DRAFT ENVIRONMENTAL ASSESSMENT

For Issuing an Exempted Fishing Permit for the Purpose of Testing a Salmon Excluder Device in the Eastern Bering Sea Pollock Fishery

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Abstract: This Environmental Assessment analyzes alternatives on issuance of an exempted fishing permit for continued testing of a salmon excluder device in the Bering Sea pollock trawl fishery. The experiment would be conducted from fall 2011 through fall 2012. The pollock trawl industry has experienced high numbers of salmon bycatch even though salmon bycatch measures are in place. A salmon excluder device would reduce salmon bycatch in the Alaska groundfish fisheries, reducing potential effects on the salmon stocks and the cost to the pollock fishing industry. This EFP would allow the continued development and testing of a salmon excluder device with focused efforts on reducing chum salmon bycatch and refinement to the Chinook salmon excluder device. The proposed action is not expected to have significant impacts on the human environment.

Public comments are due by the date specified in the Federal Register Notice as the end of the comment period for the application of the exempted fishing permit.

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EXECUTIVE SUMMARY

The purpose of this action is to allow the continued development and testing of a salmon excluder device for the eastern Bering Sea pollock trawl fishery. Chinook salmon *(Oncorhynchus tshawytscha)* and non-Chinook salmon (primarily chum salmon *O. keta)* are caught incidentally in Alaska groundfish fisheries, primarily in the walleye pollock (*Theragra chalcogramma)* trawl fishery. Salmon are a prohibited species in the groundfish fisheries (50 CFR 679.21) with annual limits placed on the number of Chinook and non-Chinook salmon taken in the Bering Sea and Aleutian Islands (BSAI) trawl fisheries.

Chinook salmon bycatch in the Bering Sea pollock fishery is managed under a system of two prohibited species catch (PSC) limits (60,000 Chinook salmon and 47,591 Chinook salmon), allocations among the Bering Sea pollock fishery sectors, inshore cooperatives, and Community Development Quota (CDQ) groups, and other measures designed to minimize bycatch below the higher PSC limit. Attainment of a Chinook salmon PSC allocation closes directed fishing for pollock in the Bering Sea subarea. The non-Chinook salmon PSC limit in the Catcher Vessel Operating Area is 42,000 fish between August 15 and October 14. Exceeding this limit triggers the closing of the Chum Salmon Savings Area (50 CFR part 679 Figure 9) for certain time periods to protect salmon. Currently, pollock fishery participants are exempt from these closures by voluntarily participating in an intercooperative agreement (ICA) for reducing chum salmon bycatch. Since the fall of 2006, members of the ICA are required to move out of salmon hot spots to reduce the rate of salmon bycatch. Pollock also occurs in these chum salmon bycatch hot spots, and closure of these areas may result in added expense to the pollock fishing industry.

The primary objective of the research will be the development and testing of an excluder that reduces chum salmon bycatch rates without significant negative effects on pollock fishing. In 2005, non-Chinook salmon bycatch numbers increased to a historic high of 704,989. A secondary objective is to improve the Chinook salmon bycatch reduction performance of the final version of the Chinook salmon excluder developed under EFP 08-02. In 2007, the pollock fishery had record Chinook salmon bycatch at over 124,000 fish taken, even though the rate of Chinook salmon bycatch was reduced by the ICA salmon hot spot closures. Additional measures are needed to reduce the number of salmon taken, and the excluder device may provide another tool for the pollock fishery to reduce salmon bycatch. A salmon excluder device would reduce potential constraints being placed on the pollock fishery by salmon bycatch area closures, hard caps, and incentive plan agreements that contain measures to avoid salmon at all times.

To facilitate the development and testing of the salmon excluder device, federal regulations require an exempted fishing permit (EFP) (50 CFR 679.6). The applicant for the EFP has worked with the Alaska Fisheries Science Center to develop a scientifically sound experiment to test the excluder device. Exemptions are needed from fishery regulations regarding total allowable catch, PSC limits, observers, and the closures of the salmon savings areas to permit the applicant to collect data required to meet the experimental plan for testing the device. Only one EFP application has been received that meets the experimental plan. Based on receipt of only one application that meets the needs of the experimental plan, the alternatives for this proposed action are limited to Alternative 1 (status quo) and issuing the EFP under Alternative 2 (preferred alternative).

The analysis of the proposed action determined that the experiment would have no significant impacts on target groundfish species, salmon and herring, and marine mammals. The impact of future actions under Alternative 2 could potentially be beneficial economically to those involved in the pollock fishery; however, the amount of future use of the salmon excluder device cannot be determined. Alternative 2 is preferred over the status quo because it would allow for the continued development and testing of the salmon excluder device in a scientific manner, potentially leading to the reduction of salmon bycatch in the pollock trawl fishery.

1.0 INTRODUCTION

1.1 Proposed Action

The proposed action is the issuance of an exempted fishing permit (EFP) under 50 CFR 679.6 to Gauvin and Associates, LLC, to allow exemptions from certain fishery regulations under 50 CFR Part 679. These exemptions are necessary to facilitate the continued development and testing of a salmon excluder device for pollock trawl gear in the Bering Sea. The EFP would be effective through November 1, 2012, to provide for testing under fall and winter conditions and to allow for enough tows with the device to gather sufficient data to meet the statistical requirements of the experiment. Details of the exemptions provided by the EFP are in chapter 2, and the experimental design is detailed in Appendix A.

1.2 Project Area

The experiment is limited to the eastern Bering Sea management area in the portions commonly used by catcher vessels and catcher/processors to harvest pollock. Areas where the experiment will be conducted include locations in the Chum Salmon Savings Area (Figure 1.1). One of the reasons for issuing the EFP is to permit experimental trawling in the salmon savings area and Catcher Vessel Operating Area (CVOA), regardless of closure status. The applicant for the EFP provided Figures 1.2 and 1.3 to show the areas where fishing under the EFP is most likely to concentrate (Gauvin 2010). Fishing in the horseshoe area near Unimak Island may occur in the winter or fall (Figure 1.2). Fishing in the canyons near the Pribilof Islands is likely to occur in the fall when pollock are dispersed north (Figure 1.3).

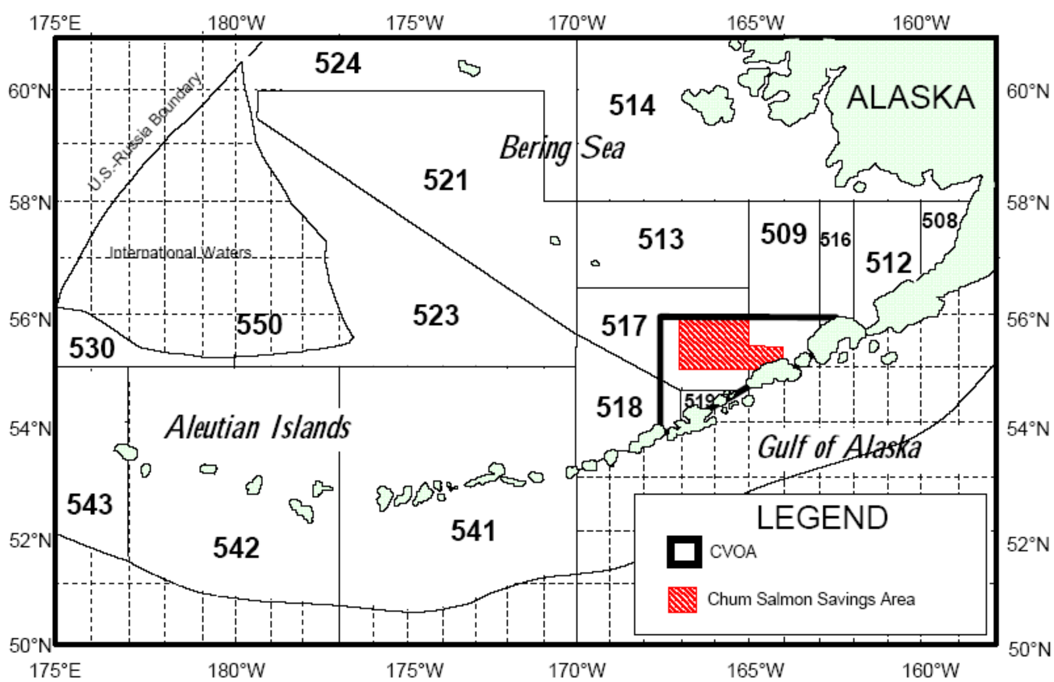

Figure 1.1 Chum Salmon Savings Area. From Figure 9 to 50 CFR part 679.

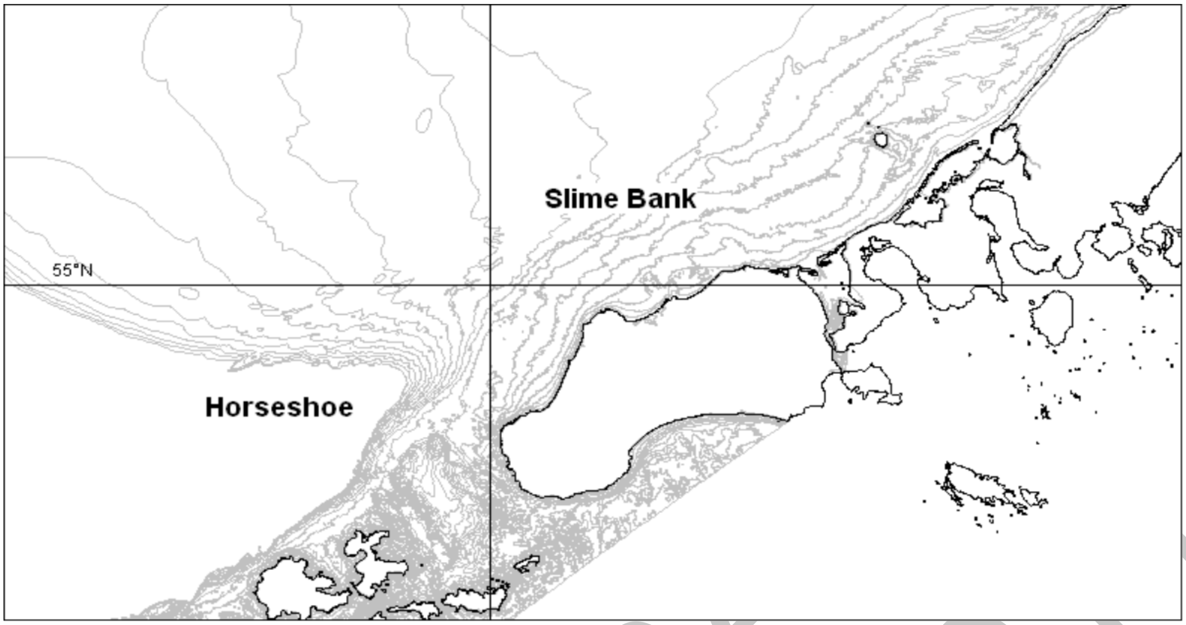

Figure 1.2 Common pollock fishing areas adjacent to Unimak Pass (Gauvin 2010). Large island in center of figure is Unimak Island.

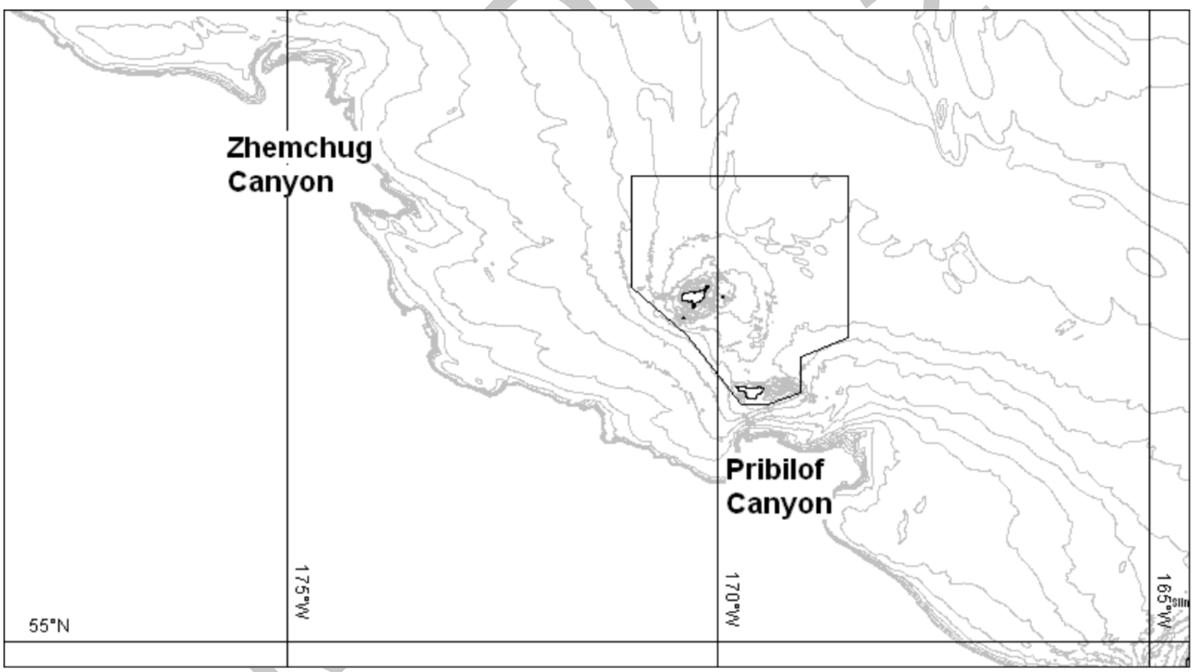

Figure 1.3 Common fishing areas along shelf break of Pribilof Islands (Gauvin 2010).Area Habitat Conservation Zone is shown by the box, closed to trawling.

1.3 Purpose and Need for Action

The purpose of this action is to allow the continued development and testing of a salmon excluder device for the eastern Bering Sea pollock trawl fishery. Chinook salmon *(Oncorhynchus tshawytscha)* and non-Chinook salmon (primarily chum salmon *O. keta)* are caught incidentally in Alaska groundfish fisheries, primarily in the walleye pollock (*Theragra chalcogramma)* trawl fishery. This action is needed to develop an additional method for reducing salmon bycatch in the Bering Sea pollock fishery. Salmon bycatch in the Bering Sea pollock fishery is a great concern to those who depend on salmon resources in Alaska and Canada, and further reduction in salmon bycatch is desired by those who use salmon resources and by the pollock fishing industry. Salmon are a prohibited species in the groundfish fisheries (50 CFR 679.21) with annual limits placed on the number of Chinook and chum salmon taken in the Bering Sea and Aleutian Islands (BSAI) trawl fisheries. Exceeding these limits triggers reductions in Chinook salmon allocations and the closing of the CSSA for certain time periods to allow for protected areas for the salmon.

In January 2011, NMFS implemented Amendment 91 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (FMP), to manage Chinook salmon bycatch (75 FR 53026, August 30, 2010). Amendment 91 includes two Chinook salmon PSC limits, 60,000 Chinook salmon and 47,591 Chinook salmon. The 60,000 Chinook salmon PSC limit is available to those who participate in an industry-developed incentive plan agreement (IPA) that provides incentives for each vessel to avoid Chinook salmon bycatch. Sectors are also held to a Chinook salmon bycatch performance standard of 47,591 Chinook salmon. More details on Amendment 91 are in Section 1.4.2 and NMFS 2009a.

In 2007, Amendment 84 to FMP was implemented (72 FR 61070, October 29, 2007) to exempt pollock fishery participants in a voluntary intercooperative agreement (ICA) for salmon bycatch reduction from the salmon savings areas closures in the BSAI. In 2010, the ICA was amended to apply to non-Chinook salmon because Chinook salmon are managed under Amendment 91. The ICA requires participants to avoid areas of high salmon bycatch rates through a voluntary rolling hot spot program (VRHS) managed by Sea State, Inc. When the rate of chum salmon bycatch becomes too high, the ICA requires certain vessels to stay out of areas of high salmon bycatch, depending on the vessel's salmon bycatch rates. More details on the ICA are in section 1.4.2, 1.4.3, and in NMFS 2007c.

NMFS and the Council continue to develop and analyze alternative measures to reduce salmon bycatch. The pollock industry, NMFS, the Council, users of salmon resources, and environmental organizations all agree that salmon bycatch amounts in the BSAI pollock fishery are too high, and must be reduced. This EFP would address this need for action by supporting the development of one method for reducing salmon bycatch.

1.4 Background

This section provides historical information regarding salmon bycatch in the pollock trawl fishery, costs of salmon bycatch, and efforts to date to reduce salmon bycatch.

1.4.1 Historical Salmon Bycatch Information

From 1991 through 2010, an annual average of 46,609 Chinook salmon and 137,242 non-Chinook salmon (over 95% chum salmon) were incidentally caught in BSAI groundfish trawl fisheries (Table 1.1). Bycatch is primarily of juvenile salmon that are one or two years away from returning to the river of origin as adults. The 2007 Chinook salmon bycatch was the highest on record since 1990 for all BSAI groundfish fisheries and is estimated at 129,567 fish. Chinook salmon bycatch in the BSAI has declined in recent years to 12,530 in 2010. As of February 22, 2011, the 2011 estimated total prohibited species catch of Chinook salmon in the BSAI is 4,108 fish (NMFS Alaska Region Catch Accounting System). Approximately 95 percent of this bycatch occurred in the pelagic trawl fishery for pollock. From 2003 through 2006, non-Chinook salmon bycatch numbers increased to a historic high of 709,397 in 2005 and since 2006 has declined substantially (Table 1.1).

Table 1.1 Bycatch of Pacific Salmon in BSAI Groundfish trawl fisheries.

	Numbers of Fish	
Year	Chinook	Non-Chinook
1991	48,880	30,262
1992	41,955	41,450
1993	46,014	243,270
1994	43,821	94,548
1995	23,436	21,875
1996	63,205	78,060
1997	50,530	66,994
1998	55,431	65,697
1999	14,599	47,132
2000	8,223	59,327
2001	40,547	60,731
2002	39,684	82,483
2003	53,571	191,150
2004	59,967	450,553
2005	74,267	709,397
2006	87,804	325,181
2007	129,567	97,352
2008	24,133	16,901
2009	14,008	47,497
2010	12,530	14,977
Average	46,609	137,242

Source: NMFS Alaska Region Catch Accounting System (1/14/11)

Pacific salmon support large commercial, recreational, and subsistence fisheries throughout Alaska. Chinook salmon commercial harvests since 1970 have ranged from 352,000 fish (2000) to 877,000 fish (1982). Commercial Chinook salmon harvests in 2010 were 365,000 fish (ADFG 2010a). Chum salmon harvests since 1970 have ranged from 4,323,000 fish (1975) to 24,376,491 fish (2000). Chum salmon commercial harvests in 2010 were approximately 18,165,000 fish (ADFG 2010a). Although reduced salmon runs may be attributable to changes in ocean conditions (Hare and Francis 1995; Kruse 1998), considerable public concern has been raised as to the effect of low salmon returns on fishery dependent communities in western Alaska. Responding to the crisis in the salmon industry, the Governor of Alaska declared a state emergency on several occasions in the early 2000s. In recent years of low Chinook salmon returns, the in-river harvest of western Alaska Chinook salmon has been severely restricted and, in some cases, river systems have not met escapement goals. Because of low Chinook salmon returns, the state of Alaska reduced the 2008 commercial Chinook salmon harvest to 89 percent below the recent five-year average. No commercial Chinook salmon fishery was allowed in 2009 on the Yukon River. The state also restricted subsistence harvests. On January 15, 2010, Secretary of Commerce Gary Locke declared a commercial fishery failure for the Yukon River Chinook salmon due to low salmon returns (U.S. DOC 2010).

Surplus fish beyond escapement needs and subsistence uses are made available for other uses. Commercial fishing for Chinook salmon may provide the only source of income for many people who live in remote villages. Chum salmon is also an important subsistence resource for western Alaska (NPFMC 2011a). In response to these concerns and ongoing incidences of salmon bycatch, the Council is continuing to review salmon bycatch management measures to reduce salmon bycatch to the extent practicable, as required by the Magnuson-Stevens Fishery Conservation and Management Act, National Standard 9. NMFS prepared a final Environmental Impact Statement (EIS) on Bering Sea Chinook Salmon Bycatch Management in December 2009 (NMFS 2009a). Chapter 3 of the Final Regulatory Impact Review (RIR) for Bering Sea Chinook Salmon Bycatch Management provides an overview of the importance of subsistence harvests and commercial harvests (NPFMC 2009a).

Two Chinook salmon stocks from the Pacific Northwest that are listed under the Endangered Species Act (ESA) may be taken in the BSAI groundfish fisheries: the Lower Columbia River and the Upper Willamette River Chinook stocks. On January 11, 2007, the NMFS Northwest Region completed a supplemental biological opinion for the BSAI groundfish fisheries, including an incidental take statement (NMFS 2007a). The 2007 amount of Chinook salmon bycatch (124,421 for trawl fisheries) was well above the range of observation cited in the 2007 incidental take statement (36,000 to 87,500 Chinook salmon for all BSAI groundfish fisheries). Under section 7 of the ESA, NMFS Alaska Region requested consultation on the changes proposed under Amendment 91. A supplemental biological opinion was completed on December 2, 2009, and provides a new incidental take statement that reflects the expected take of ESA-listed Chinook salmon under the management measures of Amendment 91 (NMFS 2009b).

1.4.2 Salmon Bycatch Reduction Measures

Salmon are listed as a prohibited species in the groundfish fishery management plans, meaning that they cannot be retained and sold. Regulations implemented in 1994 prohibited the discard of salmon taken as bycatch in BSAI groundfish trawl fisheries until the number of salmon has been determined by a NMFS certified observer (59 FR 18757, April 20, 1994). Subsequent regulations allowed for voluntary retention and processing of salmon for donation to NMFS qualified distributors of food to underprivileged individuals (Prohibited Species Donation Program (PSDP) (50 CFR 679.26).

Chum Salmon Savings Area (CSSA) and Chinook Salmon Savings Area (CHSSA)

Chinook salmon bycatch in the Alaska groundfish fisheries is generally higher in the winter and chum salmon bycatch is higher in the summer although this trend is not without exceptions. Based on this seasonal pattern, the Council has adopted extensive seasonal cap and closure measures to control salmon bycatch in the trawl fisheries (Witherell and Pautzke 1997). Starting in 1994, regulations established the CSSA, which is an area with historically high non-Chinook salmon bycatch (Figure 1.1) (50 CFR 679.21(e)(7)(vii)). In 1995, regulations established the Chinook Salmon Savings Areas (CHSSA) and mandated year-round accounting of Chinook salmon bycatch in the trawl fisheries (60 FR 61215, November 29, 1995). This prohibited species catch limit was divided between the CDQ and non-CDQ fisheries. The savings areas were adopted based on historic observed salmon bycatch rates and were designed to avoid areas with high levels of salmon bycatch.

The Council started considering revisions to salmon bycatch management in 2004, when information from the fishing fleet indicated that it was experiencing increases in Chinook salmon bycatch following the regulatory closure of the CHSSA. This indicated that, contrary to the original intent of the savings area closures, Chinook salmon bycatch rates appeared to be higher outside of the savings area than inside the area. While, upon closure, the non-CDQ fleet could no longer fish inside the Chinook Salmon Savings Area, vessels fishing on behalf of the CDQ groups were still able to fish inside the area because the CDQ groups had not yet reached their portion of the Chinook salmon prohibited species catch limit. Much higher salmon bycatch rates were reportedly encountered outside of the closure areas by the non-CDQ fleet than experienced by the CDQ vessels fishing inside. Further, the closure areas increased costs to the pollock fleet and processors.

Amendment 91

NMFS issued regulations to implement Amendment 91 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (FMP) (75 FR 53026, August 30, 2010). Amendment 91 is an innovative approach to managing Chinook salmon bycatch in the Bering Sea pollock fishery that combines a PSC limit on the amount of Chinook salmon that may be caught incidentally with an incentive plan agreement (IPA) and performance standard designed to minimize bycatch to the extent practicable in all years. Under Amendment 91, the pollock fleet is prevented from exceeding the 60,000 Chinook salmon PSC limit in every year. Each year, NMFS will allocate the 60,000 Chinook salmon PSC limit to the mothership sector, catcher/processor sector, inshore cooperatives, and CDQ groups if an IPA is formed and approved by NMFS. The sector-level performance standard of 47,591 Chinook salmon is a tool to ensure that each sector does not fully harvest its Chinook salmon PSC allocation in most years. For a sector to continue to receive Chinook salmon PSC allocations under the 60,000 Chinook salmon PSC limit, that sector may not exceed its portion of 47,591 in any three years within seven consecutive years. If a sector fails this performance standard, it will permanently be allocated a portion of the 47,591 Chinook salmon PSC limit. All vessels choosing to not participate in an IPA would fish under a much lower portion of the 60,000 Chinook salmon PSC limit and would be ineligible to participate in management measures intended to offer flexibility to vessels harvesting pollock.

With the IPA component and the performance standard, Amendment 91, as implemented by the final rule, will result in a greater reduction of Chinook salmon bycatch over time than the PSC limits. NMFS will monitor all salmon bycatch by each vessel in the pollock fishery through a census, 100 percent observer coverage, and an expanded biological sampling program. Annual reports and the proposed economic data collection program are designed to evaluate whether and how incentive plans influence a vessel's operational decisions to avoid Chinook salmon bycatch. If information becomes available to indicate that Amendment 91 is not providing the expected Chinook salmon savings, NMFS will work with the Council to take additional actions to minimize Chinook salmon bycatch to the extent practicable. Amendment 91 applies only to management of the Bering Sea pollock fishery and will not affect the management of pollock fisheries in the Aleutian Islands or the status of pollock fishing in the Bogoslof District.

Amendment 91 also removed from regulations the 29,000 Chinook salmon PSC limit in the Bering Sea, the CHSSA in the Bering Sea, exemption from Chinook Salmon Savings Area closures for participants in the VRHS ICA, and Chinook salmon as a component of the VRHS ICA. The final rule did not change any regulations affecting the management of Chinook salmon in the Aleutian Islands or non-Chinook salmon in the BSAI. The Council is currently considering a separate action to modify the non-Chinook salmon management measures to minimize non-Chinook salmon bycatch (NPFMC 2011a).

Amendment 84

Amendment 84 to the FMP became effective November 28, 2007 (72 FR 61070, October 29, 2007). This amendment allows vessels participating in the directed fisheries for pollock in the Bering Sea to use their ICA to reduce salmon bycatch using the VRHS. The VRHS uses real-time salmon bycatch information to avoid areas of high chum bycatch rates. Parties to the ICA include all pollock fishing vessels, at least one third-party group representing western Alaskans who depend on salmon and have an interest in salmon bycatch reduction, and at least one private firm retained to facilitate bycatch avoidance behavior and information sharing. The VRHS uses a system of base bycatch rates, assignment of vessels to tiers based on bycatch rates relative to the base rate, a system of closures for vessels in certain tiers, and monitoring and enforcement through private contractual arrangements. Vessels participating in the salmon bycatch ICA are exempted from closures of the CSSA in the Bering Sea.

A salmon bycatch reduction ICA using the VRHS was approved by NMFS in January 2008, and an amendment to apply the ICA to non-Chinook salmon was approved in December 2010. Amendment 84 requires that parties to the ICA be the American Fisheries Act (AFA) cooperatives or the CDQ groups. All AFA cooperatives and CDQ groups participate in the VRHS ICA.

Under the ICA, the pollock fleet has developed its own private-sector arrangements to monitor salmon bycatch rates and relay the information back to the fishing vessels while they are at sea. Observer data and other reports are transmitted to analysts associated with the private firm, Sea State, Inc. Some of these reports are transmitted immediately from sea; some are transmitted at the time catcher vessels make their shoreside deliveries. Sea State, Inc., processes the data, identifies locations with high salmon bycatch rates, and informs the fishing vessels. Sea State, Inc., in cooperation with the ICA manager of United Catcher Boats, is authorized by the agreement to restrict fishing operations in high salmon bycatch rate areas if salmon catch exceeds a threshold level (there are limits on the total area that may be restricted in a week). Fishing operations are required, by the terms of their contract in the ICA, to limit their fishing activity in an area that is closed. The vessel limitations differ among the cooperatives; cooperatives whose skippers have been fishing with little salmon bycatch are limited less than those that have had higher bycatch. Cooperatives with high salmon bycatch may be prohibited from fishing in the restricted areas for a full week. The ICA is a contract imposing binding obligations on the cooperatives.

Irrespective of Sea State, Inc., reports, vessel operators will often conduct “test fishing” upon entering new areas. Test fishing involves taking short tows to see if salmon bycatch rates are high. Test fishing adds to the cost of fishing activity.

Additional Non-Chinook Salmon Bycatch Management Measures

The Council is continuing to evaluate management alternatives for non-Chinook bycatch and prepared a Preliminary Draft Environmental Assessment for Bering Sea Non-Chinook Salmon Bycatch Management and Preliminary Review Draft Regulatory Impact Review for Bering Sea Non-Chinook Salmon Bycatch Management (NPFMC 2011a). The documents provide a preliminary analysis of alternative ways to manage chum salmon bycatch, including replacing the current CSSA and VHRS ICA in the Bering Sea with salmon bycatch limits or new regulatory closures.

1.4.3 Costs Associated with Salmon Bycatch

The closures of areas to reduce salmon bycatch have the potential to impose significant costs on pollock fishermen operating in the Bering Sea. Costs are imposed by potential closures of the salmon savings areas and salmon hot spots. There are also the costs imposed by the PSC limits. In addition, there are the costs imposed on the industry as it takes steps to control its salmon bycatch. Furthermore, handling salmon bycatch creates costs for inshore fisheries.

Closed areas prevent the fleet from determining where to fish based on pollock distribution. Pollock also occurs in the salmon savings areas and in the salmon hot spots, and closure of these areas may result in added expense to the pollock fishing industry by moving the fleet to potentially less productive fishing grounds, decreasing catch per unit effort (CPUE). The ICA for reducing non-Chinook salmon bycatch is a voluntary program, which so far has included all pollock catcher vessels. If a vessel owner chooses not to participate in the ICA, then the salmon savings area closures would apply to that vessel.

Non-Chinook (chum) salmon bycatch is a problem during the summer. The Chum Salmon Savings Area (CSSA) is closed to pollock fishermen from August 1 to August 31, irrespective of the level of non-Chinook salmon bycatch. In addition, the CSSA will close immediately if fishermen reach a non-CDQ threshold of 37,506 fish in the catcher vessel operational area (CVOA) between August 15 and October 14.[1]

The pollock fishery vessels not participating in the VRHS also have to operate within a non-Chinook salmon cap of 42,000 fish in the CVOA between August 15 and October 14 (§679.21). In 2005, the pollock fishery exceeded the non-Chinook limit of 42,000 fish by taking 54,088 fish in the CVOA between August 15 and October 14. The CSSA falls completely inside the CVOA. Since no catcher/processors are allowed to fish in the CVOA during the B season (June through October) the restriction on savings area fishing would have fallen entirely on catcher vessels. All vessels and CDQ groups that are participating in the Bering Sea pollock fishery in 2011, except one vessel, participate in the ICA.

Under Amendment 91, the sector-level performance standard of 47,591 Chinook salmon is a tool to ensure that each sector does not fully harvest its Chinook salmon PSC allocation in most years. For a sector to continue to receive Chinook salmon PSC allocations under the 60,000 Chinook salmon PSC limit, that sector may not exceed its portion of 47,591 in any three years within seven consecutive years. If a sector fails the performance standard, it will permanently be allocated a portion of the 47,591 Chinook salmon PSC limit. The IPAs under Amendment 91 contain management measures for Chinook salmon pollock fisheries in the Bering Sea that include identification of bycatch avoidance areas, Chinook salmon conservation areas, and pollock fishing prohibitions for vessels with poor bycatch performance.

A salmon excluder device would reduce bycatch thereby lessening the potential for exceeding the PSC limits and reduce the potential for constraints being placed on the trawl fisheries due to exceeding salmon PSC limits.

By forcing catcher vessels off their preferred fishing grounds, the VRHS closures, CSSA closures, bycatch avoidance areas, and Chinook salmon conservation areas can reduce revenues or increase costs. Even if catcher vessels can continue to harvest as many pollock as before, they may face increased travel

[1] The chum PSC cap is 42,000 fish, 10.7% of which is allocated to the CDQ groups, and the remainder of which (37,506 fish) is allocated to the AFA.

costs if the closures force them to move to new fishing grounds (which may be further from their delivery ports). Vessel operators may have to fish for pollock in areas where CPUE is lower, or they may be forced to fish on pollock stocks of lower quality (maybe on smaller fish). Pollock quality and its ex-vessel price can be reduced if fishermen on catcher vessels are forced by closures to fish further from delivery ports. Increased running time and increased time between harvest and processing can reduce the desirability of pollock. The quality of surimi grades for shoreside-processed pollock begin to decline as the time between harvest and delivery increases. Processors producing fillets prefer larger pollock than processors producing surimi. A vessel fishing for a processor with a size preference may be forced off of desirable sized pollock and forced to fish for unsuitably sized pollock by an area closure (NMFS 2008a). Reductions in salmon bycatch rates during normal fishing activities (prior to closures) may also serve to reduce fishing costs for the industry because fewer salmon would need to be handled and disposed of as required by the fisheries regulations (50 CFR 679.21).

Costs of Present Management Measures

Voluntary or contractually obligated changes in fishing patterns will impose costs on pollock fishermen similar to those costs involved in caps and the closures of the CSSA (borne by both catcher processors and catcher vessels). Reductions in salmon bycatch rates associated with successful development of the salmon excluder device will reduce the costs of this system and make it more cost effective. Excluder devices would reduce the salmon catch associated with initial inadvertent discovery of hot spots. Excluder devices also will slow the rate of salmon catch in hot spots in the interval between the time the hot spot is identified and the time the fleet can be notified of the salmon hotspot and directed away from it or restricted from fishing on it. It may be possible to fish in areas that would otherwise have to be closed if the excluder device lowers salmon bycatch rates sufficiently. Finally, some salmon bycatch would take place in normal fishing operations outside of hot spots. Successful development of an excluder device would reduce salmon bycatch associated with these operations.

Cost of Salmon Bycatch to Salmon Fisheries

Salmon caught by the pollock fleet will not return to their natal waters and will not become available to the fisheries exploiting those waters. Returning salmon are used in subsistence, commercial, and recreational fisheries and for escapement and investment in future stocks. Changes in trawl technology that reduce bycatch rates will increase the numbers of salmon returning to these uses. Reductions in salmon bycatch in the pollock fishery will not translate directly into one-to-one increases in salmon available for United States inshore uses for two reasons: the increased return to United States fisheries will be less than the reduction in trawl salmon harvest since many of the fish originate in Canada or Asian waters and because many of the salmon may die from natural causes between the time they escape the trawl and the time they would otherwise have returned to those waters.

Fishing Industry Concerns Regarding Salmon Bycatch in Groundfish Fisheries

The nature of the bycatch problem with salmon is complex and inherently difficult due to the unpredictable nature of salmon locations and movements. From a practical perspective, the pollock industry believes that one of the biggest problems with salmon avoidance is that areas of salmon concentration are often transitory. By the time such concentrations are identified, a relatively large number of salmon may have already been taken and salmon may have already moved to other locations. Overall, hotspot avoidance and other approaches have provided some success, but these efforts can only achieve success to the degree that salmon movements (and hence bycatch) follow some sort of predictable pattern (UCBA 2003).

The challenges of salmon bycatch avoidance itself, particularly in the context of the restrictive bycatch management measures in place, create costs for the pollock industry. This situation will undoubtedly be even more acute if salmon populations increase or environmental conditions change in the future to increase the overlap of Chinook and chum salmon feeding and migration routes with pollock fishing grounds. The potential effects of existing management controls on salmon bycatch is provided in the RIR for Bering Sea Chinook Salmon Bycatch Management for Amendment 91 and the Preliminary Review Draft Regulatory Impact Review for Bering Sea Non-Chinook Salmon Bycatch Management (NPFMC 2009a and 2011a).

One further complication is that salmon avoidance is not the only constraint facing the pollock industry. The decision of where to fish is affected by other constraints. An important constraint on where pollock vessels might fish in order to avoid salmon are regulations to minimize competition between pollock removals and Steller sea lions (50 CFR 679.22). To avoid harvesting more than the allowable amount of pollock in Steller sea lion protection areas, fishing areas must be selected outside of Steller sea lion protection areas, even when salmon bycatch was relatively low in those areas. In some cases, this tradeoff can mean higher bycatch rates of salmon.

Trawl skippers have informally developed and tested excluder devices for bottom trawls for many years. Until the past 5 years, little or no informal effort has been focused on designing a salmon excluder device for pelagic trawls used in the BSAI pollock fishery. One explanation for this is that up until recently, the industry did not have access to the technical expertise and equipment to capture video images *in situ* where low-light conditions make this difficult. Recent bycatch events (e.g. 2007 Chinook bycatch) and increasing awareness of the importance of salmon to western Alaskan communities have driven industry's efforts to develop a salmon excluder device.

1.4.4 Why Use an Exempted Fishing Permit to Develop a Salmon Bycatch Reduction Device and Evaluate Its Performance?

EFPs are an effective way to develop bycatch reduction gear by allowing for systematic testing under a rigorous experimental design. In the experience of the fishing industry, informal efforts to test net modifications in an *ad hoc* manner are not efficient because a fisherman working independently typically does not test modification ideas systematically. While fishermen often possess a strong grasp of technical aspects of fishing gear in combination with outstanding ingenuity for adaptation, the coordinated and systematic approach of testing gear modifications through an EFP collaboration of science and industry is a more productive way to develop bycatch reduction devices (BRDs).

EFPs are advantageous because of the relatively high cost of chartering large research vessels like those used in the Bering Sea pollock fishery. Additional fishing opportunities can be used to help fund research and development costs of conservation engineering without significant biological effects on stocks. In addition, there are benefits to evaluating gear modifications under the most realistic fishing scale and conditions. Research charters can be a difficult and potentially very expensive and possibly less effective way to recreate actual fishing conditions compared to an EFP test. The EFP also allows for the collection of data in context of the experimental design that would not otherwise be allowed under the groundfish regulations. For these reasons, an EFP is considered the best method for developing a salmon excluder device.

1.4.5 Evolution of the Concept of a Salmon Excluder Device for the Pollock Fishery

The EA for EFP 08-02 to support the development of a salmon excluder device (NMFS 2008b) and the final report for the work under EFP 08-02 (Gauvin et al. 2010) detail the steps leading up to the application for this EFP and continuing changes to the design. Working with the industry, Dr. Craig Rose of the Alaska Fisheries Science Center used images of salmon behavior in a pollock trawl net to develop an excluder that would permit the escapement of salmon without the loss of pollock. EFP 08-02 resulted in the current flapper excluder designed to allow escapement during towing. This design is based on installing the flapper in the straight tube section just ahead of the packing tube or codend. Weight is placed on the forward part of the flapper panel and floatation on the aft section of the escapement hole is used to achieve lift and additional room for escapement. The flapper excluder achieved between 25% and 35% Chinook salmon escapement by number with pollock (groundfish) escapement in the range of one-half to one and one-half percent by weight (Gauvin et al. 2010). Adding artificial light above or around the escapement hole may increase the Chinook escapement rate as was noted in the final tests on F/V *Pacific Prince*. The focus of testing for the new EFP will be escapement by chum salmon. Thus far, chum salmon have not responded measurably to all the excluder designs that have been developed. The current flapper design will be tested to determine its effectiveness for chum salmon escapement. It may be necessary to implement alternative design modifications (i.e., escapement holes that are not on the top of the trawl intermediate).

Figure 1.4 depicts the device to be tested and potentially modified under this action.

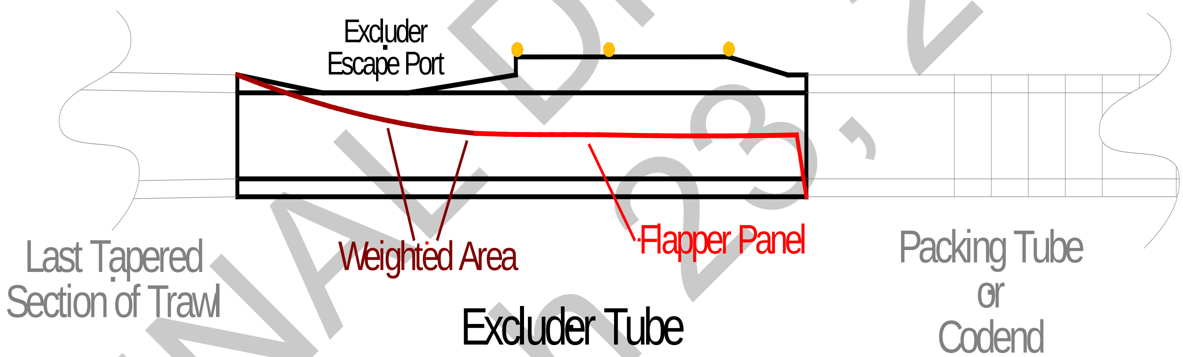

Figure 1.4: Design changes to the flapper excluder in preparation for winter 2010 EFP testing (Gauvin 2010).

Table 1.2 lists the overall groundfish in metric tons (mt), salmon numbers, and percent non-pollock by weight caught during each phase of the EFP 08-02.

Table 1.2 Catch During Each Phase of EFP 08-02.

		2008 B	2009 A PP	2009 A SB	2009 B season	2010 A season
Groundfish	MT	168	1907	1487	1656	2511
Chinook	Number	24	2435	1032	39	506
Non-Chinook	Number	17	9	0	912	17
% Non-Pollock	By weight	2%	1%	1%	3%	2%

Source: John Gauvin, personal communication, January 2011.

1.5 Related NEPA Documents

The National Environmental Policy Act (NEPA) documents listed below have detailed information on the groundfish fisheries, and on the natural resources and the economic and social activities and communities affected by those fisheries. These documents contain valuable background for the action under consideration in this Environmental Assessment (EA). The Council on Environmental Quality (CEQ) regulations encourage agencies preparing NEPA documents to incorporate by reference the general discussion from a broader EIS and concentrate solely on the issues specific to the EA subsequently prepared. According to the CEQ regulations, whenever a broader EIS has been prepared and a NEPA analysis is then prepared on an action included within the entire program or policy, the subsequent analysis shall concentrate on the issues specific to the subsequent action. The subsequent EA need only summarize the issues discussed and incorporate discussions in the broader EIS by reference (see 40 CFR 1502.20).

Alaska Groundfish Programmatic Supplemental EIS (PSEIS)

In June 2004, NMFS completed the PSEIS that described the impacts from alternative groundfish fishery management programs on the human environment (NMFS 2004). NMFS issued a Record of Decision on August 26, 2004, with the simultaneous approval of Amendments 74 and 81 to the groundfish FMPs. This decision implemented a policy for the groundfish fisheries management programs that is ecosystem-based and is more precautionary when faced with scientific uncertainty. For more information on the PSEIS, see the Alaska Region website at: http://www.alaskafisheries.noaa.gov/sustainablefisheries/seis/default.htm.

The PSEIS brings the decision-maker and the public up to date on the current state of the human environment, while describing the potential environmental, social, and economic consequences of alternative policy approaches and their corresponding management regimes for management of the groundfish fisheries off Alaska. In doing so, it serves as the overarching analytical framework that will be used to define future management policy with a range of potential management actions. Future amendments and actions will logically derive from the chosen policy direction set for the preferred alternative identified in the PSEIS.

The PSEIS provides a detailed description of the impacts of fishing on the human environment and past, present, and future actions that may result in cumulative effects in combination with impacts of the groundfish fisheries. This EA will incorporate by reference information from the PSEIS that has remained unchanged since 2004.

Alaska Groundfish Harvest Specifications EIS

In January 2007, NMFS completed an EIS analyzing the impacts of various harvest strategies for the Alaska groundfish fisheries (NMFS 2007b). Except for the no action alternative, the alternatives analyzed would implement the preferred management strategy contained in the PSEIS. This document contains an analysis of the effects of the alternative harvest strategies on target groundfish species, non-target species, prohibited species, marine mammal, seabirds, habitat, ecosystem relationships, and social and economic concerns. This EIS is based on the latest information regarding the status of each of these environmental components and provides the most recent consideration of reasonably foreseeable future actions to consider in the cumulative effects analysis. The EIS provides the latest overall analysis of the impacts of the groundfish fisheries on the environment and is a substantial reference for this EA. This document is available from the NMFS Alaska Region website at http://www.alaskafisheries.noaa.gov/analyses/specs/eis/default.htm.

Environmental Impact Statement/Regulatory Impact Review (EIS/RIR) for Bering Sea Chinook Salmon Bycatch Management, Final Rule Implementing Amendment 91 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area

This December 2009 document (NMFS 2009a) contains the most recent information regarding the bycatch of Pacific salmon in the Bering Sea groundfish fisheries. The EIS provides an evaluation of the environmental effects of alternative measures to minimize Chinook salmon bycatch in the Bering Sea pollock fishery. The RIR provides an evaluation of the social and economic effects of these alternatives. This document is available from the NMFS Alaska Region website at http://www.alaskafisheries.noaa.gov/sustainablefisheries/bycatch/default.htm

Preliminary Draft Environmental Assessment for Bering Sea Non-Chinook Salmon Bycatch Management and Preliminary Review Draft Regulatory Impact Review for Bering Sea Non-Chinook Salmon Bycatch Management

This February 2011 document (NPFMC 2011) provides a preliminary analysis of alternative ways to manage chum salmon bycatch, including replacing the current CSSA and voluntary rolling hotspot system intercooperative agreement (VHRS ICA) in the Bering Sea with salmon bycatch limits or new regulatory closures based on current salmon bycatch information. This document provides the latest information on the effects of the Bering Sea pollock fishery on chum salmon. This document is available from the Council website at http://www.alaskafisheries.noaa.gov/npfmc/current_issues/bycatch/ChumbycatchEA211.pdf and http://www.alaskafisheries.noaa.gov/npfmc/current_issues/bycatch/ChumRIR211.pdf

Environmental Assessment/Regulatory Impact Review /Final Regulatory Flexibility Analysis (EA/RIR/FRFA) for Modifying existing Chinook and chum salmon savings areas, Final Rule Implementing Amendment 84 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area

This October 2007 document (NMFS 2007c) contains recent information regarding the bycatch of Pacific salmon in the BSAI groundfish fisheries and the effects of the VRHS for reducing salmon bycatch on the human environment. A thorough description of the effects of the pollock fishery on salmon is contained in this document and will be incorporated by reference in this EA. This document is available from the NMFS Alaska Region website at http://www.alaskafisheries.noaa.gov/analyses/amd84/Am84_EARIRFRFAfr.pdf.

Steller Sea Lion Interim Final Rule and Protection Measures Supplemental EIS

A supplemental EIS (SEIS) was completed in 2001 to evaluate the impacts of groundfish fishery management measures in the Gulf of Alaska and BSAI on Steller sea lions (NMFS 2001). The purpose of the SEIS was to provide information on potential environmental impacts from implementing a suite of fisheries management measures to protect the western population of Steller sea lions. Fisheries management measures were designed to not jeopardize the continued existence of the western population of Steller sea lions nor adversely modify its critical habitat. The Steller sea lion protection measures were implemented by emergency rule in 2002 and by final rule making in 2003 (68 FR 204, January 2, 2003). The EIS may be found on the NMFS Alaska Region website at: http://www.alaskafisheries.noaa.gov/sustainablefisheries/seis/sslpm/default.htm.

For the 2011 fishing year, NMFS issued an interim final rule to implement Steller sea lion protection measures to insure that the Bering Sea and Aleutian Islands management area groundfish fisheries are not likely to jeopardize the continued existence of the western distinct population segment (DPS) of Steller sea lions or adversely modify its designated critical habitat (JAM) (75 FR 77535, December 13, 2010). These management measures will disperse fishing effort over time and area to provide protection from potential competition for important Steller sea lion prey species in waters adjacent to rookeries and important haulouts. The intended effect of this interim final rule is to ensure the Alaska groundfish fisheries are not likely to cause JAM for the endangered western DPS of Steller sea lions, as required under the Endangered Species Act (ESA), and to conserve and manage the groundfish resources in accordance with the Magnuson-Stevens Act. No changes to the Bering Sea pollock fishery management were in the interim final rule. An EA determined that this action would not have significant environmental impacts. This document is available from the NMFS Alaska Region website at http://alaskafisheries.noaa.gov/analyses/ssl/sslprotections_earir1210.pdf.

The proposed action analyzed in this EA may occur in an area that is Steller sea lion designated critical habitat and would harvest an important Steller sea lion prey species (pollock). The Steller sea lion SEIS provides descriptions of the effects of fishing on Steller sea lions, which will be incorporated by reference in this EA.

1.6 Public Participation

The notice of receipt of an application for the exempted fisheries permit will be published in the *Federal Register* before the March/April 2011 Council meeting with a 30 day public comment period. NMFS will provide the U.S. Coast Guard and the Council copies of the application and draft EA for consultation purposes. The application is on the agenda for the Council's March/April 2011 meeting. The applicant will present this project and NMFS will present this EA to the Council's Scientific and Statistical Committee (SSC) at its March/April 2011 meeting. NMFS will provide the Council the opportunity to consult on this EFP and will hear public comment on this item at the Council meeting.

2.0 ALTERNATIVES CONSIDERED

The CEQ regulations implementing NEPA require a range of alternatives to be analyzed for a federal action. The alternatives analyzed may be limited to a range of alternatives that could reasonably achieve the need that the proposed action is intended to address. Section 1.0 of this document described the purpose and need of the proposed action.

The purpose of this action is to allow the continued development and testing of a salmon excluder device for pollock trawl gear in the eastern Bering Sea. The applicant has worked closely with the Alaska Fisheries Science Center (AFSC) in the development of the experimental design, and this design has been approved by the AFSC (DeMaster 2011). The experimental design requires the applicant's exemption from several groundfish fisheries regulations at 50 CFR part 679 including:

§ 679.7(a)(2): Persons are prohibited from conducting any fishing contrary to notification of in season actions, closures, or adjustments under §§ 679.20, 679.21, 679.22, and 679.25. Groundfish taken under the EFP will not be applied to the Total Allowable Catch (TAC) limit specified in the annual harvest specifications (§ 679.20(a)). The EFP would allow for the harvest of up to 7,500 mt of groundfish (2,500 mt for each of three seasons). The EFP will allow for the harvest of salmon in the salmon savings areas, even though they may be closed. The salmon harvested will not count towards these annual PSC limits (see below). As the Council and NMFS have approved for past EFP experiments dedicated to bycatch reduction, groundfish and prohibited species taken during the experiment would not be counted against the annual TAC and PSC caps (65 FR 55223, September 13, 2000).

§679.21(e)(1)(vii) and (f)(2): Salmon taken during the experiment would not be counted against the bycatch limits established for Chinook and non-Chinook salmon. The EFP would allow for the take of up to 850 Chinook salmon (125 in two fall seasons and 600 in one winter season) and 5,125 non-Chinook salmon (2,500 in two fall seasons and 125 in one winter season). These amounts are based on the estimated amount of salmon needed by the applicant to meet the experimental design without constraining fishing under the EFP (Gauvin 2010). Taking of the salmon during the experiment is crucial for determining the effectiveness of the device. The potential exists that the amount of salmon bycatch taken by the pollock trawl industry during the EFP period will approach or exceed the salmon bycatch limits. The salmon taken during the experiment would create an additional burden on the pollock trawl industry, if the EFP salmon is counted toward the salmon bycatch limits and triggers closure of the salmon savings areas for those vessels that may not be participating in the ICA for salmon bycatch. Any vessel owner participating in the ICA for salmon bycatch (i.e., the VRHS) or the IPA that may also fish under the EFP would need to ensure the ICA allows for participation in the EFP and that the salmon taken during EFP fishing would not be used in calculating the closure areas for the ICA and IPA participants.

§ 679.21(e)(7)(vii), and § 679.22(a)(5)(ii), (a)(7)(ii), and (a)(10): Exemptions from closures of the Chum Salmon Savings Area, the Bering Sea Pollock Restriction Area, and the Catcher Vessel Operating Area would be in the EFP. The experiment must be conducted in areas of salmon concentration to ensure a sufficient sample size. These areas have high concentrations of salmon and provide an ideal location for conducting the experiment and ensuring the vessel encounters enough salmon to support the experiment.

§ 679.22(a)(7)(vii): The closure of the Steller Sea Lion Conservation Area (SCA) is based on sector specific limits of no more than 28 percent of the annual TAC taken before April 1. This section also requires the closure of the SCA to vessels greater than 99 feet length overall (LOA) to provide for harvesting by vessels in the inshore sector under 99 feet LOA. In order to conduct the experiment where salmon are likely to occur, the EFP will include an exemption from closure of the SCA, as long as the total amount of pollock harvest by all sectors remains below the 28 percent of the annual pollock TAC amount before April 1.

§ 679.50: Vessels harvesting pollock are required to have NMFS certified observers for harvest sampling and monitoring purposes. Sampling under the EFP would be conducted using "sea samplers" who are NMFS trained observers performing sampling and monitoring duties for purposes of the EFP. The sea samplers would account for the groundfish and salmon catch to ensure compliance with the amounts of groundfish and salmon limits specified in the EFP. Whole haul sampling would be used. Because the sea sampler duties under the EFP differ from those duties normally performed by NMFS observers under § 679.50, the EFP would include an exemption from observer regulations.

To accomplish the purpose of this proposed action, within the boundaries of the groundfish regulations (50 CFR parts 600 and 679) and ensuring the use of the carefully developed experimental design, an EFP under 50 CFR 679.6 would be required. Therefore, the alternatives for this action are limited to:

Alternative 1 (Status Quo): No EFP is issued. Exemptions from the regulations to facilitate the continued development and testing of the salmon excluder device would not be granted.

Alternative 2: An EFP is issued (Preferred Alternative). The testing of the salmon excluder device would be permitted with exemptions from §§ 679.7(a)(2) (regarding 679.20(a); 679.21(e)(1)(vii), (e)(7)(vii), (f)(2); and 679.22(a)(10)); 679.21(e)(1)(vii) and (e)(7)(vii); 679.22(a)(5)(ii), (a)(7)(ii), (a)(7)(vii) and (a)(10); and 679.50. The EFP would allow the applicant to conduct the experiment as designed in cooperation with the AFSC. Details of the experiment are contained in Appendix A. An EFP is needed for this action to ensure the testing of the device follows an experimental protocol that requires the harvesting of pollock and salmon in sufficient quantities to meet the statistical requirements of the experimental design (Appendix A). Therefore, pollock and salmon harvesting may be required in locations of known high levels of salmon bycatch, which may be closed to pollock fishing at the time of the experiment.

The experiment will be conducted during fall and winter seasons starting in 2011 (B season) and ending in the fall of 2012 (B season). A pollock vessel used in the BSAI trawl fishery that either processes at sea or delivers to a shoreside processor or mothership will be engaged through a Request for Proposal process for the work. The trawl net will be modified to add the salmon excluder device and a recapture device to provide for data collection. The EFP would be subject to modifications pending any new relevant information regarding the 2012 fishery, including pollock harvest specifications.

Analysis will primarily focus on the estimation of the proportions of pollock and salmon excluded from the catch through the device. The experiment is designed to estimate these values for the combination of all tows, representing the value of the device in ordinary fishery conditions. Variability of escape rates between tows will be examined for indications of conditions affecting excluder performance. Combined size composition data will be tested for differences between retained and escaping fish. Groundfish harvested by the charter vessel will be retained for sale to the extent allowed under § 679.20(e) and (f) with pollock designated as the target species. Tissue from salmon harvested during the study will be provided for genetic testing to determine region of origin. If the salmon is of acceptable quality, it will be donated under the Prohibited Species Donation Program (PSDP) (§ 679.26); otherwise it will be discarded as required by § 679.21(b). Results will be presented by the applicant in preliminary and final reports made available to managers, trawlers, scientists, the Council, and the public.

3.0 METHODOLOGY FOR IMPACTS ANALYSIS

Analysis of the potential cumulative effects of a proposed action and its alternatives is a requirement of NEPA. An environmental assessment or environmental impact statement must consider cumulative effects when determining whether an action significantly affects environmental quality. The Council on Environmental Quality (CEQ) regulations for implementing NEPA define cumulative effects as:

> *the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7*)

For the most part, the discussion of past and present cumulative effects is addressed with the analysis of direct and indirect impacts for each resource component below. The cumulative impact of reasonable foreseeable future actions is addressed in each section for the environmental components.

General Significance Criteria

This section describes the criteria by which the impacts of the proposed action are analyzed for each of the following resource categories: groundfish, prohibited species, and marine mammals.

Evaluation criteria have been developed recently for each of these categories within the Habitat Areas of Particular Concern (HAPC) EA (NMFS 2006a) and in the Groundfish Harvest Specifications EA (NMFS 2006b). The analysis used in this EA adopts the significance criteria used in the HAPC EA (NMFS 2006a), the 2006–2007 Groundfish Harvest Specifications EA (NMFS 2006b), and the Amendment 94 EA

(NMFS 2010d), because of the similar type of action analyzed and the latest methods of analyzing significance of effects provided by these analyses.

The reference point condition, where used, represents the state of the environmental component in a stable condition or in a condition judged not to be threatened at the present time. For example, a reference point condition for a fish stock would be the state of that stock in a healthy condition, able to sustain itself, successfully reproducing, and not threatened with a population-level decline. The following section describes the significance criteria used to evaluate the proposed alternatives.

4.0 STATUS OF AND IMPACTS ON THE AFFECTED ENVIRONMENT

The environmental impacts generally associated with fishery management actions are effects resulting from (1) harvest of fish stocks, which may result in changes in food availability to predators and scavengers, changes in the population structure of target fish stocks, and changes in the marine ecosystem community structure; (2) changes in the physical and biological structure of the marine environment as a result of fishing practices, for example, effects of gear use and fish processing discards; and (3) entanglement/entrapment of non-target organisms in active or inactive fishing gear. An analysis of the effects associated with groundfish harvest on the human environment is discussed in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). The Alaska Groundfish Harvest Specifications EIS also provides a recent description of environmental components, the groundfish fisheries, and potential impacts on the human environment (NMFS 2007b). This EA adopts much of the environmental status description in this EIS because it provides a recent, detailed description.

Information provided by the applicant for the EFP indicates that harvesting of target groundfish species (primarily pollock) and prohibited species (salmon) is required for testing the salmon excluder device. Potential effects on the environment can occur with the removal of target and prohibited species during groundfish harvesting. Pollock and salmon are also prey species of marine mammals, including Steller sea lions, warranting further analysis of potential effects on marine mammals. The successful development of a salmon excluder device may affect the efficiency of the pollock fisheries to avoid bycatch and prosecute a fishery with less restrictions. Because of the limited amounts of harvest, manner of testing, gear type used, and the short duration of the testing, other components of the environment are not likely to be impacted and further analysis is not needed.

Table 4.1 shows the components of the human environment and whether Alternative 2 may have an impact on the component beyond status quo, Alternative 1, and require further analysis. Extensive environmental analysis on all environmental components is not needed in this document because the proposed action is not anticipated to have environmental impacts on every component. Analysis is included for those environmental components on which Alternative 2 may have an impact beyond impacts analyzed for Alternative 1 in previous NEPA analyses (NMFS 2004, 2007b, and 2009a).

Table 4.1 Resources potentially affected by Alternative 2 beyond Status Quo.

Essential Fish Habitat	Ecosystem	Groundfish	Marine Mammals	Seabirds	Non-Target Species	Prohibited Species
N	N	Y	Y	N	N	Y

N = no impact anticipated by the alternative on the component.
Y = an impact is possible if the alternative is implemented.

Essential Fish Habitat

The potential harvest of target species under this proposed action is 0.002% of the pollock TAC in 2011 and 0.004% of the pollock TAC in 2012 (section 4.2.2). The EFP participants will use pelagic trawl gear in the Bering Sea subarea for testing the salmon excluder device. The areas trawled will be areas previously trawled for pollock. The evaluation of the potential effects of pelagic trawling on benthic habitat is detailed in the EIS for Essential Fish Habitat Identification and Conservation (NMFS 2005a) and the EFH 5-year Review for 2010 (NMFS 2010a). A recent analysis of pelagic trawl gear on Essential Fish Habitat (EFH) was done for Amendment 91 (NMFS 2009a). The conclusions from this analysis found the alternatives would have impacts on EFH similar to those found in the EFH EIS. However, the best available information does not identify any effects of fishing as significantly adverse. In other words, effects may occur from fishing, however these effects do not exceed the minimal and temporary limits established by 50 CFR 600.815(a)(2).

The continuing fishing activity in the years 2011 to 2015 is potentially the most important source of additional annual adverse impacts on marine benthic habitat in the action area. The size of these impacts would depend on the size of the fisheries, the protection measures in place, and the recovery rates of the benthic habitat. However, a number of factors will tend to reduce the impacts of fishing activity on benthic habitat in the future. These include the trend towards ecosystems management. Ecosystem sensitive management will increase understanding of habitat and the impacts of fisheries on them, protection of EFH and HAPC, and institutionalization of ecosystems considerations into fisheries governance. Because of the type of gear, amount of fishing, and the location of the fishing in previously trawled areas, the EFP would have no impact on EFH beyond those analyzed in the EIS for Amendment 91 (NMFS 2009a) and the EIS for EFH Identification and Conservation (NMFS 2005a).

Ecosystem

A recent analysis of pelagic trawl gear on ecosystem relationships was done for Amendment 91(NMFS 2009a). The conclusions from this analysis summarized trends from North Pacific Groundfish Stock Assessment and Fishery Evaluation (SAFE) reports Ecosystem Consideration chapters relevant to the Bering Sea and Chinook salmon bycatch management. No significant adverse impacts of fishing on the ecosystem relating to predator/prey interactions, energy flow/removal, or diversity were noted, either in observed trends or ecosystem level modeling results. No BSAI groundfish stock or stock complex is overfished, and no BSAI groundfish stock or stock complex is being subjected to overfishing. Recent exploitation rates on biological guilds are within one standard deviation of long-term mean levels. An exception was for the forage species of the Bering Sea (dominated by walleye pollock), which had relatively high exploitation rates during 2005–2007 as the stock declined. The 2008- and 2009-recommended catch levels are again within one standard deviation of the historical mean. This is a more direct measure of catch with respect to food-web structure than are trophic level metrics.

The impacts of the groundfish fisheries on ecosystem relationships were analyzed in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). That EIS examines the impacts of the fisheries, as currently managed, on predator-prey relationships, energy flow and removal, and diversity. Predator-prey relationships were evaluated with respect to four indicators: (1) pelagic forage availability, (2) spatial and temporal concentration of fishery impact on forage, (3) removal of top level predators, and (4) introduction of non-native species (see section 8.4.7 in NMFS 2007b). The EIS concluded that, overall, there appears to be little indication of fishing down the trophic level. The primary impact to pelagic forage availability is the predicted decline of pollock in the near-term which reduces their availability as forage sources. Biomass is likely to increase subsequently. There appear to be few other issues with forage species. The impacts on the movement of energy through the ecosystem were evaluated with respect to two indicators: (1) removal of energy from the system through fishing operations, and (2) the redirection of energy flow into new pathways by fishing operations. The EIS concluded that biomass removals are believed to be small with respect to total system biomass. Diversity was evaluated with respect to (1) species diversity, (2) functional diversity (or the diversity of components playing different roles in the ecosystem), and (3) genetic diversity. The EIS concluded that measures of species richness and diversity do not suggest a concern and that functional diversity is not considered a concern. However, impacts on genetic diversity are unknown to a considerable extent in the absence of a baseline genetic survey. Due to the small amount of harvest in relation to the commercial pollock fishery, the Bering Sea pollock fishery as modified by the proposed action is not predicted to have additional impacts beyond those identified in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b).

Seabirds

Alaska groundfish fisheries' impacts on seabirds were analyzed in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b), which evaluates the impacts of the alternative harvest strategies on seabird takes, prey availability, and seabird ability to exploit benthic habitat. Impacts on seabirds are primarily from the hook-and-line groundfish fisheries. Seabirds may be directly affected by pelagic trawl vessels by striking the third wire on the trawl or by striking the vessel. Because the amount of harvest under the EFP is a small fraction of the overall harvest of the groundfish fisheries TACs, and harvesting is limited to between one and two vessels, it is likely that the additional interaction overall with seabirds would be minimal and any potential effects would not be discernable from status quo.

Non-Target Species

Fishing under the EFP would take primarily pollock and salmon. Approximately 25–75 mt of species other than pollock and salmon are expected to be taken each season during the EFP and include the following: Pacific cod, arrowtooth flounder, yellowfin sole, Northern rock sole, halibut, Pacific ocean perch, skates, jellyfish, herring, and prowfish (John Gauvin, personal communication, January 2011).

All of these fish except herring, jellyfish, and prowfish are target groundfish species. Herring is a prohibited species. Since the pollock fishery is primarily pelagic, the bycatch of non-target species is small relative to the magnitude of the fishery (NPFMC 2007a). Jellyfish represent the largest component of the pollock bycatch of non-target species and has been stable at around 5–6 thousand tons per year (except for 2000 when over 9,000 tons were caught). The catch of other target species in the pollock fishery represent less than 1% of the total pollock catch (NPFMC 2007a). For purposes of this EA, other species taken in the groundfish fisheries include species of invertebrates and fish not managed under the FMP and forage fish species. The amounts of other species (e.g., jellyfish and prowfish) expected to be taken under the EFP are so small that any effects on non-target species would not be discernable from the status quo.

The current, detailed status of each target species category, biomass estimates, and ABC specifications for the BSAI are presented annually both in summary and in detail in the annual BSAI SAFE report (NPFMC 2010a). The SAFE reports for the 2011 groundfish fisheries are available through the AFSC's website at http://www.afsc.noaa.gov/refm/stocks/assessments.htm.

4.1 Status of Managed Groundfish Species

Designated target groundfish species and species groups in the BSAI are walleye pollock, Pacific cod, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, other flatfish, flathead sole, sablefish, Pacific ocean perch, other rockfish, Atka mackerel, squid, and other species. This EA adopts by reference and summarizes the status of the stock information in the SAFE reports (NPFMC 2010a). For detailed life history, ecology, and fishery management information regarding groundfish stocks in the BSAI see section 3.3., in the PSEIS (NMFS 2004) and the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b).

For those stocks with enough information, none are considered overfished or approaching an overfished condition. Overall, the status of the stocks continues to appear relatively favorable. The BSAI Plan Team met in November 2010 to finalize the SAFE report and to forward acceptable biological catch (ABC) and overfishing level (OFL) recommendations to the Council for action at its December 2010 meeting. The ABC, OFL, and TAC amounts for each target species or species group for 2011 and 2012 were recommended by the Council and specified by NMFS on March 1, 2011 (76 FR 1139). Table 4.2 shows the 2011 and 2012 ABC, OFL, and TAC amounts for the BSAI groundfish.

The 2010 bottom trawl survey biomass estimate for pollock was 3.75 million t, up 64 percent from the 2009 estimate, but still below average for the 1987–2010 time series. The estimate from the acoustic-trawl survey was 2.32 million t, up 151 percent from the 2009 estimate, but still below average for the 1979-2010 time series. New data on zooplankton (copepods and euphausiids) and pollock caloric contents, as reported in the chapter, suggest that from 2006–2010 conditions for planktivores (particularly pollock) were greatly improved from the time period 2001–2005; this information is consistent with the recent (including 2009–2010) results from the pollock assessment indicating recent above-average recruitment. According to the status determination of the SAFE Report, the walleye pollock stock in the eastern Bering Sea is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition (NPFMC 2010a).

Multiple sources of information indicate that eastern Bering Sea pollock biomass is increasing. Relative abundance of euphausiids, a key item in the diet of pollock, increased for several years through 2009 (NPFMC 2010a). This indicates that pollock prey is generally abundant, while the slight downturn in euphausiid abundance observed in 2010 should be monitored to determine if top-down control resulting from increased pollock abundance may be occurring.

Table 4.2 2011 and 2012 Overfishing Level (OFL), Acceptable Biological Catch (ABC), and Total Allowable Catch (TAC), of Selected Groundfish in the BSAI.

[Amounts are in metric tons]

Species	Area	2011			2012		
		OFL	ABC	TAC	OFL	ABC	TAC
Pollock	EBS	2,450,000	1,270,000	1,252,000	3,170,000	1,600,000	1,253,658
Pacific cod	BSAI	272,000	235,000	227,950	329,000	281,000	229,608
Sablefish	BS	3,360	2,850	2,850	3,080	2,610	2,610
Yellowfin sole	BSAI	262,000	239,000	196,000	266,000	242,000	197,660
Greenland Turbot	BS	n/a	4,590	3,500	n/a	4,300	3,500
Arrowtooth flounder	BSAI	186,000	153,000	25,900	191,000	157,000	25,900
Northern Rock Sole	BSAI	248,000	224,000	85,000	243,000	219,000	85,000
Flathead sole	BSAI	83,300	69,300	41,548	82,100	68,300	41,548
Alaska plaice	BSAI	79,100	65,100	16,000	83,800,	69,100	16,000
Pacific Ocean Perch	BS	n/a	5,710	5,710	n/a	5,710	5,710
Northern Rockfish	BSAI	10,600	8,670	4,000	10,400	8,330	4,000
Blackspotted/ Rougheye Rockfish	EBS/EAI	n/a	234	234	n/a	240	240
Shortraker Rockfish	BSAI	524	393	393	524	393	393
Atka Mackerel	EAI/BS	n/a	40,300	40,300	n/a	36,800	36,800
Squid	BSAI	2,620	1,970	425	2,620	1,970	425
Skate	BSAI	37,800	31,500	16,500	37,200	31,000	16,500
Shark	BSAI	1,360	1,020	50	1,360	1,020	50
Octopus	BSAI	528	396	150	528	396	150
Sculpin	BSAI	58,300	43,700	5,200	58,300	43,700	5,200

4.2 Effects on Target Species

The significance criteria used to evaluate the effects of the action on target species are in Table 4-3. These criteria are adopted from the significance criteria used in the HAPC EA (NMFS 2006a).

Table 4.3 Criteria Used to Estimate the Significance of Effects on the FMP Managed Target Stocks.

Effect	Criteria			
	Significantly Negative (-)	Insignificant (I)	Significantly Positive (+)	Unknown (U)
Stock Biomass: Potential for increasing and reducing stock size	Changes in fishing mortality are expected to jeopardize the ability of the stock to sustain itself at or above its MSST.	Changes in fishing mortality are expected to maintain the stock's ability to sustain itself above MSST.	Changes in fishing mortality are expected to enhance the stock's ability to sustain itself at or above its MSST.	Magnitude and/or direction of effects are unknown.
Fishing mortality	Reasonably expected to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Reasonably expected not to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Action allows the stock to return to its unfished biomass.	Magnitude and/or direction of effects are unknown.
Spatial or temporal distribution	Reasonably expected to adversely affect the distribution of harvested stocks either spatially or temporally such that it jeopardizes the ability of the stock to sustain itself.	Unlikely to affect the distribution of harvested stocks either spatially or temporally such that it has an effect on the ability of the stock to sustain itself.	Reasonably expected to positively affect the harvested stocks through spatial or temporal increases in abundance such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown.
Change in prey availability	Evidence that the action may lead to changed prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action will not lead to a change in prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action may result in a change in prey availability such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown.

The potential direct and indirect effects of the groundfish fisheries on target species are detailed in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). Direct effects include fishing mortality for each target species and spatial and temporal concentration of catch. Indirect effects include the changes in prey composition and changes in habitat suitability. Indirect effects are not likely to occur with either alternative because the proposed action does not change overall fishing practices that indirectly affect prey composition and habitat suitability. Temporal concentration of harvest is not likely because the EFP would occur during fall and winter seasons from B season 2011 through B season 2012 using up to two vessels. Spatial concentration also is not as likely because the harvest during the experiment occurs in various locations that are known for high chum and Chinook salmon bycatch rates but are also common pollock trawling areas. These potential areas cover many square miles, (Figures 1.2 through 1.3), and harvest will be done by only one vessel at a time. The only potential direct effect on target species is fishing mortality on groundfish species during the testing of the salmon excluder devices.

4.2.1 Alternative 1. Status Quo Effects on Target Species

The effects of fishing on groundfish under Alternative 1 are described in detail in the Alaska Groundfish Harvest Specifications EIS in section 4.1.2 (NMFS 2007b). The status quo pollock fishery impacts on groundfish stocks is not expected to (1) jeopardize the capacity of the stocks to produce maximum sustainable yield on a continuing basis, (2) alter the genetic sub-population structure such that it jeopardizes the ability of the stocks to sustain themselves at or above the minimum stock size threshold

(MSST) or experience overfishing, (3) decrease reproductive success in a way that jeopardizes the ability of the stocks to sustain themselves at or above the MSST, (4) alter harvest levels or distribution of harvest such that prey availability would jeopardize the ability of the stocks to sustain themselves at or above the MSST or experience overfishing, or (5) disturb habitat at a level that would alter spawning or rearing success such that it would jeopardize the ability of the stock to sustain itself at or above the MSST or prevent overfishing. Therefore the impacts of Alternative 1 are likely insignificant.

If the EFP is not issued, an effective salmon excluder device is less likely to be developed, and the pollock fisheries may continue to experience rates of salmon bycatch that could potentially result in the restriction of pollock fishing. Less pollock may be taken under this alternative when the CSSA and the CVOA are closed or as vessels are prohibited from fishing in high salmon bycatch areas under the IPA or ICA for salmon bycatch. Also the pollock, and other groundfish that are estimated to be taken during the testing of the salmon excluder device under Alternative 2 will not be harvested under the status quo, but this amount is less than one percent of the annual TAC for pollock. The amount of fish harvested under the EFP in relation to the total harvest is very small and any effects are not likely discernable, as further explained below under Alternative 2.

4.2.2 Alternative 2. Issue the EFP Effects on Target Species

The EFP applicant estimated that total harvest of allocated groundfish species is 7,500 mt spread over three seasons. Approximately 97–99% (7,275–7,425 mt) is expected to be pollock and 1–3% (75–225 mt) is expected to be other groundfish species such as Pacific cod and flatfish (John Gauvin, personal communication, 2011). The 2011 and 2012 pollock TAC for the Eastern Bering Sea is 1,266,400 mt and 1,253,658 mt, respectively. On February 3, 2011, 14,400 mt was transferred from the Aleutian Islands TAC to the Bering Sea TAC (76 FR 6083). The 2011 ABC recommended by the Council is not the maximum permissible ABC set by the Scientific and Statistical Committee (SSC). The maximum permissible ABC for 2011 of 2.15 million tons increased 164% from the 2010 ABC and 94% from the 2011 projected ABC last year. The author's recommended 2011 ABC of 1.27 million tons is much lower than the maximum permissible. The adjustment was made because age composition is dominated by a single year class (2006) such that about half the catch will come from this cohort. Until a more robust age composition exists, it is prudent to be cautious. The recommended ABC keeps the harvest rate at the average of the last five years and hedges against poor environmental conditions that could occur in the future (NPFMC 2010b). The OFL for pollock in 2011 is set at 2,450,000 mt and the OFL for 2012 is 3,170,000 mt. The potential harvest under this proposed action of pollock is 0.002% of the TAC in 2011 and 0.004% of TAC in 2012. The pollock TAC in 2011 is set at 3,600 mt below the ABC of 1.27 m mt. The harvest of 2,500 mt of pollock under the EFP would result in a total harvest of 1,268,900 mt of pollock, which is 1,100 mt below the ABC. The 2012 TAC is 346,346 mt less than the ABC.

The amount of harvests under the EFP in relation to the total harvest of pollock in the Bering Sea is so small that it is not likely that the EFP harvest would have any discernable effects on the pollock stock or on other species that may depend on pollock (James Ianelli, AFSC, personal communication, February 28, 2011). Also, based on recent history and management of the fisheries, the total pollock catch was less than the pollock TAC: in 2010, the TAC was set at 813,000 mt and the total catch was 810,753 mt; in 2009, the TAC was set at 815,000 and the total catch was 810,743 mt; and in 2008, the TAC was 1,000,000 mt and the total catch was 990,578 mt. The combination of the EFP fishing and directed pollock fishing is well below the OFL level of 2,450,000 mt for 2011 and 3,170,000 mt for 2012. Because the harvest of pollock under the EFP is such a small amount and the combined harvest of pollock with the directed fisheries is well below the maximum permissible ABC and OFL, it is not likely that harvesting pollock under the EFP would have any discernable effect on the pollock stock compared to status quo fishing.

Compared to commercial fishing harvests, small amounts of Pacific cod, arrowtooth flounder, yellowfin sole, Northern rock sole, Pacific ocean perch, and skates may be taken during EFP activities. The BSAI TACs are below the ABCs for Pacific cod, yellowfin sole, Greenland turbot, arrowtooth flounder, Northern rock sole, flathead sole, and Alaska plaice (Table 4.2). The anticipated harvest of 25–75 mt of groundfish and other species besides pollock per season of testing would likely have no effect on these stocks because the gap between ABC and TAC for these species is over 100 mt. If the harvest of species other than pollock is evenly distributed among the seasons of testing under the EFP, 25 mt to 150 mt of other species would be taken each calendar year of testing. For any of these species 25 mt to 150 mt would be a small portion of the annual TAC. The TAC for sablefish, Pacific ocean perch, blackspotted rougheye, shortraker rockfish, and Atka mackerel is set at ABC in 2011. Out of these species, Pacific ocean perch and Atka mackerel are the only fish that have been caught under previous EFP studies for the salmon excluder device. In 2008, during the A season, an estimated 353 lbs of Pacific ocean perch was caught. Even smaller quantities of Atka mackerel have been taken during EFP activities (John Gauvin, personal communication, March, 2011). Based on recent history and management of the fisheries, the total Pacific ocean perch catch in the Bering Sea was less than the Pacific ocean perch TAC; in 2010 9 mt remained, in 2009 2,627 mt remained, in 2008 3,058 mt remained. The total Atka mackerel remaining catch from the BSEAI fisheries was 86 mt in 2010, 464 mt in 2009, 302 mt in 2008, and 649 mt in 2007. Because of the expected underharvest by the fishery, the expected total catch including that authorized under the EFP is not expected to exceed the ABC; therefore, there are no effects beyond those analyzed in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). Because the amount of all groundfish anticipated to be harvested during the experiment is very small in relation to the annual harvest, and in most cases well below the ABCs, it is not likely that harvesting these groundfish species under Alternative 2 will have any discernable effects on these groundfish stocks. Alternative 2 impacts on groundfish stocks are not expected to affect (1) stock's ability to sustain itself above MSST, (2) the capacity of the stock to yield sustainable biomass on a continuing basis, (3) the distribution of harvested stocks either spatially or temporally such that it has an effect on the ability of the stock to sustain itself; therefore; the impacts of Alternative 2 are likely insignificant.

4.2.3 Cumulative Effects

CEQ regulations require that the analysis of environmental consequences include a discussion of the action's impacts in the context of all other activities (human and natural) that are occurring in the affected environment and impacting the resources being affected by the proposed action and alternatives. This cumulative impact discussion should include incremental impacts of the action when added to past, present, and reasonably foreseeable future actions. A discussion of the cumulative effects of the groundfish fisheries is in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). The past and current cumulative effects are discussed in the PSEIS (NMFS 2004). Both of these discussions are incorporated by reference. For target species, several future actions were identified as reasonably foreseeable future actions. These actions are described in section 3.3 of the Harvest Specifications EIS (NMFS 2007b). The reasonably foreseeable future actions that may impact target species are—

- ecosystem-sensitive management;
- fisheries rationalization;
- traditional management tools;
- actions by other state, federal, and international agencies; and
- private actions.

The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the direct and indirect effects of the alternatives on target species. This analysis builds on the analysis of the impacts of each of these actions on target species in section 4.1.3 of Harvest

Specifications EIS (NMFS 2007b) and the Amendment 91 EIS (NMFS 2009b).

Ecosystem-sensitive management

Ecosystem-sensitive management is likely to benefit target species. The specific actions that will be taken to implement an ecosystem policy for fisheries management are unknown at this time; therefore, the significance of cumulative effects of ecosystem policy implementation on mortality, spatial and temporal distribution of the fisheries, changes in prey availability, and changes in habitat suitability are unclear. However, these actions may enhance the ability of stocks to sustain themselves at or above MSST, as ways are found to introduce ecosystem considerations into the management process.

As noted in section 3.3.1 of the Harvest Specifications EIS (NMFS 2007b), an increased understanding of interactions between ecosystem components is reasonably foreseeable. This coupled with another reasonably foreseeable action, increased integration of ecosystem considerations into fisheries decision-making, is likely to result in fishery management that reduces potential adverse impacts of the proposed action on target stocks. An example of the ways new information may change our perspectives was suggested at a workshop on multi-species and ecosystem-based management held at the February 2005 Council meeting. Multi-species and ecosystem projections of biomass impacts from eliminating fishing mortality for 20 years were compared to similar estimates made with single-species models. A report of the discussions noted that, "Results… were similar for top predators such as Pacific cod and Greenland turbot. However, results for walleye pollock, a key forage species, were different when predator/prey interactions were included. Both the multi-species and ecosystem models predicted much more modest increases in pollock biomass than did the single-species model, as predation increased to compensate for the increase in food supply." Predation here refers to cannibalism of juvenile pollock by larger adult pollock.

The reasonable foreseeable future actions that will most impact the pollock fisheries and pollock stocks are changes to the management of the fisheries due to increasing protection of ESA-listed and other non-target species. The Council is considering action on management measures to minimize chum salmon bycatch in the pollock fishery. Because any revised chum salmon bycatch measures will also regulate the pollock fishery, there will be a synergistic interaction with the management measures under Amendment 91. Analysis on the chum salmon action is currently underway.

Rationalization

Fisheries rationalization makes large changes to the way the fisheries are managed and primarily affects the allocation of harvest amounts. The future effects on target species are minimal because rationalization would not change the setting of TACs, which control the impacts of the fisheries on fishing mortality. However, to the extent rationalization improves fishing practices and the manageability of the fisheries, it could reduce the adverse effects of the proposed action on target species.

Traditional management tools

Future harvest specifications will primarily affect fishing mortality, as the other significance criteria for target species (temporal and spatial harvest, prey availability, and habitat suitability) are primarily controlled through regulations in 50 CFR part 679. The setting of harvest levels each year is controlled to ensure the stock can produce maximum sustainable yield (MSY) on a continuing basis and to prevent overfishing. Each year's setting of harvest specifications include the consideration of past harvests and future harvests based on available biomass estimates. In-season managers close species to directed fishing as fishermen approach TACs, prohibit retention of species when a TAC has been reached, and introduce fishing restrictions, or actual fishery closures, in fisheries in which harvests approach OFL. The 2 million mt optimum yield in the BSAI also contributes significantly to preventing overharvests. The controls on fishing mortality in setting harvest specifications ensure the stocks are able to produce MSY on a continuing basis.

Because of improved fish stock information, the number of TAC categories with low values of ABC/OFL are increasing which tends to increase the likelihood that closures of directed fisheries to prevent overfishing will occur. In recent years management of species groups has tended to separate the constituent species into individual ABCs and OFLs. While managing the species with separate ABCs and OFLs reduces the potential for overfishing the individual species, the effect of creating more species categories can increase the potential for incurring management measures to prevent overfishing, such as fishery closures. Managers closely watch species with fairly close amounts between the OFL and ABCs during the fishing year, and the fleet will adjust behavior to prevent incurring management actions.

A large proportion of the groundfish fleet now carries vessel monitoring systems (VMS) due to VMS requirements introduced in connection with the Steller sea lion protection measures, EFH/HAPC protection measures, and the Crab Rationalization Program. The entire pollock fleet now carries VMS due to VMS requirements introduced in connection with the AFA. In-season managers currently use VMS intensively to manage fisheries so that harvests are as close to TACs as possible. VMS has also become a valuable diagnostic tool for addressing situations with unexpected harvests. It was used as a diagnostic tool in July 2006 to investigate the sources of a sudden and unexpected bycatch of squid in the pollock fishery. As agency experience with VMS grows, it should allow in-season managers to more precisely match harvests to TACs, reducing potential overages, and maximizing the value of TACs to industry. Extension of VMS will be associated with larger costs for vessels that will adopt it.

Other government actions

The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) expects that reasonably foreseeable future activities include development of oil and gas deposits over the next 15–20 years in federal waters off Alaska. Potential environmental risks from the development of offshore drilling include the impacts of increased vessel offshore oil spills, drilling discharges, offshore construction activities, and seismic surveys. Adverse environmental impacts resulting from exploration and development in the future could impact salmon and herring stocks. The extent to which these impacts may occur is unknown.

Private actions

Fishing activities by private fishing operations, carried out under the authority of the annual harvest specifications, are an important class of private action. The impact of these actions has been considered under traditional management tools.

A private action not treated above is the Marine Stewardship Council (MSC) environmental certification of fisheries. The MSC developed standards for sustainable fishing and seafood traceability. They ensure that MSC-labeled seafood comes from, and can be traced back to, a sustainable fishery. The MSC certified BSAI and GOA pollock, Pacific cod, flatfish, halibut, and sablefish. Certification will have to be renewed in the future. If the MSC environmental certification has important marketing benefits, this will increase industry incentives to address the environmental issues connected with the fishery. In this context, it may tend to lengthen industry's time horizon, and increase its interest in target stock sustainability. More information on the MSC certification program may be found at http://eng.msc.org/.

Increasing economic activity in and off Alaska may affect future fisheries. The high levels of traffic between the West coast and East Asia raise concerns about pollution incidents or the introduction of invasive species from ballast water. Pollution issues were highlighted in December 2004 when the M/V *Selendang Ayu* wrecked on Unalaska Island and again in July 2006 with the M/V *Cougar Ace* accident. Alaskan economic development can affect the coastal zone and species that depend on the zone. However, Alaska remains relatively lightly developed compared to other states in the nation. Marine transportation associated with that development may be more of a concern than in other states, due to the relatively greater importance of marine transportation to Alaska's economy.

The development of aquaculture may affect prices for, and the harvest of, some species. For example, the development of sablefish aquaculture may reduce wild sablefish prices and reduce interest in sablefish harvests in high-operating-cost areas in the BSAI where sablefish TACs are currently not fully harvested. More direct impacts, through development of finfish aquaculture in waters off Alaska, do not appear to be likely at this time.

4.2.4 Summary of Effects

The direct, indirect, and cumulative effects of the alternatives are not expected to (1) jeopardize the capacity of the stocks to produce maximum sustainable yield on a continuing basis, (2) alter the genetic sub-population structure such that it jeopardizes the ability of each stock to sustain itself at or above the minimum stock size threshold or experience overfishing, (3) decrease reproductive success in a way that jeopardizes the ability of each stock to sustain itself at or above the minimum stock size threshold, (4) alter harvest levels or distribution of harvest such that prey availability would jeopardize the ability of each stock to sustain itself at or above the minimum stock size threshold or experience overfishing, and (5) disturb habitat at a level that would alter spawning or rearing success such that it would jeopardize the ability of each stock to sustain itself at or above the minimum stock size threshold or experience overfishing. **For these reasons, impacts to target species are predicted to be insignificant for target species evaluated under Alternatives 1 and 2.**

4.3 Status of Prohibited Species Stocks

Prohibited species taken incidentally in groundfish fisheries include: Pacific salmon (Chinook, coho, sockeye, chum, and pink salmon), steelhead trout, Pacific halibut, Pacific herring, and Alaska king, Tanner, and snow crabs. In order to control bycatch of prohibited species in the BSAI groundfish fisheries, the Council annually specifies PSC limits. The status of the prohibited species in the BSAI is detailed in section 7.2 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b) and in the SAFE report (NPFMC 2010a). During haul sorting, these species or species groups are to be returned to the sea with a minimum of injury except when their retention is required by other applicable law.

Under the proposed action, salmon and herring are the only PSC species that are expected to be taken because the EFP fishing uses pelagic trawl gear in a manner that meets the trawl performance standard at 50 CFR 679.7, preventing the bycatch of other PSC species. Status information regarding salmon and herring is provided in this section. Most of the herring taken in the groundfish fisheries is taken by the pelagic trawl fishery (NMFS 2007b). Salmon is the most common PSC species taken in the midwater pelagic trawl pollock fishery (NMFS 2007b).

4.3.1 Salmon

The EIS/RIR for Bering Sea Chinook Salmon Bycatch Management has the latest status information for salmon that may be taken in the Bering Sea groundfish fisheries (NMFS 2009a). The EIS details the status of Chinook salmon stocks in Chapter 5 and the status of non-Chinook salmon stocks in chapter 6. The preliminary draft EA/RIR for Bering Sea Non-Chinook Salmon Bycatch Management (NPFMC 2011a) includes information on non-Chinook salmon stocks and is currently being updated for review.

The EA/RIR/FRFA for Modifying Existing Chinook and Chum Salmon Savings Areas Final Rule Implementing Amendment 84 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (NMFS 2007c) also has status information for salmon that may be taken in the BSAI groundfish fisheries. Chapter 3 of that document contains a detailed description of the commercial harvest and hatchery production of Chinook and non-Chinook salmon throughout the Pacific rim. Status of western Alaska salmon stocks are detailed in sections 3.4 and 3.5. Salmon from the Japanese, Russian, Alaskan, and Korean run hatchery programs likely mingle with wild stocks in the Bering Sea and are part of the BSAI groundfish fisheries salmon bycatch.

Salmon species primarily taken in the BSAI groundfish fisheries are Chinook and chum salmon. Table 4.4 shows the estimated number of salmon measured by the observer program in 2010 in the BSAI groundfish fisheries (Balsiger 2011). Because the number of salmon measured for lengths by species is in proportion to the number of each species observed caught, this information indicates the proportion of salmon species observed taken in the BSAI groundfish fisheries. Because the taking of coho, sockeye, and pink salmon is a relatively rare event in the BSAI groundfish fisheries, the proposed action is not likely to result in a substantial portion of these species being taken. This analysis will focus on Chinook and chum salmon.

Table 4.4 Estimated Number of Salmon Measured and Sampled by Observers in 2010.

Region	Species Name	# Measured	Total Salmon
BSAI	CHUM SALMON	6,611	8,169
BSAI	CHINOOK SALMON	4,526	4,792
BSAI	COHO SALMON	4	4
BSAI	SOCKEYE SALMON	5	7
BSAI	PINK SALMON	39	43

Source: Balsiger 2011

4.3.1.1 Chinook Salmon Status

Since 1979, four separate stock composition estimates of Chinook salmon bycatch samples from the eastern Bering Sea groundfish fisheries have been made, all showing that the majority of Chinook salmon samples were from western Alaska stocks (Myers and Rogers 1988; Myers et al. 2004; NMFS 2009a; Guyon et al. 2010a; Guyon et al. 2010b). The EIS for Amendment 91 provides information on the adult-equivalency (AEQ) analysis of the Chinook salmon bycatch in the Bering Sea. The AEQ methodology applies the extensive observer datasets on the length frequencies of Chinook salmon caught in the pollock fishery and convert these to ages, appropriately accounting for the time of year that catch occurred. The age data is coupled with information on the proportion of salmon that return to different river systems at various ages, and the bycatch-at-age data is used to pro-rate how any given year of bycatch affects future potential spawning runs of salmon. Overall, the estimate of AEQ Chinook mortality from 1994–2007 ranged from about 15,000 fish to over 78,000 with the largest mortality comprised of stocks in the coastal west-Alaska (NMFS 2009a).

North Pacific Chinook salmon are the target of subsistence, commercial, and recreational fisheries. Approximately 90 percent of the subsistence harvest is taken in the Yukon and Kuskokwim river systems. For more information on state management of salmon subsistence fisheries, refer to the ADF&G website at www.adfg.alaska.gov/index.cfm?adfg=fishingSubsistence.main and the Alaska Subsistence Salmon Fisheries 2007 Annual Report at www.subsistence.adfg.state.ak.us/techpap/TP346.pdf. The majority of the Alaska commercial catch is made in Southeast, Bristol Bay, and the Arctic-Yukon-Kuskokwim areas. Fish taken commercially average about 18 pounds. The majority of the catch is made with troll gear or gillnets.

The Chinook salmon is the most highly prized sport fish on the west coast of North America. In Alaska it is extensively fished by anglers in the Southeast and Cook Inlet areas. The Alaska sport fishing harvest of Chinook salmon is over 76,000 annually, with Cook Inlet and adjacent watersheds contributing over half of the catch. Unlike non-Chinook species, Chinook salmon rear in inshore marine waters and are, therefore, available to commercial and sport fishermen all year.

Directed commercial Chinook salmon fisheries in Alaska occur in the Yukon River, Nushagak District, Copper River, and the Southeast Alaska troll fishery. In all other areas of Alaska, Chinook are taken incidentally and mainly in the early portions of the sockeye salmon fisheries. Catches in the Southeast Alaska troll fishery have been declining in recent years, due to United States/Canada treaty restrictions and declining abundance of Chinook salmon in British Columbia and the Pacific Northwest. Chinook salmon catches were moderate to high in most regions between 1984–2004 (Eggers 2004). However, western Alaska Chinook salmon stocks declined sharply in 2007 and have remained depressed since. In recent years of low Chinook salmon returns, the in-river harvest of western Alaska Chinook salmon has been severely restricted and, in some cases, river systems have not met escapement goals.

Chinook salmon production in the Yukon River has been declining in recent years. The Yukon River Chinook stocks have been classified as stocks of concern (Eggers 2004), and this classification was continued as a stock of yield concern in February 2007, based on the inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above the stocks' escapement needs since 1998 (Bue and Hayes 2007). In December 2009, Alaska Department of Fish and Game (ADF&G) recommended continuing this classification as a stock of yield concern.

The 2010 preliminary data from the Yukon River Pilot Station Sonar estimated that escapement of 113,410 Chinook salmon was 24% below the recent five–year average (2005–2009) of 148,329 fish. (ADFG 2010b). This is the lowest estimated number for the Pilot Station Sonar since 2001. While escapement goals were generally met throughout the Alaska portion of the Yukon drainage over the past 5 years (2005–2009), combined commercial and subsistence harvests show a substantial decrease in Chinook salmon yield from the 10-year period (1989–1998) to the recent 5-year (2004–2008) average (Howard et al. 2009). The 2010 Yukon harvest estimate for Chinook salmon of 9,897 fish was 64% below the 10-year average (2000–2009) of 27,298 (ADFG 2010b). Through June 2010, the Chinook salmon run was assessed to be large enough to provide for escapement and subsistence uses; however, throughout the drainage there were episodes of high water events with heavy debris loads that preempted subsistence fishing. Additional subsistence restrictions were not imposed because of operating costs and high risks during openings. Subdistrict 5-D Chinook salmon run fell short of the United States/Canada Yukon Treaty obligation, and fishermen were asked to consider voluntary conservation measures. No commercial periods targeting Chinook salmon were allowed in 2010 in the Yukon River mainstream of the Tanana River due to uncertainty of run strength, the need to fulfill the Canadian border passage obligation, meet Alaska escapement needs, and provide for subsistence uses.

Kuskokwim River Chinook salmon abundance is generally on a decline following a period of exceptionally high abundance years in 2004, 2005, and 2006 that ranged from 360,000 to 425,000 fish (NMFS 2009a). Kuskokwim River Chinook salmon were discontinued as a stock of yield concern by the Board of Fisheries (BOF) in February 2007 (ADFG 2007). The BOF discontinued the stock of yield concern designations based on Chinook salmon runs being at or above the historical average each year since 2002. In 2010, Chinook salmon abundance in the Kuskokwim River was poor and escapements were below average at all monitored locations. Kogrukluk River Chinook estimated escapement was within the escapement goal range, while Kwethluk, Tuluksak, and George rivers did not achieve the lower end of their respective Chinook escapement goal ranges (ADFG 2010c). Total commercial harvest of Kuskokwim River Chinook salmon was above most recent 10-year (2000–2009) and 5-year (2005–2009) averages, with a preliminary harvest of 3,370 fish (ADFG 2010 d). Chinook salmon harvest and catch rates were below the recent 10-year average in Kuskokwim Bay.

The primary managed Bristol Bay Chinook salmon stocks are in the Nushagak River, although management occurs on rivers within each of the districts comprising Bristol Bay. The harvest of Bristol Bay Chinook salmon was 31,400, which is 48% of the average harvest for the last 20 years (ADFG 2010d). Escapement into the Nushagak River was 36,625; this is the first time since enumeration began, in 1980, that the minimum escapement goal of 40,000 was not met. Sport fishing was closed completely and subsistence fishing was reduced to 3 days per week in the Nushagak river. The preliminary commercial harvest estimate for Bristol Bay Chinook salmon in 2011 is 41,000,000 fish (ADFG 2010f). Projections are based on the most recent 5-year average and the observed mean percent error (MPE) of 28% during that same time period. ADFG is not forecasting a total run for 2011 due to uncertainties in methods used for estimating Chinook salmon abundance. In 2011, new research will begin to attempt to address these uncertainties.

In 2010, in Norton Sound, Chinook salmon had the poorest run on record and precluded commercial fishing directed on Chinook salmon for the fifth consecutive season; restrictions and early closures to the Chinook salmon subsistence and sport fisheries in Shaktoolik (Subdistrict 5) and Unalakleet (Subdistrict 6) were also implemented to meet escapement needs (ADFG 2010g). Chinook salmon in Subdistricts 5and 6 were designated a stock of yield concern in 2004 and the Alaska BOF continued this designation in February 2007 and January 2010. In Norton Sound only the eastern area has sizeable runs of Chinook salmon. The primary assessment tools for gauging Chinook salmon run strength are the Unalakleet River test net and floating weir, enumeration towers on Kwiniuk, Niukluk, and North rivers, aerial surveys, and inseason subsistence catch reports (ADFG 2010g). The North River tower count of 1,302 was the twelfth best in 18 years of counting, but the Sustainable Escapement Goal (SEG) was not reached for the second consecutive year. The Kwiniuk River tower count of 135 Chinook salmon was the lowest count since 1985 and only 45% of the lower bounds of the SEG range. This is the fourth time in the previous 5 years that the SEG has not been reached. At the Niukluk River tower, 42 Chinook salmon was the sixth lowest count since 1995, and the Pilgrim River Chinook salmon count of 44 was the worst since the project began in 2003 (ADFG 2010g).

4.3.1.2 Chum Salmon Status

Stock composition for Chum salmon in the Bering Sea is currently available by aggregate groupings (micro-satellite baseline): East Asia, North Asia, Western Alaska (includes lower Yukon), Upper/Middle Yukon, Southwest Alaska, and Pacific Northwest (includes stocks from Prince William Sound to Washington State). Aggregations were developed based on a combination of genetic characteristics and relative contributions to the mixture. To determine the stock composition mixtures of chum salmon in the Bering Sea, a number of genetics analyses have been completed (i.e., Guyon et al. 2010c, Marvin et al. 2010, Gray et al. 2010, and McCraney et al. 2010). These studies have shown that genetic samples collected from chum salmon bycatch in the Bering Sea were predominantly from Asian stocks. Substantial contributions were also from western Alaska and the Pacific Northwest. There appeared to be a higher contribution from East Asia and lower contribution from Western Alaska in more recent years (Guyon et al. 2010). Overall, the estimate of AEQ chum salmon mortality from 1994–2010 ranged from about 16,000 fish to just over 540,000 (NPFMC 2011). Additional funding and research focus is being directed towards both collection of samples from the eastern Bering Sea trawl fishery for Chum salmon species as well as the related genetic analyses to estimate stock composition of the bycatch. Updated information will be provided in the EA for Bering Sea Non-Chinook Salmon Bycatch Management.

Chum salmon fisheries in Alaska occur in 11 management regions which are detailed on the ADFG website at http://www.cf.adfg.state.ak.us/region3/finfish/salmon/salmhom3.php. These include chum salmon fisheries in the Arctic-Yukon-Kuskokwim (AYK) management area and target hatchery runs in Prince William Sound and Southeast Alaska. Chum salmon runs to AYK rivers have fluctuated in recent years. Chum salmon in the Yukon River and in some areas of Norton Sound had been classified as stocks of concern (Eggers 2004). In response to the guidelines established in the Sustainable Salmon Policy, the BOF discontinued the Yukon River summer and fall chum salmon as stocks of concern during the February 2007 work session (Bue and Hayes 2007).

The BASIS (Bering-Aleutian Salmon International Survey) study has observed significant increases in juvenile chum in the Bering Sea through 2005. Further, bycatch of adult chum in Bering Sea trawl fisheries has increased. Although not all of these fish are bound for western Alaska, higher bycatch may be an indicator of favorable ocean conditions, and chum ocean survival may have increased significantly.

Yukon summer chum salmon runs have exhibited steady improvements since 2001 with the drainage wide optimum escapement goal (OEG) of 600,000 fish exceeded annually (Bergstrom et al. 2009). In 2006, a large number of 5-year-old summer chum salmon returns were observed throughout the AYK Region. Since 2007, run abundance has shifted to near average levels and has allowed for subsistence harvests and a near average available yield for commercial harvests (Bergstrom et al. 2009). Summer chum runs have provided a harvestable surplus the last 7 years (2003–2009), and since 2007, there has been a renewed market interest for summer chum salmon in the lower river Districts 1 and 2. In 2010, a surplus of summer chum salmon was anticipated above escapement and subsistence needs; however, the extent of a directed chum commercial fishery is dependent on the strength of the Chinook salmon run. The ADFG took an unprecedented action to cancel the commercial period on a short notice to avoid harvesting a significant number of Chinook salmon because test fishery information showed an abrupt drop in the summer chum entering the river. The summer chum salmon harvest of 232,888 was 193% above the 2000-2009 average harvest of 79,438 fish (ADFG 2010b). Chum salmon escapements ranged from above average to below average at all monitored locations (ADFG 2010b).

In 2010, the preliminary total run size for Yukon fall chum salmon, primarily calculated from the main river sonar at Pilot Station, was approximately 396,000 fish and the postseason estimates was 480,000 fish. For the Yukon fall chum salmon stocks, considerable uncertainty has been associated with these run projections, particularly recently because of unexpected run failures (1997 to 2002) which were followed by a strong improvement in productivity from 2003 through 2006 (Bue and Hayes 2007). Weak salmon runs prior to 2003 have generally been attributed to reduced productivity in the marine environment and not a result of low levels of parental escapement. The commercial harvest estimate for fishery for fall chum salmon was among the lowest on record at 2,550 fish and is .02% of the recent 5-year average (2005–2009) of 117,983 fish and .04% of the 10-year average of 60,502 fish (ADFG 2010h).The 2010 subsistence harvest of fall chum salmon is expected to be below the most recent 5-year average because of low abundance and high-water level conditions.

Throughout the Kuskokwim area in 2010, chum abundance was considered very good, and amounts necessary for subsistence use is expected to have been achieved throughout the area. Kuskokwim River chum salmon are an important subsistence species, as well as the primary commercially targeted salmon species on the Kuskokwim River in June and July (NMFS 2007c). Kuskokwim River chum salmon were designated a stock of concern under yield concern in September 2000, and this designation was discontinued in February 2007. Since 2000, chum salmon runs on the Kuskokwim have been improving. Total commercial harvests of chum salmon in 2010 was above most recent 10-year (2000-2009) and 5-year (2005-2009) averages, with a preliminary commercial harvest of103,000 fish (ADFG 2010c).

In Bristol Bay, the 2010 chum salmon harvest was 1.09 million fish was 15% above the 20-year average (ADFG 2010d). Naknek-Kvichak and Nushagak Districts harvested above their 20-year averages; however, Egegik, Ugashik and Togiak Districts harvested below their 20-year averages. Over 509,000 chum salmon were harvested in the Nushagak District.

The 2010 Norton Sound commercial chum salmon harvest was the largest since 1986. Commercial chum salmon harvests were the highest observed since the mid-1980s in most Norton Sound Subdistricts. The Norton Sound preliminary ex-vessel value of $1,220,487 was record setting and was 123% above the recent 5-year average (2005–2009) (ADFG 2010g). Improved market conditions and the strong chum salmon run led to increased participation and the high value of the Norton Sound salmon fishery in 2010. A record number of 494 subsistence salmon permits were issued for the Nome Subdistrict in 2010. The Nome Subdistict escapement of chum salmon in 2010 is a new record and is 180% above the upper bounds of the Biological Escapement Goal (BEG) range of 23,000–35,000 fish. Subsistence harvests for chum were above average in all areas except for Golovnin Bay (despite the large surpluses available for subsistence) (ADFG 2010g). In 2010, Chum salmon escapement was well above average to record setting across Norton Sound and the Port Clarence area (ADFG 2010g).

Chum salmon also is harvested in the Kotzebue area. In 2010, the commercial fishery was extended by emergency order three days past the regulation closure date because of a very strong chum salmon run and the commercial harvest of 270,343 chum salmon was the highest since 1995 (ADFG 2010i). The 2010 overall chum salmon run was estimated to be above average based on the commercial harvest rates, subsistence fishery reports, and the Kobuk river test index as the fifth best in the 18-year project history. Escapement is monitored by a test fishery project on the Kobuk River. Each year, the majority of chum salmon are usually 4–5 year old fish; in 2010 there was a record number (88%) of 4-year old and a record low (6%) of 5-year old fish in the commercial catch. No stocks in the Kotzebue area are presently identified as being of management or yield concern and the commercial fishery is allowed to remain open continuously with harvest activity regulated by buyer interest. In 2010, the ex-vessel value for the Kotzebue fishery was $860,125 and was the highest value since 1988. No subsistence harvest information is available from 2010 other than comments that chum salmon fishing on the Kobuk River and Noatak River was very good (ADFG 2010i).

4.3.2 Pacific Herring

Information regarding the status of herring is available in section 7.1 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). Pacific herring are managed by the State of Alaska on a sustained yield principle. Pacific herring are surveyed each year and the State's guideline harvest levels (GHLs) are based on an exploitation rate of 20 percent of the projected spawning biomass. These GHLs may be adjusted in-season based on additional survey information to ensure long-term sustainable yields. The ADFG has established minimum spawning biomass thresholds for herring stocks that must be met before a commercial fishery may occur.

The most recent herring stock assessment for the eastern Bering Sea stock was conducted by ADFG in December 2005. For 2008 and 2009, the herring biomass in the eastern Bering Sea was estimated to be 172,644 mt. Additional information on the life history of herring and management measures in the groundfish fisheries to conserve herring stocks can be found in section 3.5 of the PSEIS (NMFS 2004).

The PSC limit for herring bycatch is set at 1 percent of the estimated herring biomass. The Pacific herring PSC limit in 2010 was 1,973 mt for all BSAI trawl fisheries. The BSAI pollock trawl fishery in 2010 took 193 mt of herring. For 2010, the BSAI trawl fishery took 18% of the herring PSC limit of which 10% was taken in the pollock fishery (NMFS Inseason Management data at http://www.alaskafisheries.noaa.gov/2010/car120_bsai_with_cdq.pdf). Herring taken in the BSAI groundfish fisheries are from the Bering Sea area and are not likely to include herring from the Gulf of Alaska (http://www.cf.adfg.state.ak.us/geninfo/finfish/herring/herrhome.php).

Herring commercial fisheries are managed by the ADFG in eight areas of the AYK area. Projections from postseason escapement estimates suggest that the 2011 spawning biomass for northeastern Bering Sea herring stocks (Security Cove to Norton Sound Districts) will be 112,695 tons, with an anticipated allowable harvest of 21,617 tons (ADFG 2010j). If the return is as expected, a harvest of this magnitude in the AYK herring fishery will be one of the largest on record. The age classes expected to occur in the herring biomass are ages 6–7(47%), ages 8–9 (32%), ages 10+ (15%), and ages 4–5 (6%). ADFG anticipates a commercial herring fishery may occur in the AYK Region in 2011 and in accordance with the AYK Region harvest strategy, any operational commercial fishery will not target newly recruited age classes (age 2 through age 5 herring). Recruitment rates typically occur every eight to ten years, and the expected low proportion of age 4–5 herring in 2011 may signal a complete recruitment period.

4.4 Effects on Salmon and Herring

The significance criteria used to evaluate the effects of the action on nontarget and prohibited species are in Table 4.5. These criteria are from the 2006–2007 groundfish harvest specifications environmental assessment/final regulatory flexibility analysis (EA/FRFA) (NMFS 2006b).

Table 4.5 Criteria Used to Estimate the Significance of Impacts on Nontarget and Prohibited Species.

No impact	No incidental take of the nontarget and prohibited species in question.
Adverse impact	There are incidental takes of the nontarget and prohibited species in question.
Beneficial impact	Natural at-sea mortality of the nontarget and prohibited species in question would be reduced – perhaps by the harvest of a predator or by the harvest of a species that competes for prey.
Significantly adverse impact	Fisheries are subject to operational constraints under PSC management measures. Groundfish fisheries without the PSC management measures would be a significantly adverse effect on prohibited species. Operation of the groundfish fisheries in a manner that substantially increases the take of nontarget species would be a significantly adverse effect on nontarget species.
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the nontarget and prohibited species, and significantly beneficial impacts are not defined for these species.
Unknown impact	Not applicable

Section 7 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b) analyzes the impacts of pollock fishing on prohibited species. Potential direct and indirect effects include mortality of the PSC species, spatial and temporal effects on genetic structure and reproductive success, impacts on habitat, and impacts on prey composition for PSC species.

Salmon and herring are the primary PSC species of concern in the Bering Sea pollock fishery (NMFS 2007b), and are potentially impacted by the proposed action. Other PSC species are not likely to be taken during the EFP activities because of the use of pelagic trawl gear. This action is not likely to affect PSC prey or habitat because any changes to the habitat or prey composition during the experiment is not expected based on the use of pelagic trawl gear to harvest a small amount of fish in relation to the commercial fishery, over a limited time period by one vessel in areas previously fished. Pelagic trawl gear is to be used in compliance with the trawl standard (50 CFR 679.7), which keeps the gear off the bottom; and the bycatch of this gear type is not likely to include prey that PSC species use. Because salmon and herring reproduce in habitats where groundfish fishing is not conducted, the EFP fishing is unlikely to have any effect on reproductive success (NMFS 2007b).

4.4.1 Alternative 1 Status Quo Effects on Salmon

The effects of the groundfish fisheries on salmon are described in detail in the EIS/RIR for Amendment 91 (NMFS 2009a), Alaska Groundfish Harvest Specifications EIS (NMFS 2007b, section 7.2) and in the EA/RIR/FRFA for Amendment 84 (NMFS 2007c). Much of the discussion in these documents is incorporated here by reference.

The absolute numbers of salmon in the observed trawl bycatch that are presumed to originate from western Alaska stocks of Chinook salmon are small, relative to the size of the Chinook salmon biomass present in the eastern Bering Sea (NMFS 2007c). The current Bering Sea pollock fishery is considered to have limited impact on these stocks although the actual impacts are difficult to determine (NMFS 2007c).

NMFS tracks the recovery of Coded-Wire Tagged (CWT) fish in the BSAI groundfish fisheries. Chinook salmon from two ESA-listed ESUs have been recovered in the BSAI groundfish fisheries (NMFS 2008b), although taking of these ESA-listed fish has been a rare event in the BSAI (NMFS 2007b). NMFS consulted on the potential effects of the BSAI groundfish fisheries on ESA-listed Pacific salmon from the Lower Columbia River and Upper Willamette River stocks based on the high amount of Chinook salmon bycatch in 2007 and for the implementation of Amendment 91 (NMFS 2007a, 2009a). No CWTs from ESA-listed ESUs were recovered from the salmon bycatch of the BSAI groundfish fisheries in either 2007 or 2008. However, one CWT from the Upper Willamette River Chinook salmon ESU was recovered from the bycatch of the BSAI groundfish fishery in both 2009 and 2010 (Balsiger 2011).

Some data are available regarding the spatial and temporal catch of Chinook salmon stocks in the BSAI groundfish fisheries. The NMFS Auke Bay Laboratory (Auke Bay Lab) is currently conducting genetic analysis of Chinook and chum salmon taken in the BSAI groundfish. Myers et al. (2005) determined that bycatch of Chinook salmon from subregions of western Alaska stocks (Yukon, Kuskokwim, and Bristol Bay) vary with brood year, time, and area. Yukon River Chinook are the dominant stock for age 1.2 fish in the BSAI in winter, especially west of 170 degrees longitude west and for age 1.4 fish in the eastern BSAI. The Yukon River Chinook tend to range further west in the Bering Sea than other stocks. Bristol Bay and Cook Inlet Chinook stocks are dominate for age 1.2 salmon in the eastern BSAI in the fall. Age 1.1 Chinook salmon in the eastern BSAI in the fall are mostly Gulf of Alaska stocks. Myers et al. (2005) concluded that immature Chinook salmon are more abundant along the outer shelf break and maturing Chinook salmon are more abundant along the inner shelf break (east of 170 degrees west longitude). The adult equivalents of the Yukon River Chinook salmon bycatch in the BSAI groundfish fisheries from 1997 to 1999 was from 2,721 to 7,510 fish, having a greater impact on the Canadian escapement and catch than on the Alaska escapement and catch (Myers et al. 2005). Because no indication exists that the quantity and pattern of bycatch of Chinook salmon has affected the genetic structure of the population, the Alaska Groundfish Harvest Specifications EIS concluded that the BSAI groundfish fisheries have a small impact on salmon genetic structure (NMFS 2007b).

4.4.2 Alternative 2 Issue the EFP Effects on Salmon

The experimental design calls for 2,500 non-Chinook salmon and 125 Chinook salmon for two fall seasons and 125 non-Chinook salmon and 600 Chinook salmon for one winter season of the EFP project. In total from fall 2011 till fall 2012, up to 5,125 non-Chinook salmon and 850 Chinook salmon may be harvested. The most Chinook salmon harvested in a calendar year would be 725 fish in 2012. This amount would be equivalent to approximately 0.06% of the 2010 Chinook salmon bycatch amount (Table 1.1). The five year average (2006–2010) of Chinook salmon bycatch in the BSAI trawl fishery is 53,608, and the 725 fish in 2012 would be approximately 0.01% of this five year average. The most chum harvest in a year under the EFP would be 2,625 fish, which is approximately 0.18% of the amount of non-Chinook salmon bycatch in the 2010 BSAI groundfish fisheries or 0.03% of the five-year average (2006–2010). Even though the EFP would allow the incidental catch of salmon outside of the current PSC protection measures of Amendment 91, the increased harvest of salmon is not substantial in comparison to the commercial groundfish fishery. It is also unlikely that a CWT from an ESA-listed ESU would be recovered during the EFP fishery because of the small number of salmon harvested in relation to the pollock fishery salmon bycatch.

The amount of chum and Chinook salmon taken during the EFP compared to the amount taken in the groundfish fisheries is very small and not likely to have a discernable effect on mortality on individual salmon stocks over the status quo. Because the levels of salmon bycatch under the EFP are such small amounts, and the harvest is dispersed over area and over different regional stocks, it is not likely there would be any discernable effects on the genetic structure of any Chinook or chum salmon stocks. The EFP would only require the take of Chinook salmon over the 60,000 cap in the event that full allocation was reached. However under the new requirements of Amendment 91, NMFS expects Chinook salmon bycatch numbers far below 60,000 and below 47,591.

If the salmon excluder device could be successfully implemented, the reduction in any potential effects on salmon stocks would create some expected benefits for commercial, recreational, and subsistence fishermen; salmon management; and conservation goals. In years where salmon returns are relatively low, the reduction in bycatch effects on salmon runs would be avoided to the timely benefit of those runs.

4.4.3 Alternative 1 and Alternative 2 Effects on Herring

As shown in section 4.3.2, the amount of herring harvested overall in the pollock fishery is well below the 1 percent of biomass limit. Herring may be present in a very small portion of the other species taken in the EFP fishing. Any potential additional harvest of herring under the proposed action is likely to be well below the one percent biomass limit for herring because of the small amount of herring that is normally taken in the pollock fishery and therefore any effects of Alternative 2 are likely not discernable from any effects of Alternative 1.

The EFP has no exemptions from the herring PSC limit or the Herring Savings Area closures (§ 679.21(e)(7)(vi)). No impact on herring resources is expected under the EFP beyond those already analyzed (NMFS 2007b). The Alaska Groundfish Harvest Specifications EIS found that the status quo fishery has very low mortality for herring in relation to the biomass and that it is unlikely there would be any impact on genetic structure of herring stocks (section 7.2 of NMFS 2007b).

4.4.4 Cumulative Effects

A discussion of the cumulative effects of the groundfish fisheries is in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). The past and current cumulative effects are discussed in the PSEIS

(NMFS 2004). Both of these discussions are incorporated by reference. For nontarget or prohibited species, several future actions were identified as reasonably foreseeable future actions. These actions are described in section 3.2 of the Harvest Specifications EIS (NMFS 2007b). The reasonably foreseeable future actions that may impact prohibited species are—

- ecosystem-sensitive management;
- fisheries rationalization;
- traditional management tools;
- actions by other state, federal, and international agencies; and
- private actions.

The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the direct and indirect effects of the alternatives on prohibited species. This analysis builds on the analysis of the impacts of each of these actions on prohibited species in section 7.3 of the Harvest Specifications EIS (NMFS 2007b).

Ecosystems approaches to management

As noted in section 3.3.1 of NMFS 2007b, an increased understanding of interactions between ecosystem components is reasonably foreseeable. This coupled with another reasonably foreseeable action, increased integration of ecosystem considerations into fisheries decision-making, is likely to result in fishery management that reduces potential adverse impacts of the proposed action on target and nontarget stocks.

Ecosystem research, and increasing attention to ecosystem issues, should lead to increased attention to the impact of fishing activity on non-target resource components, including prohibited species. This is likely to result in reduced adverse impacts. The North Pacific Groundfish Observer Program and Alaska Fisheries Science Center's Auke Bay Lab collection and analysis of salmon tissue samples will help identify the regions and natal streams of origin of bycaught salmon, and help clarify the dimensions of the environmental impact.

Many efforts are underway to assess the relationship between oceanographic conditions, ocean mortality of salmon, and their maturation timing to their respective rivers of origin for spawning. It is unclear whether the observed changes in salmon bycatch in recent years is due to fluctuations in salmon abundance, or whether there is a greater degree of co-occurrence between salmon and pollock stocks as a result of changing oceanographic conditions. Pollock distribution has been shown to be affected by bottom temperatures, with densities occurring in areas where the bottom temperatures are greater than zero (Ianelli et al. 2008). Specific ocean temperature preferences for salmon species are poorly understood. Regime shifts and consequent changes in climate patterns in the North Pacific ocean has been shown to correspond with changes in salmon production (Mantua et al. 1997). Archival tags affixed to Asian chum salmon indicate that behavior and migration in juvenile, immature, and maturing fish are linked to temperature gradients (Friedland et al. 2001) and that immature chum salmon exhibit a tendency to remain above the thermocline along the continental shelf (Azumaya et al. 2006). Anecdotal information suggests that Chinook and chum salmon prefer different (warmer) ocean water temperatures than adult pollock. A study linking temperature and salmon bycatch rates was conducted and preliminary evidence indicates a relationship, even when factoring for month and area; Chinook bycatch appeared to be also related to conditions for a given year, season, and location (Ianelli et al. 2010).

Compelling evidence from studies of changes in Bering Sea and Arctic climate, ocean conditions, sea ice cover, permafrost, and vegetation indicate that the area is experiencing warming trends in ocean temperatures and major declines in seasonal sea ice (IPCC, 2007; ACIA, 2005). Some evidence exists for a contraction of ocean habitats for salmon species under global warming scenarios (Welch et al. 1998). Studies in the Pacific northwest have found that juvenile survival is reduced when in-stream temperatures increase (Marine and Cech 2004, Crozier and Zabel 2006). A correlation between sea surface temperature and juvenile salmon survival rates in their early marine life has also been proposed (Mueter et al. 2002). The variability of salmon responses to climate changes is highly variable at small spatial scales, and among individual populations (Schindler et al 2008). This diversity among salmon populations means that the uncertainty in predicting biological responses of salmon to climate change remains large, and the specific impacts of changing climate on salmon cannot be assessed.

Rationalization

The rationalization programs currently under consideration in both the BSAI and GOA will consider methods to reduce the incidental catch of prohibited species in the groundfish fisheries affected. Fisheries rationalization may allow for better incidental catch controls and monitoring in the groundfish fisheries. To the extent rationalization improves fishing practices and reduces incidental catch, it would reduce the adverse effects on prohibited species. Prohibited species caps may be established for salmon and crab under GOA rationalization programs. In all areas, rationalization programs may include individual or cooperative incidental catch accounts for PSC, which could encourage fishermen to reduce their incidental catch of prohibited species.

Traditional management tools

Annual harvest specifications will authorize annual groundfish fishing activity and associated annual incidental catch of PSC species. The improvement of the Catch Accounting System has made it possible for NMFS to maintain more timely and accurate information regarding the incidental catch of prohibited species. This information can be used by NMFS and the industry to reduce incidental catch of prohibited species by tracking when and where it is occurring and react quickly to reduce the potential for additional incidental catch. The number of TAC categories with low values of ABC/OFL are increasing, which tends to increase the likelihood that closures of directed fisheries to prevent overfishing will occur. In recent years management of species groups has tended to separate the constituent species into individual ABCs and OFLs. For example, in 1991 the category “other red rockfish” consisted of four species of rockfish. By 2007, one of those species (sharpchin rockfish) had been moved to the “other rockfish” category and northern, shortraker, and rougheye are now managed as separate species. While managing the species with separate ABCs and OFLs reduces the potential for overfishing the individual species, the effect of creating more species categories can increase the potential for incurring management measures to prevent overfishing, such as fishery closures. Managers closely watch species with fairly close amounts between the OFL and ABCs during the fishing year and the fleet will adjust behavior to prevent incurring management actions.

The Council’s Non-target Species Committee will continue to identify species harvested in the groundfish fisheries that may need to be placed in the target or ecosystem component species groups in the FMPs to ensure the capability of managing the harvest of these species in the groundfish fisheries. The continued improvement of target species management may be beneficial to nontarget species as it may mitigate potential adverse impacts of the fisheries on these nontarget stocks, as seen with Amendment 91 (NMFS 2009a).

The reasonable foreseeable future actions that will most impact the western Alaska Chinook salmon stocks are the continuation of the management of the directed commercial, subsistence, and sport fisheries for Chinook salmon and changes to the management of the Bering Sea pollock fishery. The Council is considering action on management measure to minimize chum salmon bycatch in the Bering Sea pollock fishery. Because any revised chum salmon bycatch measures will also regulate the pollock fishery, there will be a synergistic interaction between the management measures under Amendment 91 and those considered under the chum salmon action. Analysis on the chum salmon action is currently underway, and a further discussion of the impact interactions will be included. As with new chum salmon measures, analysis of any new management measures for the pollock fleet would consider the impacts of adding those new measures to the existing suite of management measure for the pollock fleet and analyzing those impacts on prohibited species.

Actions by Other Federal, State, and International Agencies

ADF&G is responsible for managing commercial, subsistence, sport, and personal use salmon fisheries. The first priority for management is to meet spawning escapement goals to sustain salmon resources for future generations. Highest priority use is for subsistence under both State and Federal law. Surplus fish beyond escapement needs and subsistence use are made available for other uses. The BOF adopts regulations through a public process to conserve fisheries resources and to allocate fisheries resources to the various users. Subsistence fisheries management includes coordination with U.S. Federal government agencies where federal rules apply under Alaska National Interest Lands Conservation Act (ANILCA). Subsistence salmon fisheries are an important culturally and greatly contribute to local economies. Commercial fisheries are also an important contributor to many local communities as well as supporting the subsistence lifestyle. While specific aspects of salmon fishery management continue to be modified, it is reasonably foreseeable that the current State management of the salmon fisheries will continue into the future.

BOEMRE expects that reasonably foreseeable future activities include development of oil and gas deposits over the next 15–20 years in federal waters off Alaska. Potential environmental risks from the development of offshore drilling include the impacts of increased vessel offshore oil spills, drilling discharges, offshore construction activities, and seismic surveys. Adverse environmental impacts resulting from exploration and development in the future could impact salmon and herring stocks. The extent to which these impacts may occur is unknown.

The continued release of salmon fry into the ocean by domestic and foreign hatcheries is also expected to continue at similar levels. Hatchery production increases the numbers of salmon in the ocean beyond what is produced by the natural system, however some studies have suggested that efforts to increase salmon populations with hatcheries may have an impact on the body size of Pacific salmon (Holt et al 2008).

Private sector actions

The reasonable foreseeable future actions that will most impact chum salmon stocks are the continuation of the management of the directed commercial, subsistence, and sport fisheries for chum salmon and changes to the management of the Bering Sea pollock fishery. Ongoing pollock fishing activity will continue to take other groundfish, prohibited species, and forage fish species as bycatch. Likewise, most of these species support directed fisheries that will continue. Ongoing economic development of coastal Alaska, and increasing levels of marine transportation activity may interact adversely with non-target species. Development that may impact coastal and riverine spawning habitat may have the greatest potential for affecting salmon and herring. However, development in Alaska remains small compared to development in other coastal states.

Fishing activity will continue in future years as constrained by fishing regulations and the ABCs and TACs set by the Council in each year. This fishing activity is expected to result in annual incidental catch of the prohibited species and forage fish, subject to the FMPs and regulatory measures that constrain groundfish fishery PSC. The Marine Stewardship Council's certification of the pollock fishery may add to pollock industry incentives to minimize Chinook and chum salmon bycatch. Additionally, the current development and future use of salmon excluder devices for trawl vessels may result in decreases of Chinook and chum salmon incidental catch.

Increasing economic activity in and off Alaska may affect future fisheries. The high levels of traffic between the West coast of the United States and East Asia raise concerns about pollution incidents or the introduction of invasive species from ballast water. Pollution issues were highlighted in December 2004 when the M/V *Selendang Ayu* wrecked on Unalaska Island and again in July 2006 with the M/V *Cougar Ace* accident. Salmon and herring stocks may also be affected by onshore mining activities, to the extent that pollutants or contaminants from those operations may affect salmon spawning streams and herring spawning locations.

Alaskan economic development can affect the coastal zone and the species that depend on the zone. However, Alaska remains relatively lightly developed compared to other states in the nation. Marine transportation associated with that development may be more of a concern than in other states, due to the relatively greater importance of marine transportation to Alaska's economy.

4.4.5 Summary of Effects

There are incidental catch of salmon and herring in the Bering Sea subareas. Under both of the alternatives salmon and herring PSC will continue to occur in the Bering Sea. Any mortality to prohibited species is an adverse impact; however, reducing mortality to salmon with the use of a salmon excluder device could be beneficial compared to the status quo. The amounts of salmon and herring expected to be taken under Alternative 2 is not a substantial increase over PSC amounts experienced in the commercial pollock fishery. Alternative 1 PSC management for herring would remain unchanged under Alternative 2. The additional harvest of salmon under Alternative 2 in combination with the harvests in the pollock fishery is expected to be within the PSC limits for Chinook and chum salmon. **For these reasons, impacts to salmon and herring are predicted to be insignificant for these species evaluated under Alternatives 1 and 2.**

4.5 Status of Marine Mammal Populations

A number of concerns may be related to marine mammals and potential impacts of fishing. For individual species, these concerns include—

- listing as endangered or threatened under the ESA;
- protection under the Marine Mammal Protection Act (MMPA);
- announcement as candidate or being considered as candidates for ESA listings;
- declining populations in a manner of concern to state or federal agencies;
- experiencing large bycatch or other mortality related to fishing activities; or
- being vulnerable to direct or indirect adverse effects from some fishing activities.

Marine mammals have been given various levels of protection under the current FMPs of the Council, and are the subjects of continuing research and monitoring to further define the nature and extent of fishery impacts on these species. The Alaska Groundfish Harvest Specifications EIS (NMFS 2007b) and the Amendment 94 EA/RIR/FRFA (NMFS 2010d) provide the most recent status information on marine mammals that may be impacted by the action. The status descriptions in that EIS and EA are incorporated here by reference.

The BSAI supports one of the richest assemblages of marine mammals in the world. Twenty-five species are present from the orders Pinnipedia (seals, sea lion, and walrus), Carnivora (sea otter and polar bear), and Cetacea (whales, dolphins, and porpoises). Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf (Lowry et al. 1982). Marine mammals that are likely to occur in the action area and their status under the ESA are listed in Table 4.6

Table 4.6 Marine mammals likely to occur in the action area.

Common Name	Scientific Name	ESA Status
Northern Right Whale[2]	*Balaena glacialis*	Endangered
Bowhead Whale	*Balaena mysticetus*	Endangered
Sei Whale	*Balaenoptera borealis*	Endangered
Blue Whale	*Balaenoptera musculus*	Endangered
Fin Whale	*Balaenoptera physalus*	Endangered
Humpback Whale	*Megaptera novaeangliae*	Endangered
Sperm Whale	*Physeter macrocephalus*	Endangered
Steller Sea Lion[1]	*Eumetopias jubatus*	Endangered
Beluga Whale	*Delphinapterus leucas*	None
Minke Whale	*Balaenoptera acutorostrata*	None
Killer Whale	*Orcinus orca*	None
Dall's Porpoise	*Phocoenoides dalli*	None
Harbor Porpoise	*Phocoena phocoena*	None
Pacific White-sided Dolphin	*Lagenorhynchus obliquidens*	None
Beaked Whales	*Berardius bairdii* and *Mesoplodon* spp.	None
Northern Fur Seal	*Callorhinus ursinus*	None
Pacific Harbor Seal	*Phoca vitulina*	None
Pacific Walrus[3]	*Odobenus rosmarus divergens*	Precluded
Northern Sea Otter[3]	*Enhydra lutis*	Threatened
Bearded Seal	*Erignathus barbatus*	Proposed Listing
Spotted Seal	*Phoca largha*	Threatened
Ringed Seal	*Phoca hispida*	Proposed Listing
Ribbon Seal	*Phoca fasciata*	None
Polar Bear[3]	*Ursus maritimus*	Threatened

[1]Steller sea lion are listed as endangered west of Cape Suckling.
[2]NMFS designated critical habitat for the northern right whale on July 6, 2006 (71 FR 38277).
[3]Pacific walrus, sea otter, and polar bear are species under the jurisdiction of the USFWS. Walrus ESA listing is warranted but precluded (76 FR 7634, February 10, 2011).

Direct and indirect interactions between marine mammals and groundfish harvest activity may occur due to overlap of groundfish fishery activities and marine mammal habitat. Fishing activities may either directly take marine mammals through injury, death, or disturbance, or indirectly affect these animals by removing prey important for growth and nutrition or cause sufficient disturbance that marine mammals avoid or abandon important habitat. Fishing also may result in loss or discard of equipment such as fishing nets and line that may ultimately entangle marine mammals causing injury or death.
The PSEIS (NMFS 2004) describes the range, habitat, diet, abundance, and population status for marine mammals. The most recent marine mammal Draft Stock Assessment Reports (SARs) for nearly all marine mammals occurring in the BSAI were completed in 2010 based on 2008 through 2009 data (Allen and Angliss 2010). The USFWS has management authority for polar bears, sea otters, and walrus. The stock assessments for polar bear and walrus were last revised on January 1, 2010 and stock assessments for sea otters were last revised in 2008 (USFWS 2011). This information is incorporated by reference. The Alaska Groundfish Harvest Specifications EIS also provides recent information on the effects of the groundfish fisheries on marine mammals including a detailed description of the status of ESA Section 7

consultations (Section 8.2 of NMFS 2007b). For Bering Sea marine mammals, ESA Section 7 consultation has been completed for all ESA-listed marine mammals.

Direct and indirect interactions between marine mammals and groundfish harvest occur due to overlap in the size and species of groundfish harvested in the fisheries that are also important marine mammal prey, and due to temporal and spatial overlap in marine mammal foraging and commercial fishing activities. This discussion focuses on those marine mammals that may interact or be affected by the pollock pelagic trawl fishery in the BSAI. These species are listed in Table 4.2 and 4.8. Steller sea lions, resident killer whales, beluga whales, and northern fur seals are the only marine mammals that may compete with the pollock fishery for prey. Marine mammals species listed in Table 4.11 are taken incidentally in the BSAI pollock trawl fishery.

Table 4.7 Status of Pinniped Stocks Potentially Affected by the BSAI Pollock Fishery.

Pinnipedia species and stock	***Status under the ESA***	***Status under the MMPA***	***Population Trends***	***Distribution in action area***
Steller sea lion – Western and Eastern Distinct Population Segment (DPS)	Endangered (W) Threatened (E)	Depleted & a strategic stock	For the western DPS, regional increases in counts in trend sites of some areas have been offset by decreased counts in other areas so that the overall population of the western DPS appears to have stabilized (Fritz et al. 2008). The eastern DPS is steadily increasing and is being considered for delisting (75 FR 77602, December 13, 2010).	Western DPS inhabits Alaska waters from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. Eastern DPS inhabit waters east of Prince William Sound to Dixon Entrance. Occur throughout AK waters, terrestrial haulouts and rookeries on Pribilof Islands, Aleutian Islands, St. Lawrence Island, and off the mainland. Use marine areas for foraging. Critical habitat designated around major rookeries, haulouts, and foraging areas.
Northern fur seal – Eastern Pacific	None	Depleted & a strategic stock	Recent pup counts from the Pribilofs in 2008 suggest a continuing decline in survival rates and show the overall abundance estimate is strongly influenced by the continued rapid decline in pups at St. Paul Island.	Fur seals occur throughout Alaska waters, but their main rookeries are located in the Bering Sea on Bogoslof Island and the Pribilof Islands. Approximately 55% of the worldwide abundance of fur seals is found on the Pribilof Islands (NMFS 2007b). Forages in the pelagic area of the Bering Sea during summer breeding season, but most leave the Bering Sea in the fall to spend winter and spring in the N. Pacific.
Harbor seal – Gulf of Alaska Bering Sea	None	None	Moderate to large population declines have occurred in the Bering Sea and Gulf of Alaska stocks. NMFS has new genetic information on harbor seals in Alaska which indicates that the current division of Alaskan harbor seals into the Southeast Alaska, Gulf of Alaska, and Bering Sea stocks needs to be reassessed.	GOA stock found primarily in the coastal waters and may cross over into the Bering Sea coastal waters between islands.Bering Sea stock found primarily around the inner continental shelf between Nunivak Island and Bristol Bay and near the Pribilof Islands.

Ringed seal – Alaska	Proposed listing	None	Reliable data on population trends are unavailable.	Found in the northern Bering Sea from Bristol Bay to north of St. George Island and occupy ice.
Bearded seal – Alaska	Proposed listing	None	Reliable data on population trends are unavailable.	Found in the northern Bering Sea from Bristol Bay to north of St. George Island and inhabit areas of water less than 200 m that are seasonally ice covered.
Ribbon seal – Alaska	None	None	Reliable data on population trends are unavailable.	Found throughout the offshore Bering Sea waters.
Spotted seal – Alaska	Threatened (Southern DPS)	None	Reliable data on population trends are unavailable.	Found throughout the Bering Sea waters.
Pacific Walrus	Warranted but precluded	Strategic	Population trends are unknown. The stock assessment for Pacific walrus was revised on January 1, 2010 with a minimum population size estimate of 129,000 walruses within the surveyed area.	Occur primarily in shelf waters of the Bering Sea. Primarily males stay in the Bering Sea in the summer. Major haulout sites are on Round Island in Bristol Bay and on Cape Seniavan on the north side of the Alaska Peninsula.

Source: Allen and Angliss 2010; List of Fisheries for 2011 (75 FR 68485, November 8, 2010).
Northern fur seal pup data available from http://www.alaskafisheries.noaa.gov/newsreleases/2007/fursealpups020207.htm.
Ringed and bearded seal information available from http://alaskafisheries.noaa.gov/newsreleases/2010/ringedandbeardedseals120310.htm.
Pacific Walrus information available from http://alaska.fws.gov/fisheries/mmm/stock/final_pacific_walrus_sar.pdf and http://alaska.fws.gov/fisheries/mmm/walrus/pdf/faq_2011.pdf

Table 4.8 Status of Cetacea Stocks Potentially Affected by the BSAI Pollock Fishery.

Cetacea species and stock	***Status under the ESA***	***Status under the MMPA***	***Population Trends***	***Distribution in action area***
Killer whale – AT1 Transient; Eastern North Pacific transient, GOA, AI, and BS transient; West Coast transient; Eastern North Pacific Alaska Resident, and Southern Resident	Southern Resident: Endangered. Remaining Stocks: none	AT1 Transient ,– Depleted & a strategic stock Southern Resident: Depleted	Unknown abundance for the Alaska resident; and Eastern North Pacific GOA, Aleutian Islands, and Bering Sea transient stocks. The minimum abundance estimate for the Eastern North Pacific Alaska Resident stock is likely underestimated because researchers continue to encounter new whales in the Alaskan waters. Southern residents have declined by more than half since 1960s and 1970s.	Transient-type killer whales from the Aleutian Islands and Bering Sea are considered to be part of a single population that includes Gulf of Alaska transients. Killer whales are seen in the northern Bering Sea and Beaufort Sea, but little is known about these whales. Southern Resident killer whales do not occur in BSAI.
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.
Harbor porpoise – Bering Sea	None	Strategic	Reliable data on population trends are unavailable	Primarily in coastal waters, usually less than 100 m.

Humpback whale – Western North Pacific Central North Pacific	Endangered and under status review	Depleted & a strategic stock	Increasing. The Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) abundance estimate for the total North Pacific represents an annual increase of 4.9% over the most complete estimate for the North Pacific from 1991–93. Comparisons of SPLASH abundance estimates for Hawaii to estimates from 1991–93 gave estimates of annual increase that ranged from 5.5 % to 6.0% (Calambokidis et al. 2008).	W. Pacific and C. North Pacific stocks occur in Alaskan waters and may mingle in the North Pacific feeding area. Humpback whales in the Bering Sea (Moore et al. 2002) cannot be conclusively identified as belonging to the western or Central North Pacific stocks, or to a separate, unnamed stock.
North Pacific right whale Eastern North Pacific	Endangered	Depleted & a strategic stock	Abundance not known, but this stock is considered to represent only a small fraction of its precommercial whaling abundance and is arguably the most endangered stock of large whales in the world. A reliable estimate of trend in abundance is currently not available.	Before commercial whaling on right whales, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, south-central Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). During 1965–99, following large illegal catches by the U.S.S.R., there were only 82 sightings of right whales in the entire eastern North Pacific, with the majority of these occurring in the Bering Sea and adjacent areas of the Aleutian Islands (Brownell et al. 2001).
Fin whale – Northeast Pacific	Endangered	Depleted & a strategic stock	Abundance may be increasing but surveys only provide abundance information for portions of the stock in the central-eastern and southeastern Bering and coastal waters of the Aleutian Islands and the Alaska Peninsula. Much of the North Pacific range has not been surveyed.	Found in the Bering Sea and coastal waters of the Aleutian Islands and Alaska Peninsula. Most sightings in the central-eastern Bering Sea occur in a high productivity zone on the shelf break.
Minke whale – Alaska	None	None	There are no data on trends in Minke whale abundance in Alaska waters.	Common in the Bering and Chukchi Seas and in the inshore waters of the GOA.
Sperm Whale – North Pacific	Endangered	Depleted & a strategic stock	Abundance and population trends in Alaska waters are unknown.	Inhabit waters 600 m or more depth, south of 62°N lat. Males inhabit Bering Sea in summer.

Gray Whale – Eastern North Pacific	None	None	Minimum population estimate is 18,017 animals. The population size of the Eastern North Pacific gray whale stock has been increasing over the past several decades despite an unusual mortality event in 1999 and 2000. The estimated annual rate of increase, based on shore counts of southward migrating gray whales the unrevised abundance estimates between 1967 and 1988, is 3.3% with a standard error of 0.44% (Buckland et al. 1993); using the revised abundance time series from Laake et al. (2009) leads to an annual rate of increase for that same period of 3.2% with a standard error of 0.5% (Punt and Wade 2010).	Most spend summers in the shallow waters of the northern Bering Sea and Arctic Ocean. Winters spent along the Pacific coast near Baja California.
Beluga Whale – Bristol Bay, Eastern Bering Sea, eastern Chukchi Sea, and Cook Inlet	Cook Inlet: Endangered. Remaining Stocks: None	Cook Inlet: Depleted & a strategic stock	Abundance estimate is 3,710 animals and population trend is not declining for the eastern Chukchi Sea stock. Minimum population estimate for the eastern Bering Sea stock is 14,898 animals and population trend is unknown. The minimum population estimate for the Bristol Bay stock is 2,467 animals and the population trend is stable and may be increasing. Cook Inlet 2008 abundance estimate of 375 whales is unchanged from 2007. Trend from 1999 to 2008 is not significantly different from zero.	Summer in the Arctic Ocean and Bering Sea coastal waters, and winter in the Bering Sea in offshore waters associated with pack ice. Cook Inlet belugas do not occur in BSAI.

Source: Allen and Angliss 2010; List of Fisheries for 2011 (75 FR 68485, November 8, 2010).

The Steller sea lion inhabits many of the shoreline areas of the BSAI, using these habitats as seasonal rookeries and year-round haulouts. The Steller sea lion has been listed as threatened under the ESA since 1990. In 1997 the population was split into two stocks or distinct population segments (DPS) based on genetic and demographic dissimilarities, the western and eastern stocks. Because of a pattern of continued decline in the western DPS, it was listed as endangered on May 5, 1997 (62 FR 30772), while the eastern DPS remained under threatened status. The western DPS inhabits an area of Alaska approximately from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. Steller sea lions present in the action area would be primarily from the Western DPS.

Throughout the 1990s, particularly after critical habitat was designated, various closures of areas around rookeries and haulouts and some offshore foraging areas affected commercial harvest of pollock, an important component of the western DPS of Steller sea lion diet. In 2001, a biological opinion was released that provided protection measures to ensure that the groundfish fisheries would not jeopardize the continued existence of the Steller sea lion nor adversely modify its critical habitat; that opinion was supplemented in 2003. After court challenge, these protection measures remain in effect today (NMFS 2001, Appendix A). A detailed analysis of the effects of these protection measures is provided in the *Steller Sea Lion Protection Measures Supplemental EIS* (NMFS 2001).

A biological opinion documenting the program level Section 7 formal consultation on the effects of the Alaska groundfish fisheries on Steller sea lions, humpback whales, sperm whales, and fin whales was completed November 24, 2010 (NMFS 2010b). The biological opinion concluded that the fisheries were not likely to jeopardize the continued existence of the eastern distinct population segment (DPS) of Steller sea lions, the Western North Pacific and Central North Pacific populations of humpback whales, North Pacific sperm whales, or the Northeast Pacific population of fin whales. The biological opinion concluded that the fisheries were not likely to adversely modify designated critical habitat for the eastern DPS of Steller sea lions. The biological opinion concluded that the fisheries were likely to jeopardize the continued existence of the western DPS of Steller sea lions and were likely to adversely modify their designated critical habitat. The biological opinion contained a reasonable prudent alternative (RPA) designed to remove the likelihood the fisheries would jeopardize the western DPS of Steller sea lions or adversely modify their designated critical habitat.

This RPA was implemented for the 2011 fishing year (75 FR 77535; December 13, 2010). NMFS issued an interim final rule to implement Steller sea lion protection measures to insure that the BSAI management area groundfish fisheries are not likely to jeopardize the continued existence of the western DPS of Steller sea lions or adversely modify its designated critical habitat (75 FR 77535; December 13, 2010). These management measures primarily disperse fishing effort over time and area to provide protection from potential competition for important Steller sea lion prey species in waters adjacent to rookeries and important haulouts. The intended effect of this interim final rule is to protect the endangered western DPS of Steller sea lions, as required under the ESA, and to conserve and manage the groundfish resources in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA). An EA determined that this action would not have significant environmental impacts. The protection measures focused on the Atka mackerel and Pacific cod fisheries in the Aleutian Islands. No changes were made to the Bering Sea pollock fishery.

On December 13, 2010, NMFS announced a 90-day finding on two petitions to delist the eastern DPS of Steller sea lions under the ESA. NMFS concluded that the petitions presented substantial scientific or commercial information indicating that the petitioned action may be warranted (75 FR 77602). NMFS is continuing a status review of this DPS to determine if the petitioned action is warranted.

The Bering Sea subarea has several closures in place for Steller sea lions including no transit zones, rookeries, haulouts, and the Steller Sea Lion Conservation Area. The proposed action would not change the pollock fishery, and groundfish closures associated with the five Steller sea lion sites located at Sea lion Rock, Bogoslof Island/Fire Island, Adugak Island, Pribilof Islands, and Walrus Islands. The harvest of pollock in the Bering Sea subarea is temporally dispersed (§ 679.20) and spatially dispersed through area closures (§ 679.22). These harvest restrictions on the pollock fishery decrease the likelihood of disturbance, incidental take, and competition for prey to ensure the groundfish fisheries do not jeopardize the continued existence or adversely modify the designated critical habitat of Steller sea lions (NMFS 2000 and NMFS 2001).

Northern fur seals forage in the pelagic area of the Bering Sea and reproduce on the Pribilof and Bogoslof Islands. On June 17, 1988, NMFS declared the northern fur seal stock of the Pribilof Islands, Alaska (St. Paul and St. George Islands), to be depleted under the MMPA. The Pribilof Islands population was designated depleted because it declined to less than 50 percent of levels observed in the late 1950s, and no compelling evidence suggested that carrying capacity has changed substantially since the late 1950s (NMFS 2007d). Recent pup counts from the Pribilofs in 2008 suggest a continuing decline in survival rates and show the overall abundance estimate is strongly influenced by the continued rapid decline in pups at St. Paul Island (Allen and Angliss 2010).

4.6 Effects on Marine Mammals

Table 4.9 contains the significance criteria for analyzing the effects of the proposed action on marine mammals. These criteria are from the Amendment 94 environmental assessment/regulatory impact review/final regulatory flexibility analysis (EA/RIR/FRFA) (NMFS 2010d). Significantly beneficial impacts are not possible with the management of groundfish fisheries as no beneficial impacts to marine mammals are likely with groundfish harvest. Generally, changes to the fisheries do not benefit marine mammals in relation to incidental take, prey availability, and disturbances; changes increase or decrease potential adverse impacts.

Table 4.9 Criteria for Determining Significance of Impacts to Marine Mammals.

	Incidental take and entanglement in marine debris	Harvest of prey species	Disturbance
Adverse impact	Mammals are taken incidentally to fishing operations or become entangled in marine debris.	Fisheries reduce the availability of marine mammal prey.	Fishing operations disturb marine mammals.
Beneficial impact	There is no beneficial impact.	There are no beneficial impacts.	There is no beneficial impact.
Insignificant impact	No substantial change in incidental take by fishing operations or in entanglement in marine debris.	No substantial change in competition for key marine mammal prey species by the fishery.	No substantial change in disturbance of mammals.
Significantly adverse impact	Incidental take is more than PBR or is considered major in relation to estimated population when PBR is undefined.	Competition for key prey species likely to constrain foraging success of marine mammal species causing population decline.	Disturbance of mammal or such that population is likely to decrease.
Significantly beneficial impact	Not applicable	Not applicable	Not applicable
Unknown impact	Insufficient information available on take rates.	Insufficient information as to what constitutes a key area or important time of year.	Insufficient information as to what constitutes disturbance.

4.6.1 Incidental Takes

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the effects of the groundfish fisheries on marine mammals (chapter 8 of NMFS 2007b) and is incorporated by reference. Potential take in the groundfish fisheries is well below the potential biological removal (PBR) for all marine mammals, except killer whales and humpback whales. This means that predicted take would be below the maximum number of animals that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. Table 4.10 provides the marine mammals taken in the BSAI pollock fishery as published in the List of Fisheries for 2011. Table 4.11 provides more detail on the levels of take based on the most recent Draft SAR (Allen and Angliss 2010). The BSAI pollock fishery is a Category II fishery because it has annual mortality and serious injury of a marine mammal stock greater than 1 percent and less than 50 percent of the PBR level (75 FR 68468, November 8, 2010).

Table 4.10 Category II BSAI Pollock Fishery with documented marine mammal takes from the List of Fisheries for 2011 (75 FR 68485, November 8, 2010).

Fishery Category II	Marine Mammal Stocks Taken
BSAI pollock trawl	Dall's porpoise, AK Harbor seal, AK Humpback whale, Central and Western N. Pacific Killer whale, Eastern North Pacific, GOA, Aleutian Islands, and Bering Sea transient Minke whale, AK Ribbon seal, AK Spotted seal, AK Steller sea lion, Western U. S

*Northern fur seal, bearded sea, and fin whale will be added to List of Fisheries for 2012 (see Table 4.11).

Based on the most recent information, under Alternatives 1 and 2, the potential incidental take of marine mammals are limited to the species taken by the BSAI pollock trawl fishery listed in Table 4.11. Animals that may be taken by the BSAI pollock trawl fishery are Steller sea lions, northern fur seals, bearded, ringed and ribbon seals, minke whales, fin whales, GOA and BSAI transient killer whales, and Dall's porpoises (Allen and Angliss 2010; 2011 List of Fisheries, 75 FR 68485, November 8, 2010).

Table 4.11 Estimated mean annual mortality of marine mammals from observed BSAI pollock fishery compared to the total mean annual human-caused mortality and potential biological removal .

Marine Mammal	Mean annual mortality, from BSAI pollock fishery	Total mean annual human-caused mortality *	PBR
**Steller sea lions (western)	5.6	223	254
Northern fur seal	2.7	565	13,809
Harbor seal (BS)	0.55	100	603
Spotted seal	0	5,266	N/A
Bearded seal	1.0	6,789	N/A
Ribbon seal	0	194	N/A
Killer whale Eastern North Pacific AK resident	0	1.2	20.8
Killer whale Eastern North Pacific Northern resident	0	0	1.62
Killer whale GOA, BSAI transient	0.41	0.4	5.5
Dall's porpoise	1.09	30	Undetermined
**Humpback whale Western North Pacific	0	0.4	2.6/2.0
**Humpback whale Central North Pacific – BSAI feeding	0	1.8	7.9
Minke whale Alaska	0	0	N/A
**Fin whale Northeast Pacific	0.23	0.23	11.4

Mean annual mortality, expressed in number of animals, includes both incidental takes and entanglements, as data are available, and averaged over several years of data. Years chosen vary by species (Allen and Angliss 2010).
* Does not include research mortality. Other human-caused mortality is predominantly subsistence harvests for seals and sea lions.
** ESA-listed stock

On December 10, 2010, NMFS announced that it proposed to list two populations of seals that occur in the Bering Sea under the ESA: the Pacific bearded seal sub-species Beringia DPS and the ring seal Arctic subspecies. BSAI groundfish fisheries may directly or indirectly affect both populations. From 2002–2006, the average annual bearded seal mortality level incidental to BSAI pollock fisheries was 1.0. Should NMFS list either of these sub-species, ESA consultation on the effects of the groundfish fisheries may be necessary.

All of the incidental takes are very small numbers in comparison to the total mean annual human caused mortality and/or in comparison to the PBR. The additional pollock fishing under the EFP is not likely to result in discernable additional interaction with marine mammals because the quantity of pollock is very small, in relation to the commercial pollock fishery and the harvest is by one vessel in the same locations where pollock fishing already occurs. The EFP vessel will be required to comply with most Steller sea lion protection measures, reducing the potential for interaction with this species. Therefore, under Alternative 2, no discernable effect on the amount of incidental takes of marine mammals is expected beyond the effects of the status quo fishery.

4.6.2 Harvest of Prey Species

The Alaska Groundfish Harvest Specifications EIS determined that competition for key prey species under the status quo fishery is not likely to constrain foraging success of marine mammal species or cause population declines (NMFS 2007b). The exceptions to this are the Steller sea lions and northern fur seals for which potential prey competition with the groundfish fisheries may be a concern. Both of these species depend on pollock as a principal prey species (NMFS 2007b).

The Bering Sea pollock fishery may impact availability of key prey species of Steller sea lions, harbor seals, northern fur seals, ribbon seals; and fin, minke, humpback, beluga, and resident killer whales. Animals with more varied diets (baleen whales) are less likely to be impacted than those that eat primarily pollock and salmon, such as northern fur seals. Resident killer whales and beluga whales have shown a preference for Chinook salmon (Salveson 2009, NMFS 2008d). Table 4.12 shows the Bering sea marine mammal species and their prey species that may be impacted by the Bering Sea pollock fishery. Pollock and salmon prey are in bold.

Table 4.12 Prey species used by Bering Sea marine mammals that may be impacted by the Bering Sea pollock fishery

Species	Prey
Fin whale	Zooplankton, squid, fish (herring, cod, capelin, and **pollock**), and cephalopods
Humpback whale	Zooplankton, schooling fish (**pollock**, herring, capelin, saffron, cod, sand lance, Arctic cod, and **salmon**)
Minke whale	Pelagic schooling fish (including herring and **pollock**)
Beluga whale	Wide variety of invertebrates and fish including **salmon and pollock**
Killer whale	Marine mammals (transients) and fish (residents) including herring, halibut, **salmon**, and cod.
Ribbon seal	Cod, **pollock**, capelin, eelpout, sculpin, flatfish, crustaceans, and cephalopods.
Northern fur seal	**Pollock**, squid, herring, **salmon**, capelin
Harbor seal	Crustaceans, squid, fish (including **salmon**), and mollusks
Steller sea lion	**Pollock**, Atka mackerel, Pacific herring, Capelin, Pacific sand lance, Pacific cod, and **salmon**

Sources: NOAA 1988; NMFS 2004; NMFS 2007b; Nemoto 1959; Tomilin 1957; Lowry et al. 1980; Kawamura 1980; and http://www.adfg.state.ak.us/pubs/notebook/marine/orca.php

Under Alternative 2, the EFP would allow harvests of pollock that exceed the TAC by 0.002% in 2011. These amounts of pollock are so small, that harvest under Alternative 2 is not likely to have an effect on the overall availability of pollock to marine mammals. Because the harvest would be conducted with one to two vessels, over several seasons, outside of most protection areas for Steller sea lions and for fur seals in the Pribilof Island Area Habitat Conservation Zone and dispersed over a large area (Figure 1.2 and 1.3); it is unlikely the pollock harvest under Alternative 2 would have any discernable effect on prey availability for marine mammals dependent on pollock.

The exemption from the sector closures of the Steller Sea Lion Conservation Area (SCA) is not expected to have an impact on Steller sea lions. From 2007 through 2010, and average of 79,970 mt of sector combined pollock quota was left unharvested in the SCA before April 1 (Mary Furuness, NMFS Inseason Management, personal communication, February, 2011). The amount of groundfish expected to be taken during EFP fishing before April 1 is no more than 2,500 mt. The goal of the Steller sea lion protection measures for harvest in the SCA is to prevent the temporal concentration of harvest before April 1. This is accomplished by limiting harvest to 28% of the annual TAC. The SCA has not been closed since 1999 because the American Fisheries Act allowed for the establishment of pollock cooperatives which monitor their own fishing, generally leaving the SCA before quotas are exceeded. The SCA exemption under the EFP would only apply as long as the combined amount of pollock taken from the SCA does not exceed the 28 percent annual TAC before April 1, as specified in the Steller sea lion protection measures (§ 679.20(a)(5)(i)(B)). Because this exemption ensures the temporal harvest of pollock remains dispersed as specified in the Steller sea lion protection measures, this exemption is not expected to have an impact beyond those already identified in previous analysis (NMFS 2001, Appendix A).

Salmon is also a prey species of Steller sea lions (NMFS 2001), northern fur seals (NMFS 2007d), killer whales and beluga whales (NMFS 2010d). Sea lions eat salmon primarily in May and where salmon congregate for migration based on geography. Alternative 2 will be taking a limited amount of salmon that will not likely affect salmon prey availability for Steller sea lions. EFP fishing would be conducted outside of protection areas (except the SCA), and the salmon harvest would be limited to one to two vessels over a large area, and dispersed over two seasons in 2012. It is not likely that the harvest of salmon under the EFP will have a measurable effect on salmon used by killer whales or beluga whales. As described in Section 4.3.1, salmon stocks taken as bycatch in the Bering Sea pollock fishery are mixed origin, with the majority of the Chinook salmon bycatch analyzed coming from Western Alaska. The Cook Inlet beluga and Southern Resident killer whale stocks depend on Chinook salmon returning to Cook Inlet and the area of occurrence of the Southern Resident killer whale in the Vancouver, Puget Sound Region. The amount of Chinook salmon harvested under the EFP is so small that is not possible to measure a potential effect on the prey availability for these ESA-listed marine mammal stocks.

Under the status quo, the Northern Fur Seal Conservation Plan recommends gathering information on the effects of the fisheries on fur seal prey, including measuring and modeling effects of fishing on prey (both commercial and noncommercial) composition, distribution, abundance, and schooling behavior, and evaluate existing fisheries closures and protected areas (NMFS 2007d). The Alaska Groundfish Harvest Specifications EIS analyzed the effects of the groundfish fisheries on fur seal prey (section 8.3.2 of NMFS 2007b). The EIS for the annual subsistence harvest of fur seals determined that the groundfish fisheries in combination with the subsistence harvest may have a conditional cumulative effect on prey availability if the fisheries were to become further concentrated spatially or temporally in fur seal habitat, especially during June through August (NMFS 2005b).

The harvest of pollock under the EFP would occur in the northern area of the Bering Sea in September or October (Figure 1.3). Fur seals are likely to be in the same area at the same time as the EFP fishery would be occurring (NMFS 2007d). No more than 2,500 mt of pollock are likely to be harvested in this northern area due to the seasonal distribution of fishing under the EFP. No more than 125 Chinook and 2,500 non-Chinook salmon would be taken in the B season and in the area that may overlap with fur seals. The frequency of occurrence of salmon occurring in fur seal scat collected from Bering Sea rookeries range from 3 to 16 percent (NMFS 2007d). Salmon does not appear to be as important in the fur seal diet as pollock and squid which occur much more frequently in scat samples analyzed. Because the harvest of pollock and salmon is such a small proportion of the total annual pollock and salmon harvest, occurs over a short time period, and is limited to one vessel, it is not likely to have a discernable effect on fur seal prey.

4.6.3 Disturbance

The Alaska Groundfish Harvest Specifications EIS analyzed the potential disturbance of marine mammals by the groundfish fisheries (Section 8.3.3 of NMFS 2007b). The EIS concluded that the status quo fishery does not cause disturbance to marine mammals that may cause population level effects and fishery closures limit the potential interaction between the fishing vessels and marine mammals. Because the EFP fishing would be conducted by one vessel outside of areas closed to protect Steller sea lions and northern fur seals and the time period of fishing is limited, it is not likely that any discernable disturbance of marine mammals would occur. Therefore, Alternative 2 is not likely to result in marine mammal disturbance beyond that which may occur under the status quo.

4.6.4 Cumulative Effects

The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the effects of the alternatives on marine mammals. Some of these actions are broadly based on the potential changes to the groundfish fisheries that may result in impacts on marine mammals.

Ecosystem-sensitive management

Increased attention to ecosystem-sensitive management is likely to lead to more consideration for the impact of the pollock fishery on marine mammals and more efforts to ensure the ecosystem structure that marine mammals depend on is maintained, including prey availability. Increasing the potential for observers collecting information on marine mammals and groundfish fisheries interaction, and any take reduction plans, may lead to less incidental take and interaction with the groundfish fisheries, thus reducing the adverse effects of the groundfish fisheries on marine mammals.
Changes in the status of species listed under the ESA, the addition of new listed species or critical habitat, and results of future Section 7 consultations may require modifications to groundfish fishing practices to reduce the impacts of these fisheries on listed species and critical habitat. Listing any of the ice seals and designating critical habitat would require Section 7 consultation for the groundfish fisheries to determine if they are likely to adversely affect the listed species or designated critical habitat. Change to the fisheries may be required if it is determined that the fishery may pose jeopardy or adverse modification or destruction of critical habitat. Fishery measures would be needed to reduce that potential harm.

Modifications to Steller sea lion protection measures will result in Section 7 consultations. These changes may be a result of recommendations by the Council based on a review of the current protection measures, potential state actions, or recommendations from future biological opinions. Any change in protection measures likely would have insignificant effects because any changes would be unlikely to result in the PBR being exceeded and would not be likely to result in jeopardy of continued existence or adverse modification or destruction of designated critical habitat.

Improved management of fur seals may result from the Council's formation of the Fur Seal Committee, and the continued development of information regarding groundfish fishery interactions and fur seals. The timing and nature of potential future protection measures for fur seals are unknown, but any action is likely to reduce the adverse effects of the groundfish fisheries on fur seals.

Ongoing research efforts are likely to improve our understanding of the interactions between the harvest of pollock and salmon and the impacts on marine mammals in the Bering Sea. NMFS is conducting or participating in several research projects, which include understanding the ecosystems and fisheries interactions. These projects will allow NMFS to better understand the potential impacts of commercial fisheries, the potential for reducing salmon bycatch, and the Bering Sea ecosystem. The results of the research will be useful in managing the fisheries with ecosystem considerations and is likely to result in reducing potential effects on marine mammals. For more information see http://www.afsc.noaa.gov/.

The implementation of the Arctic fishery management plan will provide protection to those marine mammals that use Arctic and Bering Sea waters, such as ice seals. The plan initially prohibits commercial fishing in the Arctic Management Area until information is available to sustainably manage the fishery (74 FR 56734, November 3, 2009). No commercial fishing in either the Chukchi or Beaufort Seas would prevent the potential for incidental takes, disturbance or competition for prey species between fishing vessels and marine mammals.

Traditional management tools

The cumulative impact of the annual harvest specifications in combination with future harvest specifications may have lasting effects on marine mammals. However, as long as future incidental takes remain at or below the PBR, the stocks will still be able to reach or maintain their optimal sustainable population. Additionally, since future TACs will be set with existing or enhanced protection measures, it is reasonable to assume that the effects of the fishery on the harvest of prey species and disturbance will likely decrease in future years. Improved monitoring and enforcement through the use of technology would improve the effectiveness of existing and future marine mammal protection measures by ensuring the fleet complies with the protection measures, and thus, reducing the adverse impacts of the alternatives.

Actions by other Federal, State, and International Agencies

Expansion of state pollock or Pacific cod fisheries may increase the potential for effects on marine mammals. However, due to ESA requirements, any expansion of state groundfish fisheries may result in reductions in federal groundfish fisheries to ensure that the total removals of these species do not jeopardize any ESA-listed species or adversely modify designated critical habitat, including Steller sea lion critical habitat.

The state manages the salmon fisheries of Alaska and the state's first priority for management is to meet spawning escapement goals to sustain salmon resources for future generations. Subsistence use is the highest priority use under both state and federal law. Surplus fish beyond escapement needs and subsistence use are made available for other uses, such as commercial and sport harvests. The state carefully monitors the status of salmon stocks returning to Alaska streams and controls fishing pressure on these stocks. Even though prey availability is not accounted for in the setting of salmon harvest levels, the management of salmon stocks effectively maintains healthy populations of salmon where possible and may provide sufficient prey availability to marine mammals.

Incidental takes of Steller sea lions and other marine mammals occur in the state managed set and drift gillnet, troll, and purse seine salmon fisheries (75 FR 68485, November 8, 2010). Marine mammal species taken in the state-managed fisheries and also the pollock fishery are in Table 4.12.

Table 4.13 Marine Mammals Taken in State-Managed and Federal Pollock Fisheries

Marine Mammal Stocks Taken in State Managed and Federal Pollock Fishery	State Fisheries mean annual mortality*
Dall's porpoise	28
Harbor seal, Bering Sea	0
Steller sea lions, western	14.5
Humpback whale western and central stocks	1.2
Spotted seal	0
Harbor Porpoise, Gulf of Alaska	71.4

Allen and Angliss 2010
List of Fisheries for 2011 (75 FR 68485, November 8, 2010)

The mortalities listed in Table 4.1 are included in the total mean annual human caused mortalities in Allen and Angliss 2010. The combination of the incidental takes in the pollock fishery with takes in the State-managed fisheries for these species is either well below the PBR or a small portion of the total mean annual human caused mortality for species which PBR is not determined. It is not likely that EFP fishing would change the pollock fishery in a manner that would greatly increase the overall incidental takes of these marine mammals to where either the PBR would be exceeded or the proportion of fishery mortality in the total mean annual human caused mortality would greatly change.

Private actions

Subsistence harvest is the primary source of direct mortality for many species of marine mammals. Current levels of subsistence harvests are controlled only for fur seals. Subsistence harvest information is collected for other marine mammals and considered in the stock assessment reports. It is unknown how rates of subsistence harvests of marine mammals may change in the future, but subsistence harvests are not expected to greatly increase as the number of subsistence users is not expected to greatly increase.

Other factors that may impact marine mammals include continued commercial fishing; non-fishing commercial, recreational, and military vessel traffic in Alaskan waters; oil and gas exploration; seismic surveying; and tourism and population growth that may impact the coastal zone. Little is known about the impacts of these activities on marine mammals in the BSAI. However, Alaska's coasts are currently relatively lightly developed, compared to coastal regions elsewhere. Despite the likelihood of localized impacts, the overall impact of these activities on marine mammal populations is expected to be modest.

4.6.5 Summary of Effects

The continuing fishing activity and continued subsistence harvest are potentially the most important sources of additional annual adverse impacts on marine mammals. Both of these activities are monitored and are not expected to increase beyond the PBRs for marine mammals. The extent of the fishery impacts would depend on the size of the fisheries, the protection measures in place, and the level of interactions between the fisheries and marine mammals. However, a number of factors will tend to reduce the impacts of fishing activity on marine mammals in the future, most importantly ecosystem management. Ecosystem-sensitive management and institutionalization of ecosystem considerations into fisheries governance are likely to increase our understanding of marine mammal populations and interactions with fisheries. The effects of actions of other federal, state, and international agencies are likely to be less important when compared to the direct interaction of the commercial fisheries, subsistence harvests, and marine mammals.

Because of the amount of harvest and method under Alternative 2, compared to Alternative 1, no substantial change in effects on marine mammals is expected. There will be no substantial change in incidental take by fishing operations or entanglement in marine debris under Alternative 2. There will be no substantial change in competition for key marine mammal prey species by the fishery. There will be no substantial change in disturbance of marine mammals. **For these reasons , impacts to marine mammals are likely insignificant under Alternatives 1 and 2.**

4.7 Socioeconomic Effects

4.7.1 Background

The operation of the groundfish fishery in the BSAI and the GOA is described by gear type in the PSEIS (NMFS 2004). General background on the fisheries with regard to each fish species is given in the BSAI and GOA groundfish Fishery Management Plans (FMPs) (NPFMC 2010c and 2010d). The pollock trawl and State salmon fishery sectors are the only sectors that may be affected by this proposed action. For detailed information on the fishery participants including vessels and processors in the pollock fishery see Chapter 12 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). Additional information regarding fishery participants can be found in the 2009 Economic SAFE report (Hiatt et al. 2010).

The most recent description of the economic aspects of the groundfish fishery is contained in the 2009 Economic SAFE report (Hiatt et al. 2010). This report, incorporated herein by reference, presents the economic status of groundfish fisheries off Alaska in terms of economic activity and outputs using estimates of catch, bycatch, ex-vessel prices and value, the size and level of activity of the groundfish fleet, the weight and value of processed products, wholesale prices, exports, and cold storage holdings. The catch, fleet size, and activity data are for the fishing industry activities that are reflected in Weekly Production Reports, Observer Reports, fish tickets from processors who file Weekly Production Reports, and the annual survey of groundfish processors. External factors that, in part, determine the economic status of the fisheries are foreign exchange rates, the prices and price indices of products that compete with products from these fisheries, and fishery imports.

4.7.2 Socioeconomic Effects

The potential socioeconomic effects of this proposed action primarily are future benefits that may result from the use of a salmon excluder device in the pollock trawl fisheries. Pollock taken during the testing will be sold to help offset the costs to the vessel operations during the experimental work. Salmon harvested during the testing will be donated for distribution under the Prohibited Species Donation Program (PSDP) (§ 679.26) or disposed of in accordance with § 679.21(b).

4.7.3 Alternative 1 Status Quo Effects

If the EFP is not issued, the development of an effective salmon excluder device may be more difficult, if not impossible. The pollock fishery may experience high salmon bycatch rates that exceed salmon bycatch limits, especially for Chinook salmon. The economic impact to the pollock fishery is the potential closure of hot spots under the voluntary rolling hot spot program, and closure areas under the IPA, limiting the choices for pollock harvest. Limited fishing grounds can result in additional expense in finding areas with sufficient catch rates and quality of fish. In addition, the pollock industry incurs costs in sorting and disposing bycatch. Alternative 1 would not facilitate the development of a salmon excluder device, eliminating the potential for future socioeconomic benefits identified under Alternative 2.

4.7.4 Alternative 2 Issue the EFP Effects

The knowledge gained from this experiment may make it possible to reduce the costs of salmon bycatch in the pollock trawl fisheries. However, there are several caveats. The experiment may not be successful; the vessel may not encounter sufficient salmon to support the experimental design. The excluder device may exclude enough pollock to reduce net CPUE. Moreover, the excluder may turn out to be expensive to purchase or operate (perhaps by excluding large numbers of pollock or by increasing the net's drag) and not be widely adopted by the fleet.

Under Alternative 2, the proposed action may allow for the development of an effective salmon excluder device for trawl gear. If such a device were available, trawl vessels could use this device to lower the salmon bycatch which would result in less potential for exceeding the PSC limits or requiring the vessel to move to areas with lower salmon bycatch rates. By not exceeding the PSC limits or by not being closed out of salmon hot spot areas, pollock fisheries would have more locations available for selecting fishing grounds, potentially leading to less harvesting expense and higher quality product. Benefits to consumers and the country overall from the pollock fishery could also increase under the expectation that the benefits of efficiency gains and increased product quality would accrue to consumers and the nation.

These benefits are based on the assumption of minimal injury to salmon utilizing the escapement device. Any evaluation of the performance of salmon bycatch reduction device and its costs and benefits would clearly need to explicitly evaluate the question of long term survival in order to assess actual benefit/cost tradeoffs. The expectation of benefits from a bycatch reduction device also assumes that changes in fishing behavior as a result of widespread use of the device would not increase some other potential environmental costs associated with the fishery. It is also not possible to predict the level of acceptance of using such a device in the pollock trawl fishery though there is great interest in reducing salmon bycatch within and outside the pollock industry.

Issuing the EFP also would provide the pollock industry a way to show those concerned about salmon bycatch that there is a good faith effort by the industry to address the problem. The success of such a device would likely result in benefits to salmon stocks used by subsistence, commercial and recreational fishermen and those communities that depend on salmon resources.

Selection of Vessels, Costs and Revenue

This is a joint project of the NMFS AFSC and the North Pacific Fishery Research Foundation (NPFRF). The NPFRF is a private non-profit foundation whose main purpose in recent years has been to promote the development of trawls that take fewer salmon PSC during pollock fishing operations (Paine)[1]. The principal investigators will be scientists from the AFSC and a contractor chosen by the NPFRF. This contractor is the applicant for the EFP. Based on previous practice, Requests for Proposals (RFPs) will be issued separately for each of the three seasonal experiments. Vessels will be selected by an AFSC review panel based on criteria described in the RFP (Gauvin, 2011).

The vessel operations selected under the RFP will be able to sell the groundfish harvested under the EFP and retain the proceeds (although, as noted below, the EFP may impose some requirements on delivery). The value of the revenues in the 2011 "B" season, and in 2012, cannot be determined with any precision at the current time (March 2011). For the purposes of this analysis, 2009 wholesale values have been used

[1] Paine, Brent. Executive Director of the United Catcher Boats, Fisherman's Terminal, Seattle, WA. President of the North Pacific Fishery Research Foundation. Phone call on March 21, 2011.

to provide a rough estimate of possible revenues. Catcher/processor "A" and "B" season values have been used to value the harvest in the relevant seasons ($1,501 per metric ton round weight for the "A" season, and $1,135 for the "B" seasons) (Haitt, pers. comm.[2])[3]. This produces a revenue estimate of about $9.4 million. There is a great deal of uncertainty associated with this revenue estimate; however, it is not possible to quantify this with a confidence interval.[4] If catcher vessels are used, the value received by fishing operations would be quite a bit less. The catcher vessel trawl revenue per metric ton of round weight in 2009 (inferred from information in Hiatt et al. (2010: 52)) was about $364. In this case the pollock would be processed on-shore (with associated processing costs) by a firm associated with the catcher vessel either through ownership or joint membership in a coop, and there would be a wholesale value received by the processor. In 2009, this wholesale value was somewhat lower than the catcher/processor price in the "A" season, and somewhat higher in the "B" season[5], but assuming that all the fish is taken by catcher vessels, produces the same $9.4 million total value.

This is an estimate of gross revenue accruing to the program participants. Actual profits will be less than this, depending on the costs of participating in the program. These costs include the normal costs of fishing for and processing pollock, the additional costs imposed on fishing operations by the need to comply with the requirements of the EFP, the profits foregone by fishing for EFP pollock instead of pursuing other fishing opportunities (such as American Fisheries Act (AFA) pollock, Community Development Quota (CDQ) pollock, or other groundfish), and the possibility that operations may donate part of the proceeds to the NPFRF for its research efforts.

The EFP fishing protocol sets out how many hauls and how many tons per day can be harvested, the criteria used to select fishing areas for the EFP test, the gear the EFP applicant will need to provide for the EFP testing (e.g., nets and catch indicating devices), and the duties of crew members in support of the EFP experiment. These requirements and others are described in the RFP used to solicit applications from interested Bering Sea pollock vessel-owning companies (Gauvin 2011).

The costs of fishing under the EFP are likely to be higher than the costs of fishing for AFA or CDQ pollock. In every stage of salmon excluder EFP fieldwork for past EFPs, and as will be the case for the current application, the EFP protocol constrains harvest amounts per day due to the necessity of collecting more data on the catches than would occur in the normal fishery and due to the need to essentially collect data from two separate nets on each haul (the regular codend and the fish in the recapture net). The EFP also constrains the selection of fishing areas to those that provide sufficient levels of pollock and salmon for the EFP experimental design. In the past this has often forced a vessel to conduct fishing where target catch rates are not optimal and where product quality factors are not the best. As such, EFP applicants need to consider whether they are able to operate under the EFP protocol and recover their operating

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[2] Hiatt, Terry. Alaska Fishery Science Center. Seattle, WA. Email on March 17, 2011.

[3] These are not wholesale prices, but values, estimated by dividing the wholesale value of the wholesale production of all pollock products, by the round weight volume of pollock harvested.

[4] Among the factors contributing to the uncertainty are the use of 2009 prices as a proxy for unknown 2011 and 2012 prices, the impact of the Japanese earthquake on Japanese demand for surimi and pollock roe, the potential impact of EFP project requirements on product quality and price, and whether or not the pollock will be taken by catcher/processors or by catcher vessels delivering to shoreside plants for processing.

[5] The shoreside wholesale values were estimated to be $1,394 in the "A" season, and $1,189 in the "B" season. (Hiatt, pers. comm.).

costs. Profitability is not guaranteed given the constraints of the EFP fishing protocol. The major factor affecting production under the EFP may be frequent slowdowns from the need to handle and account for EFP catches from two nets separately. This is very problematic when a large quantity of catch occurs in the recapture net as this can damage that secondary net,and it must be repaired before EFP testing can resume. Malfunctions in camera and sonar equipment that are needed during the EFP are also common, and these must be resolved before EFP fishing can resume. The EFP vessel cannot switch to its non-EFP fishing opportunities during the EFP because once the EFP commences, only EFP fishing is allowed. (Gauvin, 2011).

Past EFPs have not been evaluated to determine whether or not they were profitable for the successful applicants. In the past, EFPs may have resulted in losses (failures to recover operating costs) when participating vessels relocated to areas where salmon bycatch rates were sufficient for the objectives of the EFP or fishing operations were suspended because of equipment breakdowns. Past RFPs specifically informed applicants of this possibility. NMFS' application review panel considers the applicants' responses to questions in the RFP about their ability to accommodate slowdowns and unanticipated occurrences during the EFP. Possible scenarios include equipment failure requiring the vessel to return to port for parts, or difficulty finding fishing locations that meet EFP objectives, leading to days of searching with few or no hauls (Gauvin 2011).

In addition to the potentially higher operating costs involved in fishing under the EFP protocols, applicants may be under an obligation to transfer part of their revenues to the NPFRF. In the past, the RFPs have assigned points for willingness of the applicant to commit to donate part of the revenues from the sale of groundfish to the NPFRF. A recent RFP provided that the applicant could receive up to 5 points (out of a total of 100) for donations to the NPFRF at the rate of 1 point for every $20 increase in the donation. The donation was meant to contribute to defraying the costs the NPFRF incurs for this project (including field project manager, sea samplers, gear, travel) as well as other North Pacific fisheries research activities of the Foundation.[6] In this recent RFP, all of the successful applicant's sea sampler costs during the EFP were paid by the NPFRF out of the donations made in connection with the EFP. The EFP exempted the EFP vessel from its normal observer coverage requirements, and the EFP provided for the EFP holder to place up to two sea samplers on EFP vessels to collect the necessary data for the EFP test (Gauvin, 2009).

[6] Specific to the salmon excluder EFP, the NPFRF pays for many of the cost components of EFP fieldwork that are not covered by EFP participants. These include the cost of the two sea samplers needed on each EFP vessel during testing, the field project manager and travel costs for getting people and equipment to Dutch Harbor. The field project manager goes out on all EFP fieldwork to manage the experiment to ensure the fieldwork meets the requirements of the experimental design. Additionally, the NPFRF typically covers most of the costs of gear expenditures for excluders and recapture nets as well as provides some of the equipment (e.g. supplemental underwater camera system). In addition to covering costs of field research on the EFP, the NPFRF has also funded facility and travel costs for multiple trips to the flume tank facility in Newfoundland. It has also funded several outreach projects related to the salmon excluder implementation into the regular pollock fishery such as hiring a video technician during the summer and fall of 2010 working out of Dutch Harbor to go out on boats interested in video work to help them tune their salmon excluders. A more recent project by the NPFRF was to send a technician out to sea during the 2010 A season during the regular pollock fishery to evaluate whether salmon catches in future EFPs can be accounted for via video cameras placed in recapture nets with open codends. This A season work included having the same technician go to Kodiak last month to get preliminary information on how to adapt the current salmon excluder to the smaller scale Gulf of Alaska vessels and pollock nets (Gauvin 2011).

In the current instance, a \$100 per ton donation commitment for 7,500 metric tons of groundfish implies revenues of \$750,000. Any donation commitment by an applicant would be premised on applicant's estimate of the profitability of the EFP. \$100/ton is an upper bound potential commitment in the above-cited RFP. In the past, successful bidders have committed to donate \$50/ton to \$100/ton. (Paine)[7] As noted earlier, the evaluation of applicants is carried out by AFSC staff, and not by the NPFRF or its contractor, so that the NPFRF does not have control over the size of the donation.

[7] Email on March 21, 2011.

5.0 SUMMARY AND CONCLUSIONS

Context: The action would issue an EFP to allow for the continued development and testing of a salmon excluder device for pollock trawl gear in the Bering Sea. Any effects of the action are limited to areas commonly used by the pollock trawl fishery. The effects on society within these areas are on individuals directly and indirectly participating in the pollock fisheries, those participating in the experiment, those who depend on salmon resources, and those who may receive the small amount of salmon through the Prohibited Species Donation Program (PSDP). Because this action may affect the efficiency of pollock fishing and the bycatch of salmon in the future, this action may have impacts on society as a whole or regionally.

Intensity: National Oceanic and Atmospheric Administration Administrative Order (NAO) 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 CFR1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1) Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

Response: No. The proposed action would harvest a very small quantity of pollock in relation to the overall annual harvest of pollock. No discernable effect on any target species is expected; therefore, the proposed action is not likely to jeopardize the sustainability of any target species (EA section 4.2).

2) Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?

Response: No. A very small quantity of fish species other than pollock and salmon is expected to be taken by the proposed action. The amount of salmon taken is a small portion of the annual bycatch of salmon. Any effect from the EFP is not likely discernable over the status quo fishery effects; therefore, the proposed action is not likely to jeopardize the sustainability of any non-target species (EA section 4).

3) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?

Response: No. This action is limited to the use of pelagic trawl gear in a manner which has been found to not cause substantial damage to oceans and coastal habitats or essential fish habitat (EA section 4 Introduction).

4) *Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

Response: No. This action is limited to the use of pelagic trawl gear by one vessel, harvesting a relatively small amount of fish over several seasons in two large areas of the Bering Sea. The quantity of fish and method of harvest are not likely to have any discernable effects on biodiversity or ecosystem function (EA section 4).

5) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

Response: No. The proposed action involves one vessel conducting controlled scientific testing of a bycatch reduction device in a location away from the public. No changes to fishing practices are expected that would impact public health and safety. Therefore, no impacts to public health or safety are expected (EA section 2).

6) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

Response: No. The proposed action is limited to the use of pelagic trawl gear by one vessel, harvesting a relatively small amount of fish over several seasons in two large areas of the Bering Sea. Because of the amount of pollock and salmon harvested, the method of harvest, and compliance with existing closures for Steller sea lions and northern fur seals, no discernable effects are expected on ESA-listed species, critical habitat, marine mammals or other non-target species (EA sections 4.4 and 4.6).

7) Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: No. The issuance of the EFP would allow for the vessel used in the EFP work to be compensated for expenses through the sale of pollock harvested during the salmon excluder device testing. No substantial social or economic impacts are expected from the issuance of the EFP. Successful development and use of the salmon excluder device may result in beneficial economic effects for the pollock industry and for those dependent on salmon resources (EA section 4.7).

8) Are the effects on the quality of the human environment likely to be highly controversial?

Response: No. The potential effects of the action are well understood and not controversial. Any effects on the human environment are not likely discernable due to the limited amount of fish and vessel participation and short time period of the EFP project. The industry, NMFS, Western Alaska salmon users, and environmental organizations are in favor of efforts to reduce salmon bycatch (EA section 1).

9) *Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?*

Response: No. This action is limited to the use of pelagic trawl gear in a manner which has been found to not cause substantial damage to oceans and coastal habitats or essential fish habitat (EA Section 3 Introduction). This action is limited to the marine environment so other unique areas listed would not be impacted (EA section 1).

10) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: No. The potential effects of fishing on pollock and marine mammals is well understood and the returns of salmon in Alaska are well monitored. Any effects on the human environment are not likely discernable due to the limited amount of fish and vessel participation and short time period of the EFP project (EA sections 4.1, 4.3 and 4.5).

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: No. Each environmental component that may be affected by this action was analyzed for potential direct and indirect impacts. For each of these components, no discernable direct or indirect effects were identified resulting from this action when comparing the potential impacts under Alternative 2 compared to Alternative 1. An analysis of cumulative effects was included to determine the incremental effects of this and other actions on each environmental component affected. The combined direct, indirect, and cumulative impacts were not likely significant for this action (EA section 4).

12) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

Response: No. This action is limited to the marine waters of the Bering Sea, and these types of sites do not occur in the Bering Sea. The fishing activities under this action are not likely to result in destruction or loss of significant scientific, cultural, or historical resources because the pelagic trawling occurs in the water column where these resources do not occur. Therefore, this question is not applicable (EA section 1).

13) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

Response: No. This action does not change fishing activities in a manner that would result in the spread or introduction of non-indigenous species (EA section 1).

14) Is the proposed action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

Response: No. This action allows for the development of a device that may be considered for use by the fishing industry at a later time. No decisions would be made at this time regarding the future use of the device, and any future actions would be analyzed for potential significant effects (EA section 1).

15) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: No. The proposed action would be done in accordance with all federal, state, and local laws (EA section 1).

16) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: No. Reasonably foreseeable future actions from this EFP study is the industries use of a salmon excluder device which would be a beneficial cumulative effect for pollock and salmon species. No cumulative adverse effects are likely for target or non-target species with this action (EA section 4).

Comparison of Alternatives and Selection of a Preferred Alternative

Alternative 1 does not meet the need or the purpose of this action, to allow for a scientific study to develop a salmon excluder device for pollock trawl vessels in the Bering Sea. The status quo would not meet the need to reduce the amount of salmon bycatch in the pollock trawl fishery. Alternative 2 would provide an EFP that permits the continued development and testing of such a device in a scientifically valid manner and within groundfish regulations (50 CFR 679 and 600), meeting the need and purpose of this action. Without the EFP, the testing would not be conducted following the carefully conceived experimental design, potentially resulting in no development of the bycatch reduction device and no potential tool for lowering salmon bycatch in the pollock trawl fishery. Therefore, Alternative 2 is the preferred alternative.

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Request for a new exempted fishing permit (EFP) to continue research on salmon bycatch reduction devices with a focus on chum salmon bycatch reduction and one field season to improve to Chinook salmon escapement rates

Date of Application: November, 2010

Name, mailing address, and phone number of applicant:

Signature of Applicant:

EFP Applicant and Principal Investigator:
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Purpose and Objectives of the EFP: This application requests the Alaska Region of the National Marine Fisheries Service (NMFS) issue an exempted fishing permit for our continuing research on salmon excluders for the Bering Sea pollock fishery. The primary objective of this research will be the development and testing of an excluder that reduces chum salmon bycatch rates without significant negative effects on pollock fishing. While we have achieved some success on Chinook salmon bycatch through our previous EFP work on salmon excluders, to date none of our excluder designs have shown much promise for reducing chum salmon bycatch. Additionally, a secondary objective under this EFP is to examine two promising ideas to improve the Chinook salmon bycatch reduction performance of the final version of the Chinook salmon excluder developed under EFP 08-02.

Figure 1 below summarizes the salmon bycatch reduction rates achieved in our most recent tests under EFP 08-02. Field testing under EFP 08-02 was completed in February of 2010. Most notably, our final excluder design in the last field season (winter 2010) was able to reduce Chinook salmon catch rates on the two test vessels by approximately 25% and 35% (winter 2010 results for Phase 1 (P1) tests) with no negative effects on pollock fishing. In the past, problems such as bulging of the trawl intermediate and loss of trawl door spread in areas with high pollock catch rates were experienced.

As we noted in our final EFP report for EFP 08-02, confidence intervals around estimated escapement rates for the P1 tests on *F/V Pacific Prince* and *F/T Starbound* allowed us to conclude that significant gains in Chinook salmon selectivity were achieved from the final version of an excluder developed under that EFP. That excluder is a flapper-style excluder designed to stay open and therefore allow escapement during normal towing operations. A secondary test done during that same field work season (Phase 2 (P2) results in Figure 1 below) on one of the EFP vessels (*F/V Pacific Prince)* suggested that the addition of artificial light placed just above the excluder's escapement portal may increase Chinook escapement rates. However, due to the limited amount of groundfish available to that EFP test in winter 2010, we were not able to confirm that potential result with sufficient statistical confidence. As part of our continuing work under this EFP, we are therefore planning to do one field season on Chinook salmon to evaluate how to improve Chinook salmon escapement. One part of that work will involve a dedicated test of whether artificial light increases Chinook escapement rates. The other potential focus is to examine how reducing the degree to which the flapper panel extends aft of the escapement hole (overhang) affects Chinook (and pollock) escapement.

Figure 1: Overall salmon escapement results from EFP 08-02

Test /date	Vessel	Codend salmon #	Recap salmon #	Salmon escape %
Winter 2009 P1	Pac Prince	726	91	11.1%
Winter 2009 P2	Pac Prince	1079	209	16.2%
Winter 2009	Starbound	720	70	8.9%
Fall 2009 P1 (chum)	Starbound	196	5	2.5%
Fall 2009 P2 (chum)	Starbound	643	34	5.0%
Winter 2010 P1	Pac Prince	122	62	33.7%
Winter 2010 P2	Pac Prince	37	25	40.3%
Winter 2010 P1	Starbound	150	49	24.6%
Winter 2010 P2	Starbound	38	21	35.6%

Although improvement in Chinook escapement is a component of this EFP application, chum salmon bycatch reduction will be the primary focus. Two stages of field research on chum salmon are planned in this EFP, the first in fall of 2011 and the second in fall of 2012. The reason for focusing on chum is that like Chinook bycatch, reducing chum salmon bycatch is a priority for the Bering Sea pollock industry.

To date, excluders that have shown useful selectivity advantages for Chinook salmon do not appear to work for chum salmon. For example, in the fall of 2009 testing under EFP 08-02, an early version of a flapper excluder was tested to evaluate its selectivity for chum salmon bycatch reduction. Just as with funnel and tunnel excluders, testing showed that version of a flapper excluder was not effective for chum bycatch reduction.

What we were unable to do under EFP 08-02 was to evaluate the device tested in the final stage of work on EFP 08-02 in terms of its selectivity for chum salmon bycatch reduction. The final version of the flapper excluder differs from the earlier flapper excluders because it is installed further back in the trawl, a location where the flow of water down the trawl is slower because the excluder is located in the straight section of the trawl instead of a tapered section. Because the lower escapement rates for chums seen in our excluder research to date may be explained by differences in swimming behavior or ability, the final version excluder from EFP 08-02 may hold promise for reducing chum bycatch. Likewise, it will be worthwhile to evaluate how a reduction in the overhang of the flapper panel might increase chum escapement as well.

Finally, a long-suspected reason for the performance differences comparing Chinook and chum salmon is that chum may avoid swimming out the top portion of the trawl where escapement holes have been placed for all past excluder designs. The notion that chum are unlikely to swim out of top of the net comes from numerous comments from salmon fishermen who report that chum tend to dive to avoid their gill and seine nets. Should the first field season of tests involving the latest version of the flapper excluder show that the design is not very effective for chum (including with the reduction in overhang), a potential focus for the second field season might be to modify the current flapper excluder in conjunction with side escapement holes.

The re-design aspects to allow side escapement holes with a flapper excluder would not be trivial, however, and would likely require work in a flume tank prior to field testing. This is why work using side escapement holes would logically be best done during the second field season on chum in 2012. This would allow the first priority to be on the simpler, more easily modified aspects of the current excluder while at the same time setting the stage for more challenging work if it is needed in 2012.

Names of participating vessels, copies of vessel Coast Guard documents, names of vessel masters: For each stage of our field testing under the new EFP, the principal investigator will notify the Alaska Regional Administrator of NMFS (or his agent) in writing of the name of the vessel selected including associated document numbers. The principal investigator will also notify all relevant enforcement agencies of the vessel documentation and dates and area of operations for the EFP work. This will include ADF&G, NMFS, and the US Coast Guard.

Exemptions needed to regulations affecting regular pollock fishing during 2011 and 2012

1. While conducting EFP testing under this permit, the EFP vessel(s) must be exempted from the Non-Chinook Salmon ICA regulations (671.21g) and Chum Salmon Savings Area (CSSA) regulations. These exemptions are needed to allow the EFP field work to be conducted in areas where high salmon bycatch can be expected, as necessary.
2. Ability to do up to 100% of testing in the portion of the Sea Lion Conservation Area (SCA) normally open to pollock fishing as long as this area remains open for the regular pollock fishery.
3. Ability to conduct EFP testing with a catcher processor inside the Catcher Vessel Operations Area (CVOA) during B season. Catcher processors are normally excluded from this area in pollock B season, but at times the CVOA

has preferable conditions for EFP testing so an exemption to this regulation for our testing on catcher processors is needed.

4. Exemption from regular observer coverage requirements for vessels when participating in our salmon excluder EFP field tests. We need to be able to place up to two sea samplers working directly for the principal investigator and field project manager on vessels participating in this EFP. Additionally, we need to redirect sampling to concentrate on effects of the excluder on salmon and pollock catches. This is the same exemption we have had in the past salmon excluder EFPs.
5. All groundfish and salmon catches during the EFP will not count against the regular groundfish TACs or Chinook salmon bycatch caps per regulations at (679.21f) affecting the regular pollock fishery or other in-season salmon bycatch control measures in place for the regular pollock fishery (e.g. Chinook salmon IPA agreements promulgated under Amendment 94). Additionally, EFP chum salmon catches need to be exempted from the accounting for triggers to Chum Salmon Savings Area trigger amounts.

Proposed catch limits for the salmon excluder EFP

Field work season	MT of groundfish (in pollock target)	Number of Chinook salmon	Number of non-chinook salmon
Fall 2011	2,500	125*	2,500
Winter 2012	2,500	600	125*
Fall 2012	2,500	125*	2,500

*allowance of salmon species not normally taken as bycatch seasonally to avoid premature closure of EFP

In the past we have based the requested EFP catch allowances on a statistical power analysis fashioned from available catch data from the regular pollock fishery and limited by the lack of a concrete expectation for the proportional effect of the excluder. Accordingly, our EFP applications in 2005 and 2007 requested catch allowances that were designed around the objective of having a sufficiently high probability of detecting a 10% difference in proportion of effect (bycatch reduction via excluder) at the 95% level of statistical confidence. While impressive sounding, in fact our expectations for the number of chum or Chinook salmon captured per tow and the variability associated with that catch were based on rates from the regular pollock fishery even if our study was allowed to access bycatch hotspot areas closed to normal fishing operations. This was necessary because we lacked data that better represented our proposed testing inside salmon bycatch hotspots, where salmon catch rates were expected to be higher. Likewise, as no data or *a priori* expectation for proportional effect of any particular excluder design were available, our power calculations used a simple binary escape process with the most conservative escape proportion (0.5)[1]. So our early power analysis suffered from significant limitations.

Over time and with the experience of multiple field-testing seasons using recapture nets, we have established testing protocols that have effectively used the resources provided under the previous EFPs. For this reason, we feel that the power analyses used in previous EFP applications are somewhat obsolete but that relying on the same baseline catch amounts from recent EFPs is a better and more realistic basis for further work. With this in mind, our request for what we feel are sufficient pollock and salmon allowances for this EFP application is designed to assure a valid test for at least one configuration even under the worst case scenario of salmon availability and catch variability or gear problems. We feel this is achievable because we have been able to do this in the past. Additionally, in our field work experimental success indicators (i.e., variance around estimate, number of salmon observed) have been monitored until study managers are confident that a valid and useful performance evaluation has been achieved. The remaining catch allowances for the EFP have then been expended testing a secondary configuration whenever possible. Therefore our expectation for this EFP is that a minimum of one statistically precise test and possibly two can be achieved in one field season. Failing full completion of a second test, the partial second test generally would at least provide an indicator of whether the new modification pursues a useful direction.

This practical approach is particularly appropriate because the main focus on our new EFP shifts from Chinook to chum salmon. Applying recent results in a formal power analysis would only roughly approximate the new experimental parameters. In fact, we do know that excluders that have created useful selectivity results for Chinook salmon have not achieved similar results for chum salmon. This means that expectations for statistical power would only be as good as the degree of relevance between chum and Chinook bycatch and excluder performance.

Our experience with field testing of salmon excluders has shown that tests to evaluate Chinook salmon excluders comprising 12-15 tows under the EFP protocol have been successful in providing useful confidence intervals around estimates of mean escapement. This was the range of sampled tows originally estimated to be needed to attain the 200 observed salmon guideline[2] indicated by our earlier power analysis. Equally important,

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[1] Variance of proportion p [= p*(1-p)] is highest at 0.5 (=0.25). For comparison, Var (0.1) = 0.09 and Var (0.25) = 0.1875.

[2]Minimum number of salmon in a test from previous power analysis for 2003 EFP application, based on having a sufficient power to an 80% percent probability of detecting a 10% difference in proportion of effect from the underlying proportion of 0.5 with 95% statistical confidence (alpha =0.05), as described in Application (EFP 2003-01) Technical Support Document" as part of our 2005 EFP application.

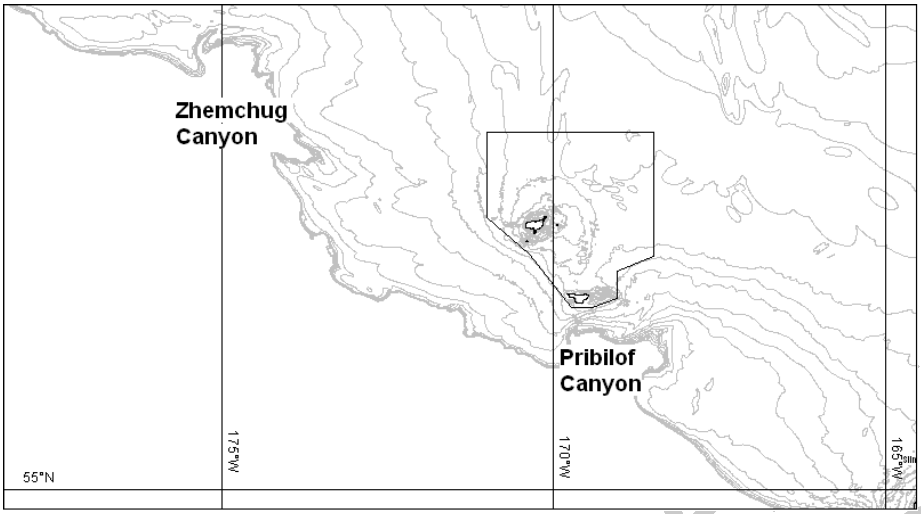
these 12-15 tows tended to provide a sufficiently wide range of fishing conditions (e.g., day/night, tow direction relative to weather and current, etc.) to represent the variability inherent in commercial fishing operations. Our protocols were designed to be representative of fishing in the regular pollock fishery in terms of the catch amounts (e.g. 80 to 100 mt of catch per tow) and fishing locations were selected to provide representative pollock catch rates and relatively high salmon bycatch rates. This is another reason why we have opted to continue our research using previous EFP catch limits and the amount of research obtained from them as guidelines for what can be accomplished during each field season under this new EFP.

Areas where EFP testing is expected to occur during fall (2011 and 2012) and winter 2012 testing: For valid tests of salmon excluders, we need to be able to conduct EFP testing in areas with sufficiently high concentrations of salmon to achieve our sample size objectives. We also need to conduct our testing where pollock catch rates are representative of actual fishing conditions. This is important for evaluating the effects of the excluder on pollock catch rates and salmon escapement rates under realistic conditions.

Predicting where adequate concentrations of salmon and pollock will occur from year to year is inherently difficult. For this reason, it is impossible to specify exactly where the EFP testing will occur for the fall testing in 2011 and 2012 directed at our primary objective of chum salmon selectivity. During earlier salmon excluder EFP tests, we have found suitable testing conditions in the northern portion of the Catcher Vessel Operations Area (CVOA) within and adjacent to areas that formerly were closed by regulation in the Pollock B Season. Previous EFPs have also successfully found adequate areas for testing for chum salmon escapement in the Horseshoe during late September and October. This could be ideal because it is relatively close to Dutch Harbor in case there are equipment failures or a need to obtain materials to repair our excluder or the recapture net.

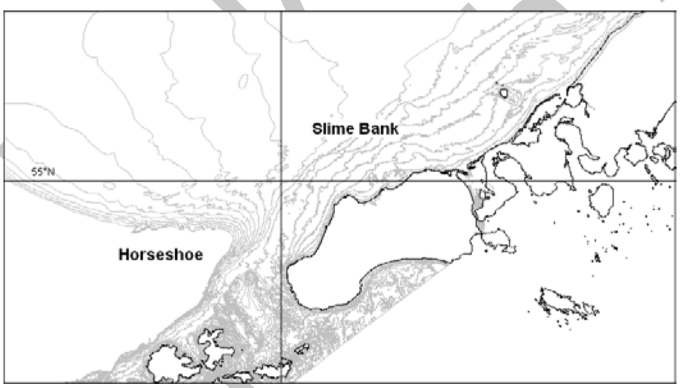
If suitable pollock and salmon conditions cannot be found in the CVOA or Horseshoe, then we may have to conduct testing on the shelf area adjacent the Pribilof no trawl zone or in the headlands of Pribilof or Zemschug Canyons. These areas are identified in Figure 2 below. In most cases, areas of the shelf between 80-200 fathom outside of the Pribilof Islands no trawl zone or at the headlands of the Bering Sea canyons would be where we would expect to find adequate concentrations of salmon and pollock. In years when the Bering Sea “cold pool” feature extends onto the shelf, pollock tend to school in the canyons themselves and in that case we might need to conduct testing in those canyons.

Figure 2: Common fishing areas around the Pribilof Islands



To address our secondary objective of potentially improving the effectiveness of the current excluder for Chinook salmon, our best guess is that Winter A Season in January 2012 EF P testing will occur somewhere in the areas known as the “Horseshoe” or the Slime Bank (see Figure 3 below). If these areas do not offer suitable conditions for the test, then winter testing could be conducted in the “Mushroom” area northwest of Unimak Pass or in the areas around the Pribilof Islands that are commonly used by the pollock fishery during the Winter A Season.

Figure 3: Common Winter A Season pollock fishing areas adjacent to Unimak Pass



Administration of the EFP: The administration of the EFP will follow the same procedures used for the previous salmon excluder EFPs by the same EFP researchers. The EFP applicant (permit holder) will be responsible for the overall responsibilities of the EFP including carrying out and overseeing all the field research and associated responsibilities of the EFP. This includes managing the field experiments to make sure that objectives of the EFP are accomplished and staffing field experiments with a qualified field project manager. The EFP applicant will also be responsible for working with the NMFS-certified observer provider companies to ensure the experiments utilize qualified sea samplers. The EFP applicant will ensure that sea samplers are provided with instruction and briefing materials to understand their sampling duties for the EFP. The EFP applicant will also prepare materials for and conduct periodic meetings to get feedback from pollock captains and gear manufacturers on excluder designs that will be tested during the EFP. The permit holder will present results from the different field work seasons to the pollock industry, North Pacific Fishery Management Council, and other venues to obtain feedback needed for development of the excluder designs. The permit holder will be responsible for data analysis and preliminary and final report drafting in consultation with Dr. Craig Rose of the Alaska Fishery Science Center. As with the earlier EFPs, decisions on gear modifications to be tested and field testing protocols will be the shared responsibility of the PI and co-investigators. Co-investigators on the overall project to develop a workable salmon excluder are Dr. Craig Rose of the Alaska Fishery Science Center and Mr. John Gruver of the United Catcher Boats Association.   Input from the pollock industry will help inform the decision process in terms of prioritizing designs to be tested and making adjustments as data from tests and video and sonar information become available. The permit holder will be responsible for informing the Alaska Region of National Marine Fisheries Service of field testing dates and required EFP vessel information prior to each field test. Additionally, the permit holder will be responsible for drafting "request for proposals" and other explanatory materials to solicit applications for qualified EFP vessels. The Resource Assessment and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center will review those applications and advise the EFP holder on which vessel(s) are best qualified to conduct the EFP testing.

Supplemental information for our EFP field testing plan: The most pressing area to address in continued work on salmon excluders is coming up with a workable excluder for chum salmon escapement. All excluder designs tested prior to EFP 08-02 have shown much lower chum escapement rates than for Chinook with the highest escapement of chum being about 12% from a tunnel and funnel-style excluder testing in 2003 and 2004. Those same excluders achieved between 25% to 43% Chinook escapement, albeit with routine problems from fish and jellyfish becoming pinned ahead of the square mesh excluder panel as explained in our EFP final reports. The difference in performance with chum and Chinook escapement from the same excluder design has never been understood. More recently with EFP 08-02, fieldwork in fall of 2009 also showed little or no useful selectivity for reducing chum salmon bycatch rates with a flapper excluder. That version of the flapper, however, was different from the final version with one of the most important differences being that it was located in the tapered section of the trawl intermediate and the final version was moved back into un-tapered section where water flow is lower.

Potential explanations for the excluder performance differences between chum and Chinook are that Chinook are stronger swimmers or that chum salmon behavior in response to the excluder is somehow different from Chinook. For the latter idea, several salmon fishermen contacted us to point out that chum salmon tend to dive in seine and gill nets. Their speculation is that chums would be reluctant to swim up and out of an escapement hole located in the top of the trawl. Most of our escapement holes have been in the top section although earlier excluders had escapement portals located in the upper portion of the sides and top of the trawl. We did in fact see higher escapement rates for chums in the earlier tests with escapement holes extending to the sides of the upper panels of the intermediate. Excluder designs have evolved so much since the earlier tests that it is hard to even speculate whether this suggestive difference is even meaningful at this point.

For our focus on chum salmon, the first logical step will be to see whether the final version of the excluder as tested in January/February 2010 provides useful selectivity for reducing chum salmon bycatch. The reason this is warranted is that the final excluder from EFP 08-02 is located in a part of the net with slower water flow than all other excluders tested in EFPs to date. Based on what is learned from that initial test and video observations accompanying that work, a modification to the current excluder might be to cut back the overhang (distance aft of the escapement hole that the flapper panel extends) to reduce the distance chum would need to swim forward to escape. Alternatively, the current escapement hole at the top of the trawl might be revised such that it extends to the sides to some degree. This matter is, however, not as simple as cutting a different type of escapement hole. The shape of the flapper excluder and how it is built into the trawl would mean that some design changes are needed to accommodate room at the sides for escapement. This is particularly true if the initial work suggests that side escapement holes would have to extend down very far towards the top riblines.

As a practical matter, the most efficient way to proceed would be to start with reducing the overhang to see if that creates useful results. If escapement at the sides is still an area of focus following the first tests, work in a flume tank to redesign the current flapper excluder to accommodate escapement at the sides would likely be needed. So that focus would logically be done as a second step and a trip to the flume tank would be probably be done to help inform that work because attempting to do that kind of shaping work in the field would likely be inefficient.

For our secondary objective of additional Chinook salmon bycatch reduction testing, fishermen remain interested in knowing whether the addition of artificial light above the escapement hole in the current flapper excluder would help improve escapement. The impetus for looking at how light affects escapement rates came about during the winter 2010 testing where daytime escapement rates per tow were nominally higher than nighttime rates. To examine this possibility, we attempted to evaluate how the addition of artificial light above the excluder escape portal increased escapement rates. This was done in the second EFP test on the Pacific Prince last winter. Interestingly, the average escapement rate did increase nominally to approximately 40% in that test but confidence intervals around that average escapement rate were not sufficient for us to conclude that a lighted escapement pathway actually increases Chinook escapement. So a clear priority is to do another test with a lighted pathway to see if that results in higher Chinook escapement.

Another logical place to focus for increasing Chinook escapement is to decrease the "overhang" of the flapper sheet relative to the back edge of the escapement hole. This would reduce the distance salmon need to swim forward to reach the escapement hole. A potential downside to this would be that pollock, which thus far have shown only limited ability to swim forward against the flow to reach the escapement portal may have a better opportunity to do so. The question is how much of an increase in pollock and salmon escapement would result and would the increase in salmon escapement justify additional pollock escapement?

A recapture net experiment is particularly well suited for addressing tradeoff regarding the reduction in salmon escapement and related increase in pollock escapement. As long as the change in the amount of overhang is made in a relatively small increment, the recapture net should be able to accommodate the increase in pollock escapement. In our experience, this is the best way to evaluate this kind of selectivity tradeoff; video alone or paired comparisons are unlikely to be able to efficiently measure the effect of these tradeoffs from small adjustments.

Field testing methods to address the above objectives for this EFP will be the same as those used in previous EFPs where recapture nets were used. Given our past experiences, we are now confident that use of the recapture net in conjunction with opportunistic video and sonar observations and data is the best overall method for gauging the performance of salmon excluders for the pollock fishery.

The detailed draft testing plan for this EFP is as follows:

<u>Fall 2011:</u>
Test with the current excluder to measure chum escapement and follow-up test with some amount of reduction in the flapper panel overhang as a second test if sufficient groundfish and salmon allowance remain after the first test. This test would likely involve use of a single testing vessel to avoid vessel-effects so that the results from the first and second tests are as comparable as possible.

<u>Winter 2012:</u>
The focus would be to evaluate whether adding artificial light or reducing overhang augments Chinook escapement rates. This test would logically involve two different testing vessels assuming that the 2010 results are the starting point for Chinook escapement and modifications to the device would reflect the difference in escapement rates for Chinook. So using the baseline from the Pacific Prince from 2010 testing (35% escapement in the first test without artificial light), we might test the escapement rate with artificial light set up to illuminate above the escapement hole. On the second vessel, we might conduct a test with the flapper panel that extends back less that the current excluder based on what was tested in winter 2010.

<u>Fall 2012:</u>
Depending on what was learned from the first test on chum in 2011, the fall 2012 work would evaluate additional cut back in flapper panel's overhang or escapement portals cut

into the sides of the intermediate. Either one or two test vessels may be needed for the fall 2012 tests. If the focus was on whether the excluder design was workable for vessels with different towing power or other differences in fishing characteristics of nets used by different types of pollock vessels, then two different vessels would be used for the test. If the test was focused on a large change to the excluder, such as escapement portals in the sides of the trawl, then the preference may be for one test vessel and two different sets of side escapement portals to evaluate the differences in chum and pollock escapement.