take 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 that 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.

However, salmon is one of many prey species eaten by Steller sea lions in the GOA and Steller sea lion population trends in the GOA in general are increasing and do not appear to be limited by prey availability (NMFS 2010). Therefore, the EA would analyze whether the salmon drift gillnet fisheries in the EEZ are likely to adversely affect the WDPS of Steller sea lions or its critical habitat beyond those effects already analyzed in the previous 2010 BiOp (NMFS 2010).

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 these marine foraging areas and may alter the distribution of certain prey resources in ways that reduce the foraging effectiveness of Steller sea lions. More data on the foraging habits of Steller sea lions from research in key geographic areas could aid our understanding of where and when these effects might be most important.

5.4 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
- 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 5-4). Short-tailed Albatross is listed as endangered, Steller’s Eider is listed as threatened, and Kittlitz’s Murrelet is a candidate species³⁴ for listing under the ESA.

This section provides a preliminary analysis of the commercial salmon fishery in the Cook Inlet EEZ and its potential for interactions with identified seabird species. A complete analysis of the interactions between the commercial salmon fishery in Cook Inlet with seabirds would be conducted in the environmental assessment prepared for the proposed action.

Table 5-4 ESA-listed and candidate seabird species that occur in the GOA

Common Name	Scientific Name	ESA Status
Short-tailed Albatross	Phoebastria albatrus	Endangered
Steller’s Eider	Polysticta stelleri	Threatened
Kittlitz’s Murrelet	Brachyramphus brevirostris	Candidate

³⁴For more information on the Kittlitz’s Murrelet’s candidate status, see <http://alaska.fws.gov/media/murrelet/qa.pdf>.

Cook Inlet Drift Gillnet Fisheries

The impacts of the commercial salmon fishery in the Cook Inlet EEZ on seabirds were analyzed in the Environmental Assessment for Amendment 12 (NMFS 2012). Under Section 118 of the MMPA, NMFS is required to monitor the rate of incidental take of marine mammals in commercial fisheries. 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 are designed for estimating marine mammal take, not seabird take. However, seabird bycatch information collected by this program is the best available information we have to assess the potential impact of these fisheries on seabirds.

USFWS has identified gillnet fisheries as one source of human-caused mortality for Kittlitz's Murrelets (USFWS 2010b). Being small-bodied, nearshore divers, these birds sometimes get caught in gillnets and drown (Day et al. 1999). Mortalities have been documented in gillnet fisheries in Alaska in Prince William Sound (Wynne et al. 1992), Kodiak (Manly et al. 2007), and Yakutat Bay (Manly 2009). The Kittlitz's Murrelet forages in shallow waters for schooling fishes (including capelin, Pacific sandlance Pacific herring, and walleye pollock), zooplankton, and other invertebrates. In areas with tidewater glaciers within its range, the Kittlitz's Murrelet associates with icebergs (but not heavy ice) and outflows of glacial streams (Day et al. 1999, USFWS 2010b), sometimes nesting up to 45 miles inland on rugged mountains near glaciers. Most recent population estimates indicate a global population between 30,900 and 56,800 individuals (USFWS 2010b). Significant population declines have been reported in several of its core population centers (USFWS 2010b).

USFWS lowered the listing priority for Kittlitz's Murrelet from a 2 (highest possible priority for the species) to an 8 (out of 12) (76 FR 66370, October 26, 2011). 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 leads 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. However, 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/ship wrecks, number and location of gillnets) (76 FR 66370, October 26, 2011).

The following analysis provides the best available information on seabird interactions with the Cook Inlet drift gillnet fishery.

Potential marine bird interactions are of concern in the drift gillnet fisheries, 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.

Bird species in Cook Inlet include Short-tailed Shearwaters (*Puffinus tenuirostris*), Tufted Puffins (*Fratercula cirrhata*), Black-legged Kittiwakes (*Rissa tridactyla*), Common Murres (*Uria aalge*), *Brachyramphus* murrelets, phalaropes (mainly Rednecked Phalaropes, *Phalaropus lobatus*), Fork-tailed Storm-petrels (*Oceanodroma furcata*), Northern Fulmars (*Fulmarus glacialis*), Glaucous-winged Gulls (*Larus glaucescens*), Horned Puffins (*Fratercula corniculata*), and Pigeon Guillemots (*Cepphus columba*).

The Alaska Marine Mammal Observer Program for the Cook Inlet salmon drift gillnet fisheries 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 these fisheries. 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.

5.5 Essential Fish Habitat

Section 303(a)(7) of the Magnuson-Stevens Act 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 2012 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. The 2012 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 Alaska Fisheries Science Center (AFSC) staff have developed a new methodology using oceanic variables to refine EFH descriptions for all marine life stages of salmon. This methodology has under gone 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 impacts habitat. The activity targets only adult salmon in the water column, successfully avoiding any significant disturbance of the benthos, substrate, or intertidal habitat. The EEZ salmon fisheries do not occur on any areas designated as Habitat Areas of Particular Concern.

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.

The waters and substrates that comprise salmon EFH are susceptible to a wide array of human activities unrelated to fishing. Broad categories of such 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 each of these activity categories, known and potential adverse impacts to EFH are described in *Impacts to Essential Fish Habitat from Non-fishing Activities in Alaska* (NMFS 2016). Further, mechanism or processes that may cause the adverse effects and how these may affect habitat function are described in that report.

Coordination and consultation on EFH is required by Magnuson-Stevens Act § 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 Magnuson-Stevens Act's EFH consultation requirements.

Regarding the effects of recreational fishing on EFH, recreational fishing in state waters falls under non-Magnuson-Stevens Act (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 Magnuson-Stevens Act 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-Magnuson-Stevens Act fishing activities are covered within the discussion of fishing effects on habitat in the 2005 EFH EIS and remain valid.

Regarding coordination with the state and other agencies, 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 Magnuson-Stevens Act. However, this consultation does not supersede the regulations, rights, interests, or jurisdictions of other Federal or state agencies. The Magnuson-Stevens Act 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.

5.6 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 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. This can often cause millions of dollars in damage to local economies.

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.

5.6.1 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 nearly \$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.

In the past five years, the State has led efforts to eliminate northern pike populations from four 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 or 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 (34 lakes, including Nancy Lake Recreational Area)
- Anchorage lakes (5 lakes)
- Kenai Peninsula lakes (13 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 gathered 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—

- removed >4,000 pike from 50 side-channel sloughs of Alexander Creek system by gillnet,
- evaluated 2010 eradication projects,
- used a \$50K Alaska Sustainable Salmon Fund (AKSSF) awarded to USFWS/ADF&G partnership for a multi-media education campaign on invasive pike in Southcentral Alaska,
- concluded the Stormy Lake pike movement study, and
- used a Cooperative Agreement with USFWS to secure ~\$250K for Stormy Lake pike eradication project - activities completed include public scoping and collection of Stormy Lake arctic char broodstock to preserve remnant population (in significant decline) due to pike predation.

ADF&G's ongoing projects and partnerships include —

- continue to control net in side-channel sloughs of Alexander Creek to reduce pike abundance;
- study pike movement with radio telemetry in Alexander Creek system;
- AKSSF grant (match provided by Kenai River Sportfishing) provided ADF&G \$40K for Stormy Lake pike eradication supplies and equipment;
- Stormy Lake pike eradication project scoping and permitting are completed (phase one), plan is to eradicate pike in Stormy Lake in September of 2012 and restock native fish assemblage after the detoxifies in 2012 (phase two);
- NFHAP grant (\$16K) for Soldotna Creek drainage invasive pike control/eradication planning and public scoping – scoping was completed in April of 2012 – funding for implementing the preferred alternative (rotenone treatment) is being sought;
- Joint project by USGS, ADF&G Commercial Fish Division, and CIAA to (1) study effectiveness of electrical barrier and hydrogun for controlling pike – to be conducted in June 2012 at Derks

Lake on Kenai Peninsula - and (2) conduct pike movement, distribution, and mitigation studies in Susitna drainage; and

- develop an eDNA study on the Kenai Peninsula to assess the pike detection sensitivity of eDNA in water samples. The USGS is providing technical help to ADF&G to develop this study based on its invasive pike bioenergetics and eDNA study in Susitna drainage.

5.6.2 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 three lakes in the Anchorage Bowl. 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, Alaska Department of Natural Resources (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. Management actions outlined here have been accomplished by a consortium of agencies and organizations.

Anchorage Bowl: Sand, DeLong, Little Campbell lakes, Lake Hood, and Little Survival Creek

In 2011, *Elodea* was detected in DeLong, Little Campbell and Sand lakes. *Elodea* was also detected in Lake Hood, and Little Survival Creek. Eleven additional waterbodies have been surveyed for *Elodea* in the Anchorage Bowl since 2011 with no detections of invasive species.

2015

- June *Elodea* detected in Lake Hood
- July Emergency Exemption granted by AK Department of Environmental Conservation (DEC), 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 Alaska Department of Natural Resources (DNR) and US Fish and Wildlife Service (FWS) 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 FWS 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 AK DEC 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.

6 Preparers and Persons Consulted

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APPENDIX 1: Exploration of Overcompensation and the Spawning Abundance Producing Maximum Sustainable Yield for Upper Cook Inlet Sockeye Salmon Stocks

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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 Smsy. 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 (Smsy), 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?

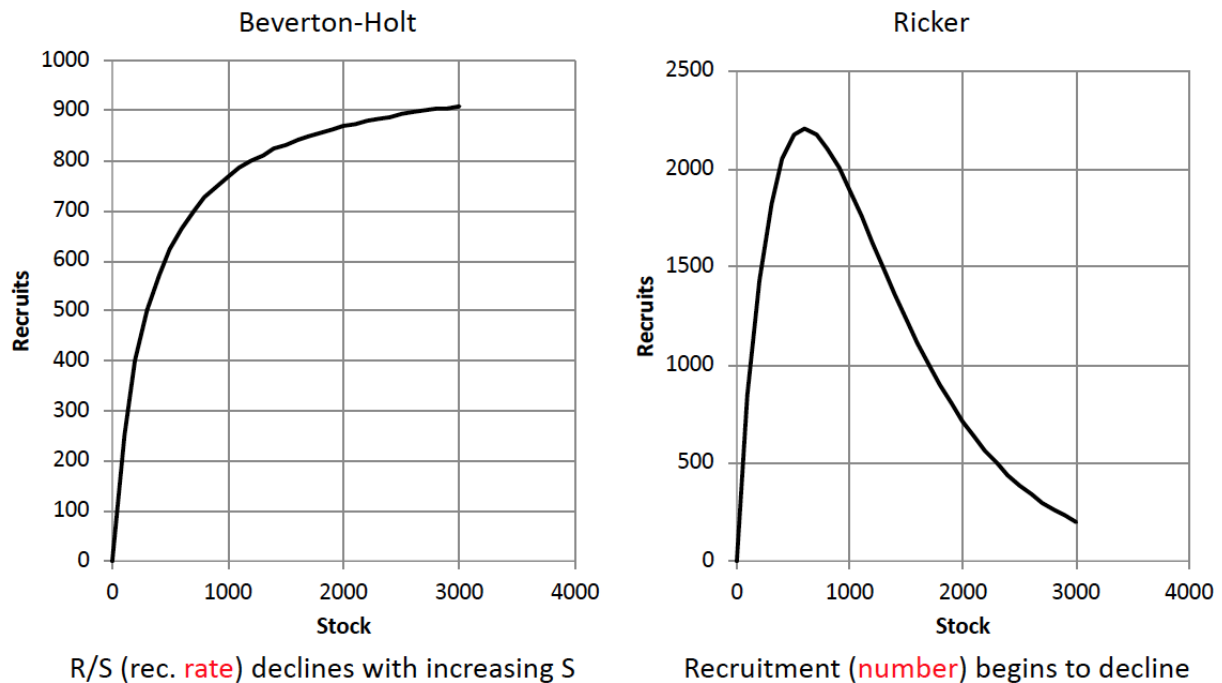


Figure 1. Graphical explanation of the difference between simple compensation and overcompensation in the context of stock-recruitment relationships.

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.

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.

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 : $\varepsilon_t \sim Normal(0, \sigma^2)$.

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.

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.

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.

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

$$R = aS(1 - bcS)^{1/c}$$

- Beverton-Holt and Ricker all *special cases*

If $c = -1$
 $c = 0$ then

$$R = aS / (1 + bS)$$

$$R = aSe^{-bS}$$

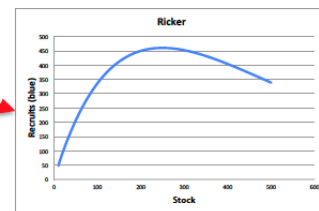
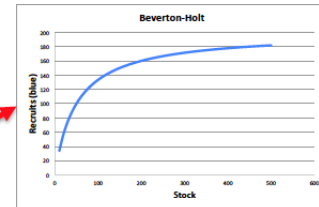


Figure 2. Visual description of the Deriso-Schnute stock-recruitment model.

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	$R_t = \alpha S_t (1 - c\beta S_t)^{\frac{1}{c}} e^{\varepsilon_t}$	$\alpha \sim Uniform(1e - 3, 20)$ $\beta \sim Uniform(0, 1)$ $c \sim Uniform(-1, 0)$ $\sigma \sim Normal(0, 1)[1e - 3, 2]$

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

General Results

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.

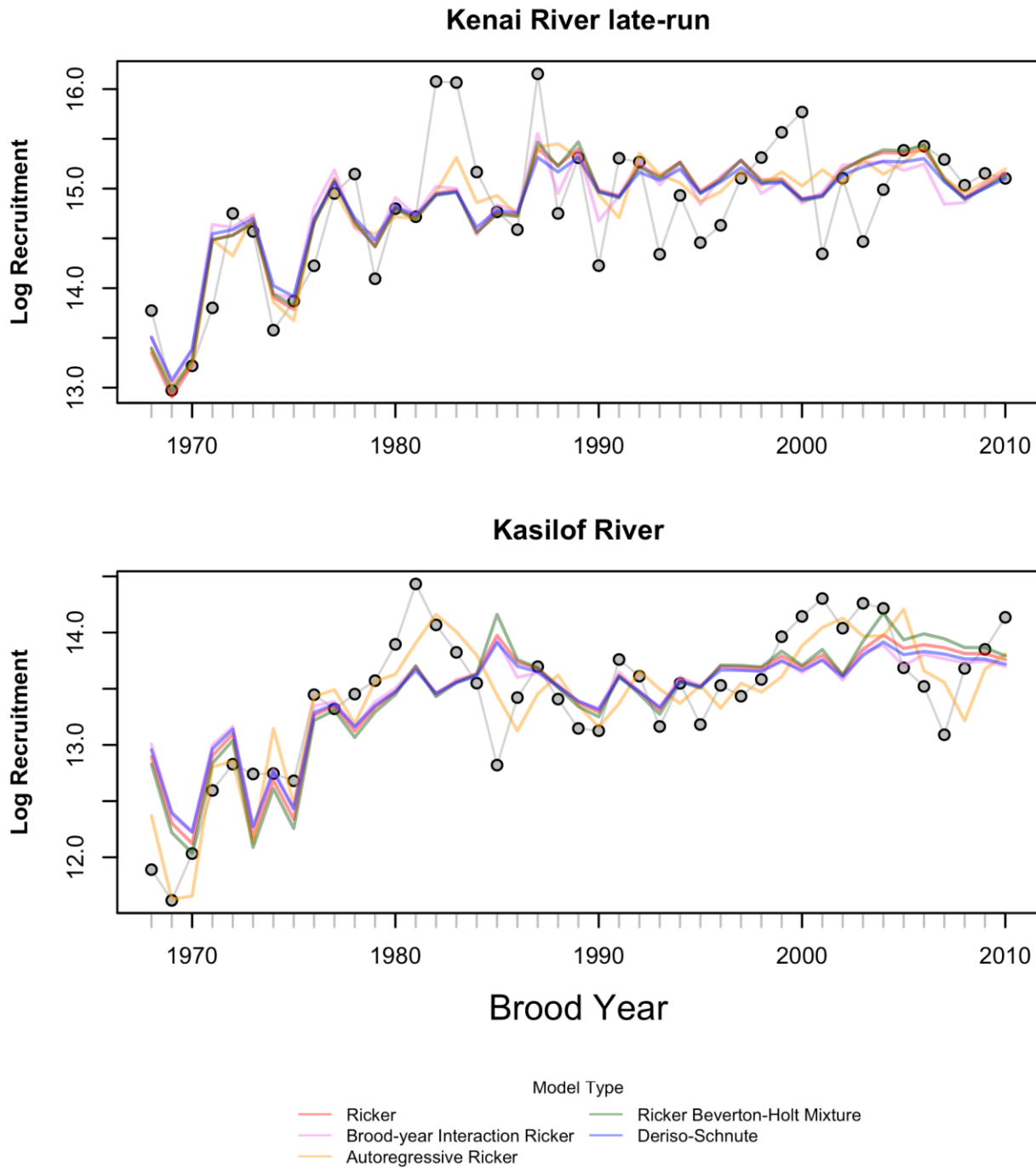


Figure 3. Predicted recruitment from the five model alternatives for the Kenai and Kasilof river sockeye salmon stocks. Lines are posterior median values for predicted recruitment in log space and points are the observed recruitments in log space, by brood year.

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).

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.

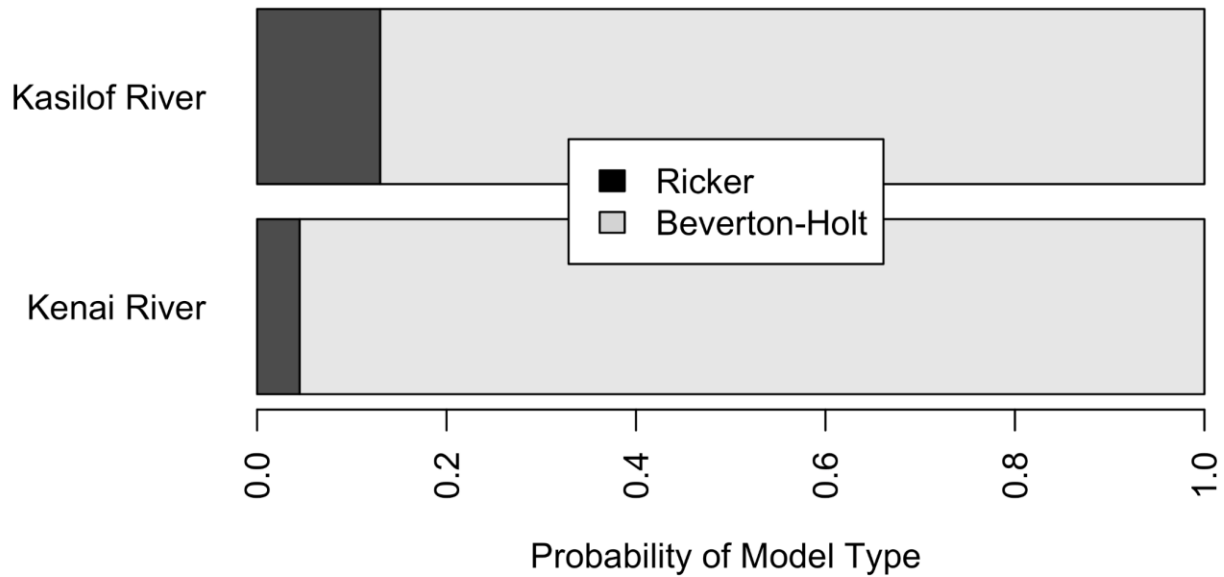


Figure 4. Probability of the Ricker or Beverton-Holt model representing stock-recruitment relationships for each sockeye salmon stock, from the mixture Ricker model. Each bar describes the proportion of time the model spent sampling as Ricker or Beverton-Holt, as defined by the proportion of posterior 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.

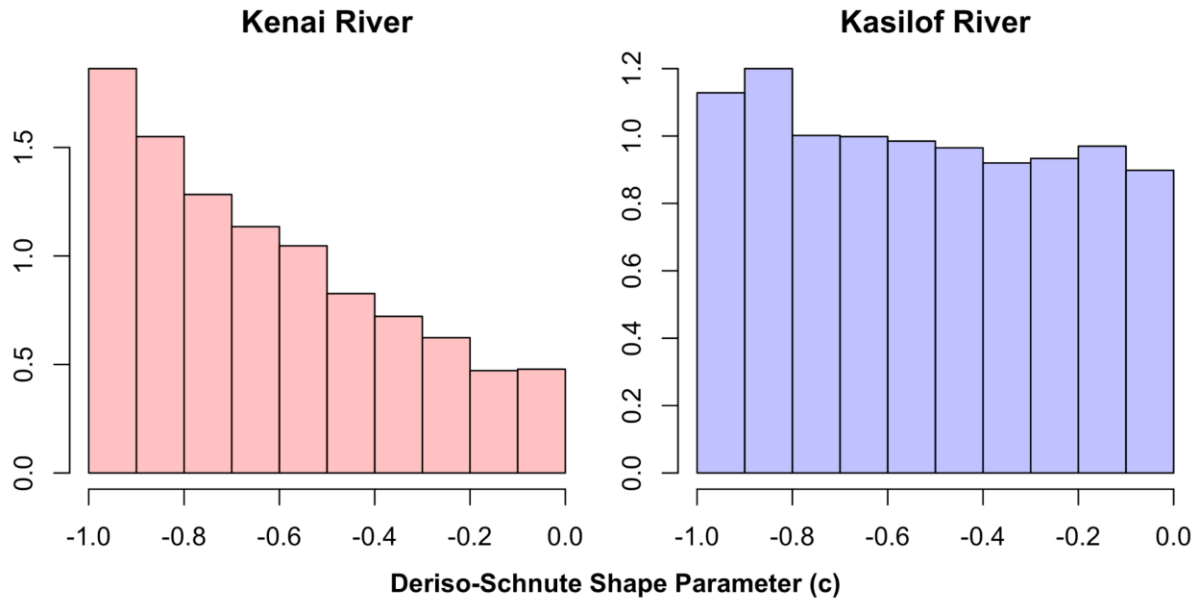


Figure 5. Evidence for a Ricker or Beverton-Holt like model better representing the data for each stock based from the Deriso-Schnute model. The Deriso-Schnute shape parameter controls whether the underlying relationship is more consistent with one of the two model types. A shape parameter value of -1 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.

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.

Standard Ricker

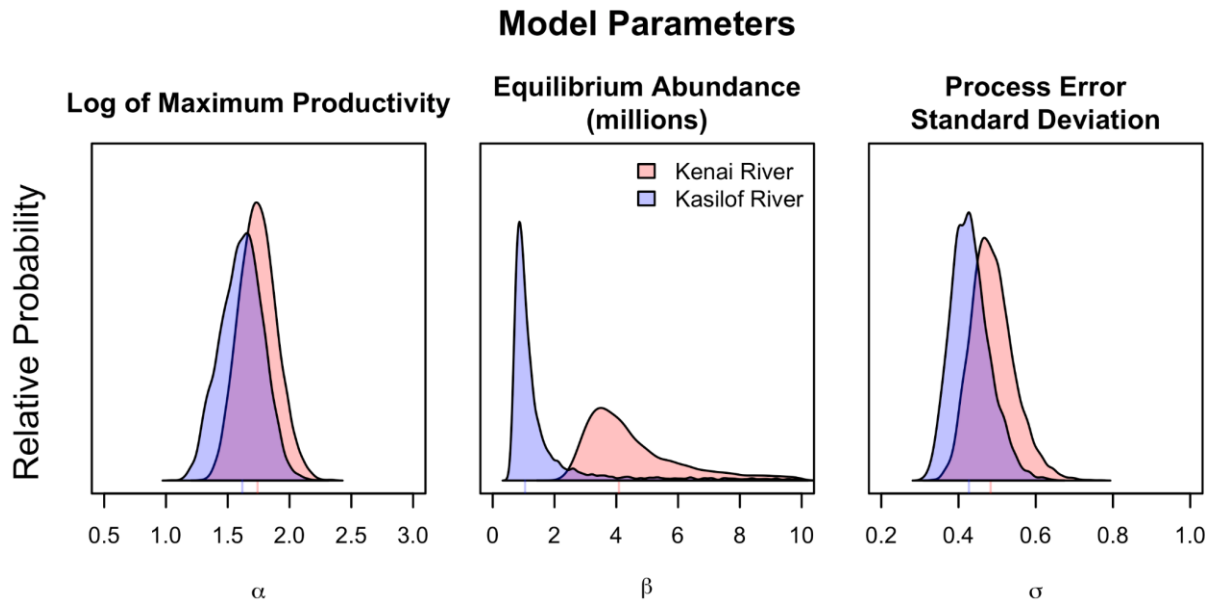


Figure 6. Posterior distributions for Ricker model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

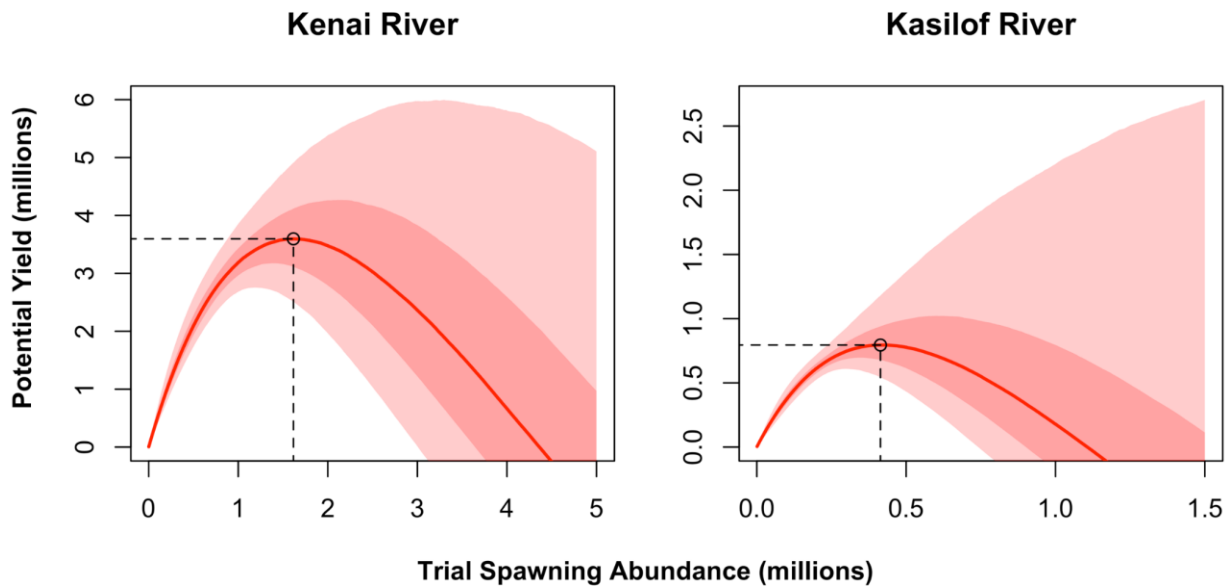


Figure 7. Simulated potential yield for the standard Ricker model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted Smsy and MSY for each stock.

Brood Year Interaction Ricker

Model Parameters

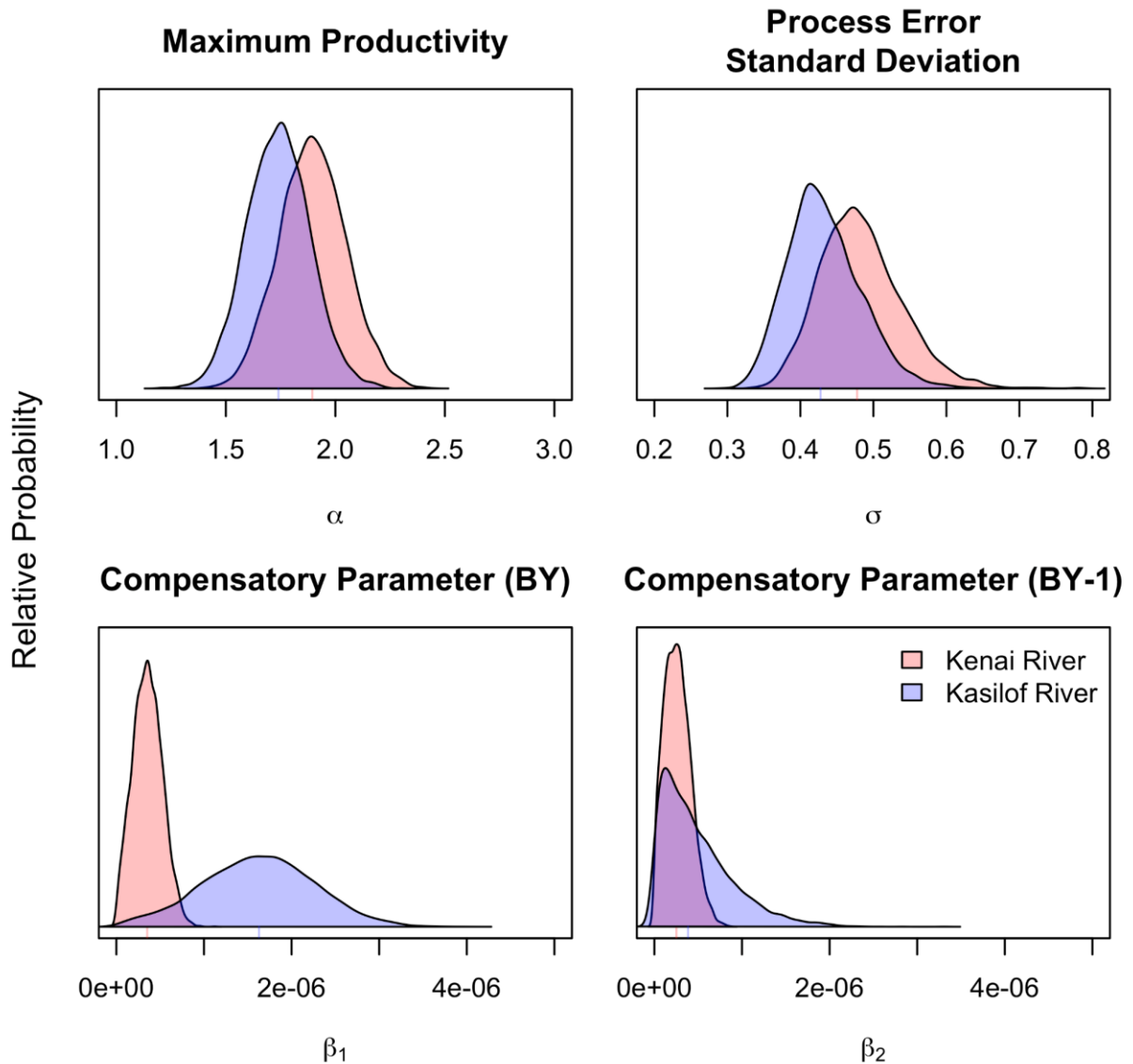


Figure 8. Posterior distributions for brood year interaction Ricker model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

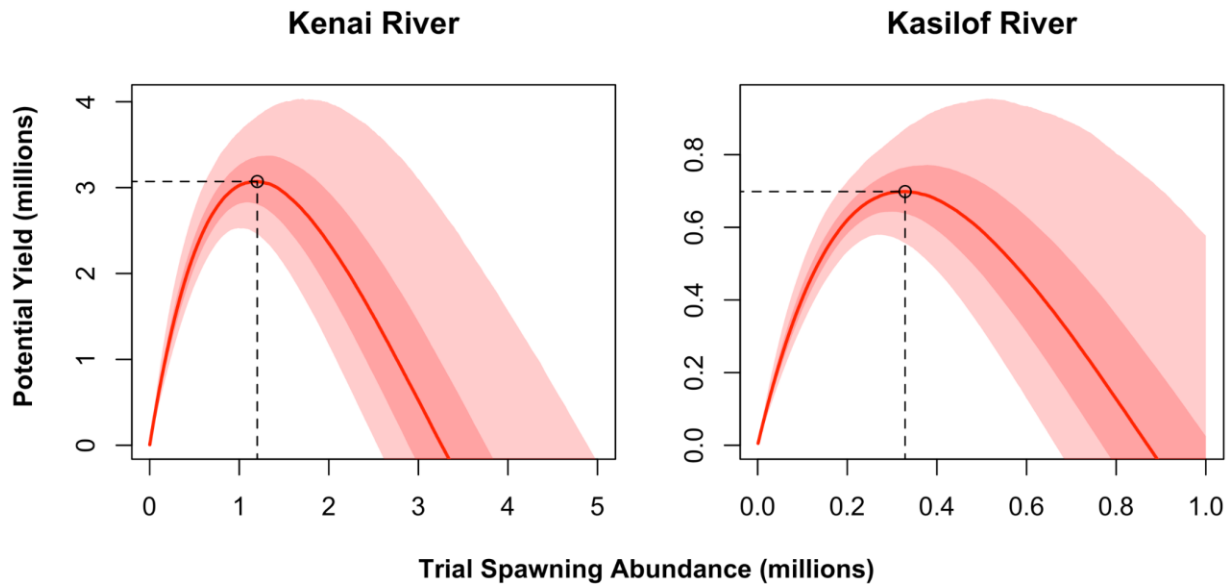


Figure 9. Simulated potential yield for the brood year interaction Ricker model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted Smsy and MSY for each stock.

Autoregressive Ricker

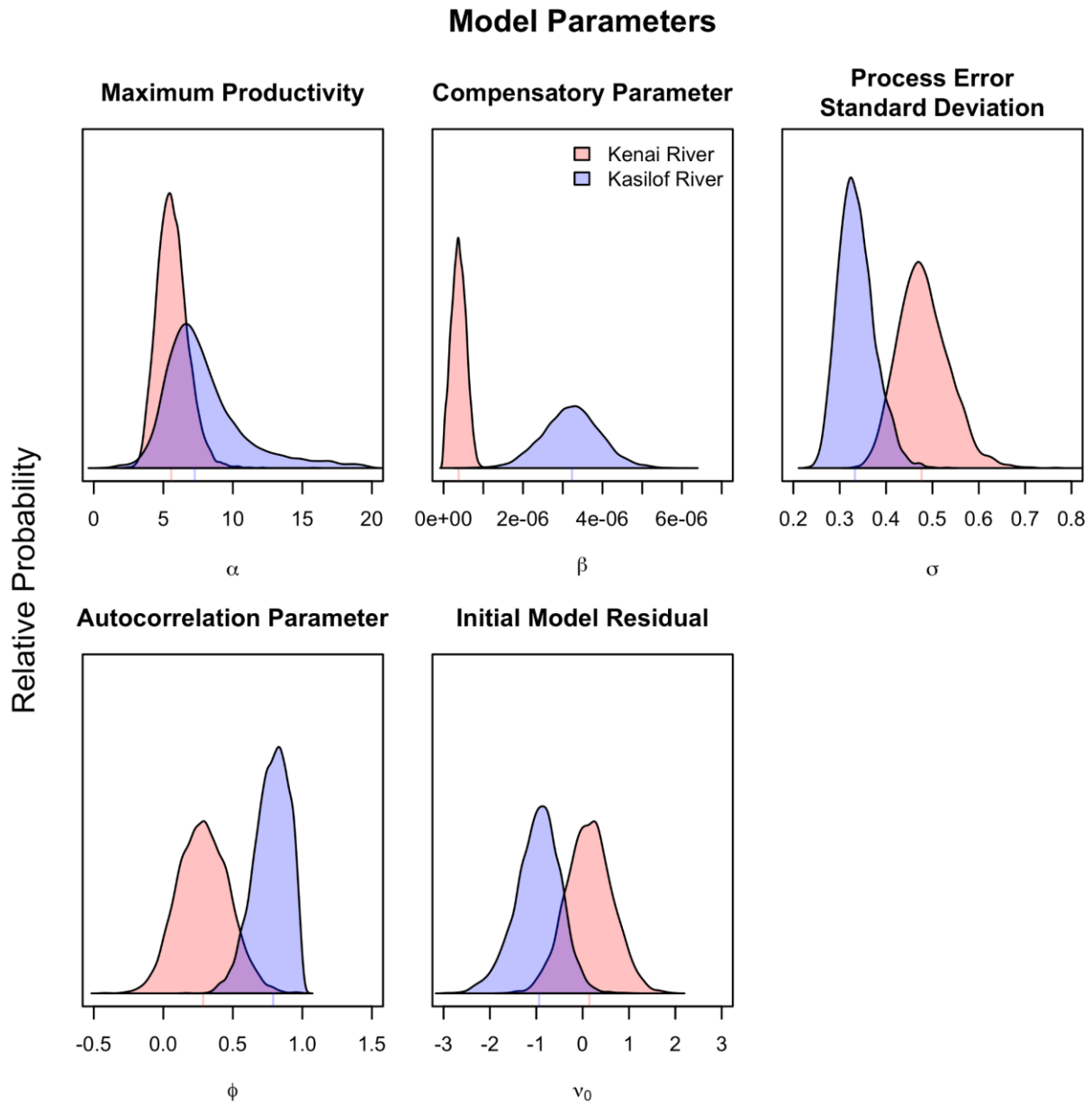


Figure 10. Posterior distributions for autoregressive Ricker model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

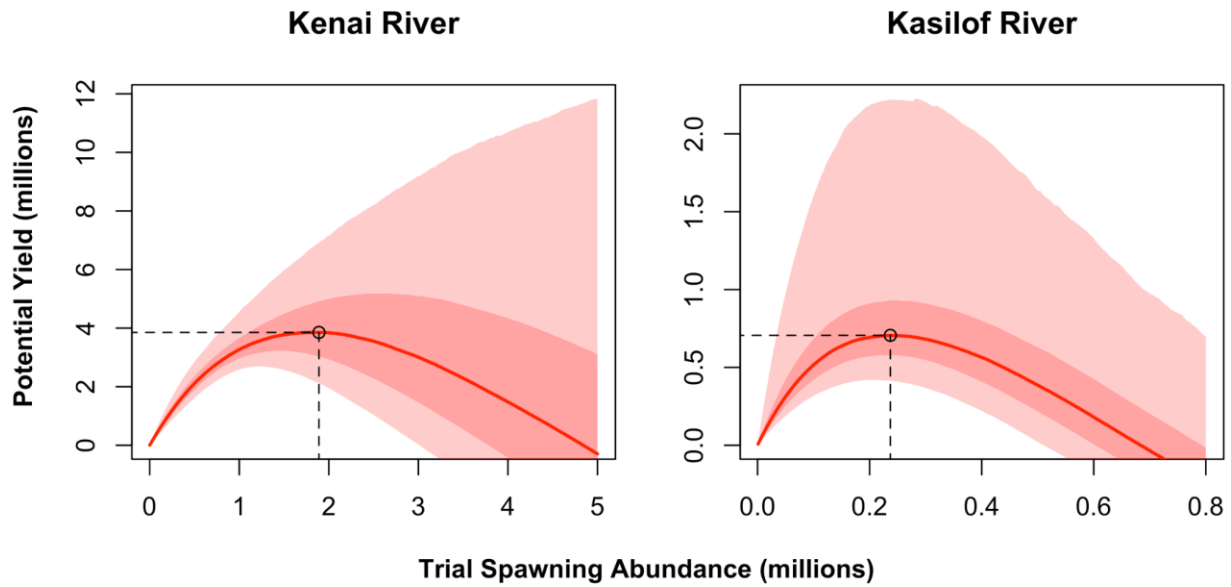


Figure 11. Simulated potential yield for the autoregressive Ricker model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted S_{msy} and MSY for each stock.

Ricker Beverton-Holt Mixture

Model Parameters

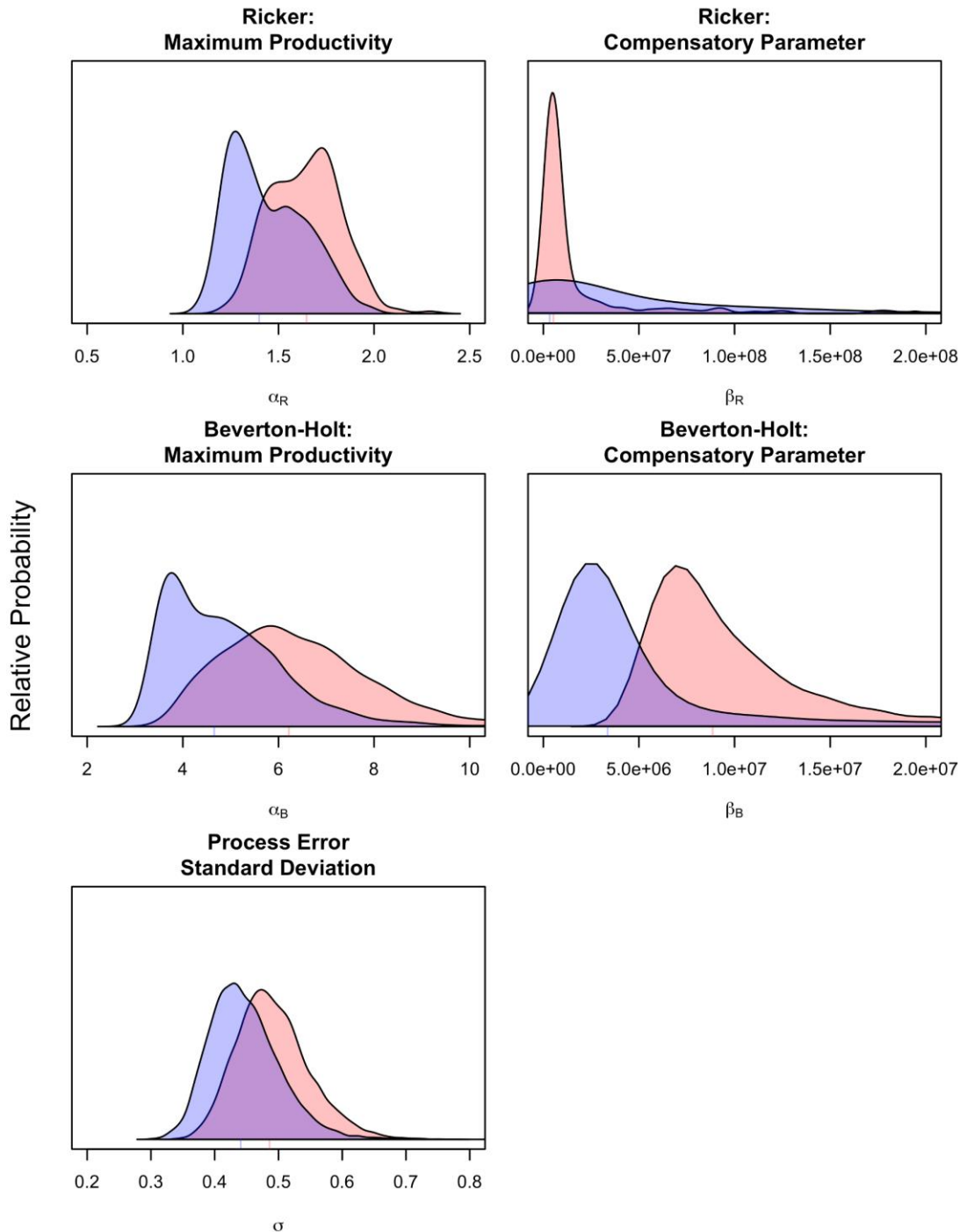


Figure 12. Posterior distributions for Ricker Beverton-Holt mixture model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

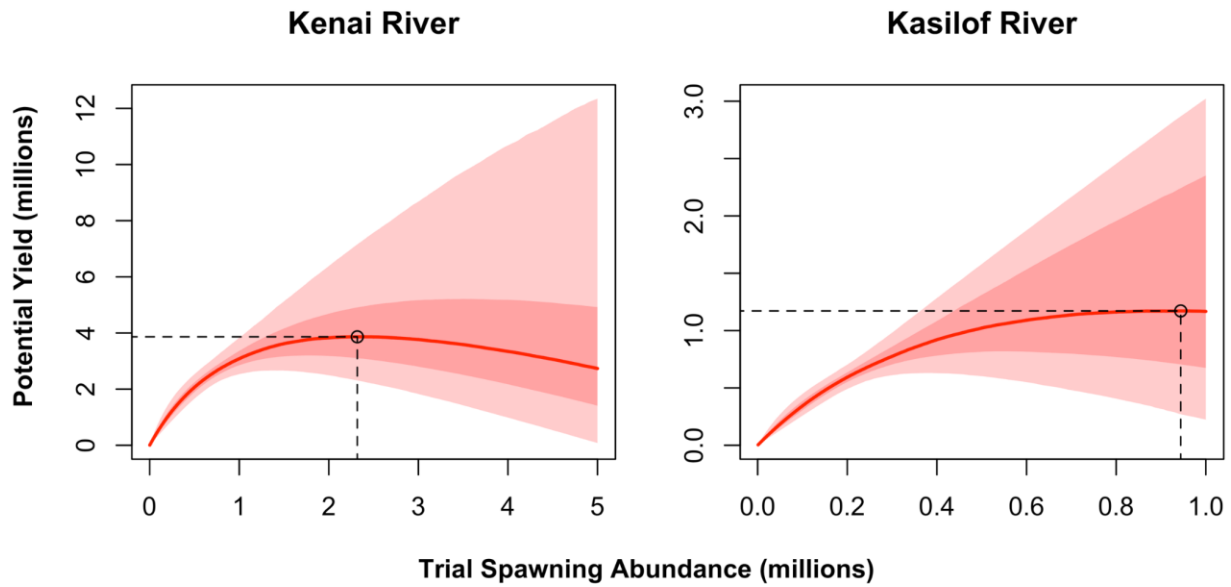


Figure 13. Simulated potential yield for the Ricker Beverton-Holt mixture model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted S_{msy} and MSY for each stock.

Deriso-Schnute

Model Parameters

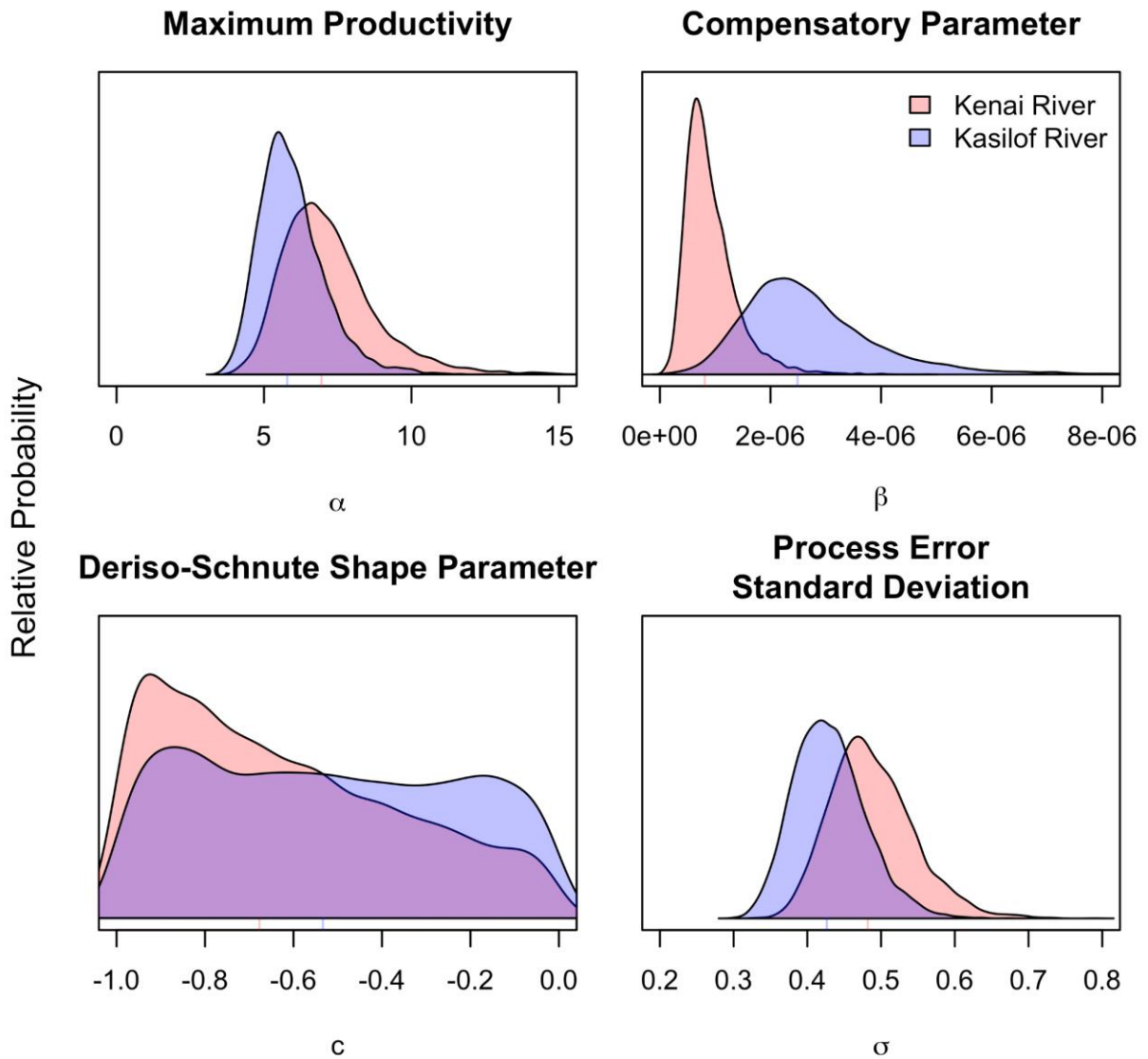


Figure 14. Posterior distributions for Deriso-Schnute model parameters. The highest point on each distribution indicates the parameter value with the highest posterior probability density given the data. Vertical lines on the x-axis highlight the posterior median parameter value for each population.

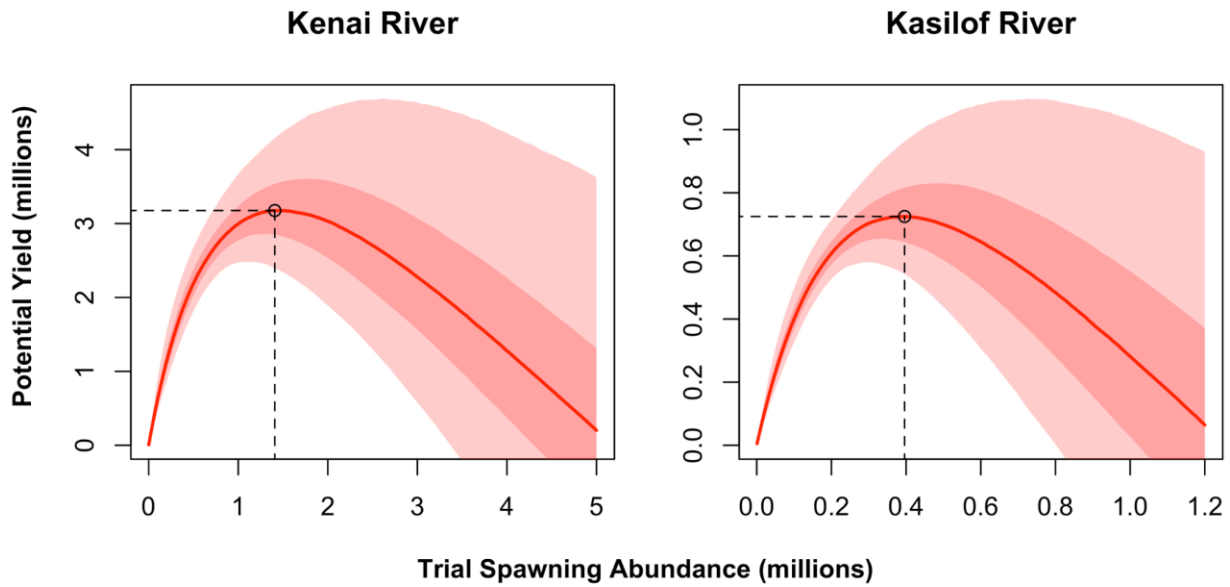


Figure 15. Simulated potential yield for the Deriso-Schnute model across a range of trial spawning abundances. The red line indicates the median expectation, while the dark and light shaded regions indicate the 50% and 95% credible intervals for predictions. Dashed lines describe predicted S_{msy} and MSY for each stock.

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