INITIAL REVIEW DRAFT

ENVIRONMENTAL ASSESSMENT / REGULATORY IMPACT REVIEW /
INITIAL REGULATORY FLEXIBILITY ANALYSIS

For a proposed Amendment to the
Fishery Management Plan for Groundfish of the Gulf of Alaska

Chinook Salmon Prohibited Species Catch in the Gulf of Alaska Non-Pollock Trawl Fisheries

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North Pacific Fishery Management Council
605 W. 4th Avenue, Suite 306
Anchorage, Alaska 99501
Tel: (907) 271-2809

Executive Summary

This document analyzes proposed management measures that would apply to all trawl fisheries in the Central and Western Gulf of Alaska (GOA), except the directed pollock fishery. The measures under consideration include: setting prohibited species catch (PSC) limits in the Central and Western GOA for Chinook salmon (*Oncorhynchus tshawytscha*), which would close fisheries in those regulatory areas once attained, and full retention of salmon species. Implementation of the management measures evaluated in this analysis would require an amendment to the Fishery Management Plan for Groundfish of the Gulf of Alaska (GOA Groundfish FMP), as well as amendments to implementing regulations.

Problem Statement

The Council adopted the following problem statement in February 2012.

> *Magnuson-Stevens Act National Standards require balancing achieving optimum yield with minimizing bycatch, while minimizing adverse impacts on fishing dependent communities. Chinook salmon prohibited species catch (PSC) taken incidentally in GOA trawl fisheries is a concern, and incidental take is limited in the Biological Opinion for ESA-listed Chinook salmon stocks. The Council recently adopted a PSC limit of 25,000 Chinook salmon for the Western and Central GOA pollock trawl fisheries, while also indicating an intent to evaluate Chinook salmon bycatch in the non-pollock GOA trawl fisheries, which currently do not have a Chinook salmon bycatch control measure.*

Description of the Alternatives

The alternatives that are analyzed in this amendment package were approved by the Council in February 2012; they are listed below and detailed in the sections that follow. These alternatives propose management measures that would apply exclusively to the directed non-pollock trawl fisheries in the Western and Central Gulf of Alaska.

Alternative 1: Status quo.

Alternative 2: 5,000, 7,500, 10,000, or 12,500 Chinook salmon PSC limit (hard cap).
- Option 1: Apportion limit between Central and Western GOA.
- Option 2: Apportion limit by operational type (CV vs. CP).
- Applies to both options: Apportion proportional to historic average bycatch of Chinook salmon (5- or 10-year average).

Alternative 3: Full retention of salmon.
Vessels will retain all salmon bycatch until the number of salmon has been determined by the vessel or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed.

Note, both Alternative 2 and Alternative 3 could be selected by the Council in their preferred alternative. Likewise, under Alternative 2, both Option 1 and Option 2 could be selected by the Council.

Table ES-1 provides the proposed PSC limits for the non-pollock trawl fisheries under Alternative 2, and each option to Alternative 2.

Table ES-1 Proposed PSC limits for non-pollock trawl fisheries, under Alternative 2 and Options 1 and 2

			5-Year Average (2007 to 2011)					10-year Average (2002-2011)				
			%	12,500	10,000	7,500	5,000	%	12,500	10,000	7,500	5,000
Alt. 2	All GOA (W&C)		100%	12,500	10,000	7,500	5,000	100%	12,500	10,000	7,500	5,000
Option 1	WGOA		8%	997	797	598	399	18%	2,210	1,768	1,326	884
	CGOA		92%	11,503	9,202	6,902	4,601	82%	10,291	8,232	6,174	4,116
Option 2	All GOA (W&C)	Catcher Vessels	52%	6,460	5,168	3,876	2,584	49%	6,104	4,883	3,662	2,442
		Catcher Processors	48%	6,039	4,831	3,623	2,416	51%	6,397	5,118	3,838	2,559
Options 1 & 2	WGOA	Catcher Vessels	1%	86	69	52	35	5%	606	485	363	242
		Catcher Processors	7%	910	728	546	364	13%	1,604	1,284	963	642
	CGOA	Catcher Vessels	51%	6,374	5,099	3,824	2,549	44%	5,498	4,399	3,299	2,199
		Catcher Processors	41%	5,129	4,103	3,077	2,052	38%	4,792	3,834	2,875	1,917

Environmental Assessment

Groundfish

Under the status quo, groundfish stocks are not overfished nor approaching an overfished condition. A lower hard cap may result in the fishery closing before the TACs are reached, while a higher hard cap would allow for groundfish fishing at current levels, and impacts would likely be similar to the status quo fishery. If the groundfish TACs are not fully harvested, fishing will have less impact on the stocks, and there will be no adverse impact on the groundfish stocks from the fishery. Any changes in fishing patterns that may result from the alternatives, however, would be monitored and updated in future stock assessments.

Chinook salmon

The non-pollock trawl fisheries have an adverse impact on Chinook salmon through direct mortality due to PSC. Under the status quo, there are no additional management measures to reduce PSC of Chinook salmon in the GOA non-pollock trawl fisheries, however, Chinook salmon are a prohibited species, and it is incumbent upon fishermen, under the regulations, to avoid catching Chinook salmon. The average PSC for the non-pollock trawl fisheries is 6,176 Chinook salmon over the last ten years. 2003 and 2010 were the years of highest Chinook salmon PSC over this time period, with catches of 10,877 and 9,694 Chinook salmon, respectively.

Since 2007, there have been poor or below average Chinook salmon runs in Western Alaska. In 2012, all monitored Chinook salmon runs in the GOA were below average. The Chinook salmon stock composition of the GOA non-pollock trawl fishery PSC is not available, however the GOA groundfish fisheries have been documented to catch Chinook salmon both from Southeast Alaska and Cook Inlet, in the GOA. It is not possible to draw any correlation between patterns of PSC and the status of salmon stocks, especially given the uncertainty associated with estimates of PSC in the groundfish fisheries, and the lack of data on river of origin of Chinook salmon PSC. This results in the inability to discern and accurately describe small scale impacts on particular individual stocks; nonetheless, we understand that setting PSC limits will likely reduce the potential to impact salmon stocks in the aggregate, and therefore are more likely to be beneficial to Chinook salmon stocks as a whole compared to status quo. There is also no evidence to indicate that the groundfish fisheries' take of Chinook salmon is causing escapement failures in Alaska rivers. Since 2011, efforts have been underway to improve genetic sampling of salmon PSC in the GOA

pollock fishery, which should, in time, allow for a better understanding of the stock composition of PSC in that GOA trawl target fishery. While it is not one of the target fisheries that is subject to the PSC limits that are currently under consideration, the pollock target fisheries occur in similar geographical areas, and with a somewhat similar gear type, to the non-pollock trawl fisheries. As such, understanding the stock composition of PSC in that fishery would provide an additional perspective on the non-pollock trawl fisheries' Chinook salmon PSC.

Alternative 2 would establish a PSC limit that would be an upper limit on the PSC of Chinook salmon in the GOA non-pollock trawl fisheries in the Western and Central GOA. This limit would represent an upper threshold of Chinook salmon PSC in the GOA non-pollock trawl fisheries, as the non-pollock trawl fisheries will be closed when the limit is reached. The Regulatory Impact Review evaluates the PSC limit retrospectively, to see how many Chinook salmon would not have been caught had the cap been in place, and a summary is provided in Table ES-2. Note, however, that the PSC limit and potential salmon savings in years of higher Chinook salmon PSC do not translate directly into adult salmon that would otherwise have survived to return to its spawning stream. Salmon caught as PSC in the GOA groundfish trawl fisheries are generally immature salmon, with an average weight varying between 5 and 9 pounds. Some proportion of the Chinook salmon caught as PSC would have been consumed as prey to other marine resources, or been affected by some other source of natural or fishing mortality. In the GOA non-pollock trawl fisheries, data is not available to assess (a) how many of the intercepted salmon were likely to have returned to their streams as adults, and (b) to which river system or region they would likely have returned. It is assumed that the non-pollock trawl fisheries could be catching Chinook salmon that originate from anywhere in Alaska or elsewhere, and it is not possible to estimate the proportion any stock has contributed to the Chinook salmon PSC. Therefore our ability to assess the impacts of reducing salmon PSC on salmon populations is constrained.

Table ES-2 Number of years the fishery would have closed under the PSC limits and Alternative 2 options, applied retrospectively to 2003 to 2011, and range of estimated salmon savings that could have occurred in a single year.

PSC Limit	GOA-wide		Option 1 - by regulatory area		Option 2 - by operational sector		Options 1 & 2 combined	
	Number of years closed	Salmon savings	Number of years closed	Salmon savings	Number of years closed	Salmon savings	Number of years closed	Salmon savings
12,500	0	0	0-4	0-502	0-1	0-113	0-4	0-554
10,000	1	0-1,057	0-4	0-1,102	0-1	0-754	0-4	0-1,732
7,500	2	0-2,384	2-4	0-2,704	2-3	0-1,918	0-5	0-2,372
5,000	6	0-3,361	4-6	0-3,598	4-6	0-3,893	0-7	0-4,415

Note, due to confidentiality restrictions, the salmon savings are estimated using the week the closure would have occurred in a particular year (2003 to 2011), and applying that closure to a characteristic or average year representing 2003 to 2011.
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

Nonetheless, it is possible to develop general conclusions for the action that is being proposed. If Chinook salmon PSC is reduced in some years as a result of this action, it would likely have beneficial impacts on Chinook salmon stocks, and the harvesters and consumers of Chinook salmon, compared to the status quo. With a PSC limit in place, it is possible that Chinook salmon PSC may be curtailed in years of otherwise high PSC, such as 2003. To the extent that Alternative 2 reduces a source of direct mortality on Chinook salmon stocks, the impact to Chinook salmon overall is likely to be beneficial.

Under a PSC limit, and especially if the attainment of the threshold appears to be imminent, the non-pollock trawl fleet may be active in making efforts to avoid high PSC rates, in order to preserve the opportunity to fully harvest the groundfish TACs. Efforts to avoid Chinook PSC could take a variety of forms. Particularly at the outset, these efforts may have limited effect, as participants have little

understanding of the means of avoiding Chinook PSC. Yet, the adoption of a Chinook PSC limit likely will prompt efforts to gain better information concerning Chinook avoidance, improving the ability of participants to avoid Chinook in the long run. The extent of any redistribution of effort is difficult to predict and will depend not only on the distribution of Chinook salmon catch rates on the fishing grounds and the participants' ability to accurately estimate Chinook salmon catch rates, but also participants' flexibility to alter their temporal and spatial fishing behavior. It is possible that shifting the spatial or temporal distribution of the non-pollock trawl fisheries may impact some particular Chinook salmon stocks more than others, but as we do not currently know how effort may shift in the non-pollock trawl fisheries, nor the stock composition of Chinook salmon PSC, this impact is not possible to assess.

Under Alternative 2, it appears unlikely that Chinook salmon PSC would increase from the status quo. Any impact to the Chinook salmon stocks as a whole, is likely to represent either no change from the status quo, or to be beneficial, as PSC levels either remain the same or are reduced. None of the options considered under Alternative 2, would have a significant adverse impact to Chinook salmon stocks.

Other Resource Components

Under the status quo, marine mammal and seabird disturbance and incidental take are at low levels and are mitigated by seasonal and spatial restrictions on the GOA non-pollock trawl fisheries. Under the alternatives, disturbance or incidental take is not expected to increase to a level that would result in population level effects on marine mammals or seabirds. In years where the hard cap constrains fishing, Alternative 2 may reduce the potential effects of the fishery on prey availability. If the fleet spends longer time fishing in areas with lower catch rates to avoid salmon, there may be some increase to benthic habitat impacts and potential removals of marine mammal and seabird prey. However, this increase is unlikely to result in population level effects.

Previous analyses have found no substantial adverse effects to habitat in the GOA caused by fishing activities (NMFS 2005b). A constraining hard cap may reduce any effects on habitat that are occurring under the status quo, however any effects continue to be limited by the amount of the groundfish TACs and by the existing habitat conservation and protection measures. Overall, the combination of the direct, indirect, and cumulative effects on habitat complexity for both living and non-living substrates, benthic biodiversity, and habitat suitability is not likely to be significant under any of the alternatives.

Regulatory Impact Review

Alternative 1

Selecting the status quo alternative would maintain the current regulations in the action area. Directed GOA non-pollock groundfish trawl fisheries would not be closed due to the attainment of a Chinook salmon PSC hard cap. Fishery closures would only occur if the TAC had been fully harvested, if Pacific halibut PSC limits had been reached, or in accordance with prescribed season end dates. Under existing regulation, while the fisheries would not close due to the fulfillment of Chinook salmon PSC allowances, it is still incumbent upon fishery participants to avoid catching Chinook salmon to the extent practicable.

Maintaining current GOA groundfish regulations should not impact annual harvest in the non-pollock directed fisheries. Over the last decade, harvests of GOA Pacific cod, flatfish, and rockfish have not significantly increased or decreased, and are typically constrained by TACs or halibut PSC limits. Despite this relative consistency, it is possible that harvests may decline in future years in these fisheries (with the exception of the Central GOA rockfish fishery) if reductions in halibut PSC limits result in fishery closures. Rockfish Program participants will have an advantage in being able to time their fishing to maintain their shares in other target fisheries, knowing that their rockfish allocations are secure.

Chinook salmon PSC and PSC rates (the number of Chinook salmon caught per metric ton of groundfish) have varied annually and with no distinct trend, during the analyzed 2003 to 2011 historical period. Future Chinook PSC levels are unpredictable, as are the timing and location of high trawl-Chinook interactions. Individuals, businesses, and communities that benefit from the use or existence of Chinook salmon will continue to rely on the non-pollock groundfish fleet to minimize their PSC through voluntary measures. In the absence of PSC limits, however, independent vessels participating in increasingly competitive fisheries may lack the incentives to stop fishing in an area with high Chinook salmon PSC. The recent trend of increasing participation in non-pollock groundfish trawl fisheries may limit the ability of vessels to voluntarily avoid Chinook PSC, independently or as part of cooperative agreements, without risking the loss of target catch to vessels that do not avoid Chinook PSC. If other participants continue to fish at high rates of Chinook PSC, vessels that reduce their own catch by taking salmon avoidance measures would earn less gross revenue (and likely net revenue).

The status quo alternative would not require unobserved vessels to retain Chinook salmon on board until they can be biologically sampled at shoreside facilities. Vessels carrying an observer would still be required to retain Chinook until sampling and data collection could occur. The number of vessels in the full observer coverage category is set to increase in 2013, but observer duties will not change from their present definition, which does not always allow for biological sampling of Chinook salmon. Alternative 1 would not greatly enhance the understanding of the stock origins of Chinook salmon taken as non-pollock groundfish trawl PSC.

Alternative 2

Alternative 2 would establish an annual Chinook salmon PSC limit for the GOA non-pollock groundfish trawl fisheries. As noted in the Description of Alternatives, this hard cap could be applied to the GOA non-pollock trawl fleet as a whole, or apportioned to subdivisions of the fishery according to either a 5-year or 10-year Chinook salmon PSC history. Full usage of the Chinook PSC limit would trigger the closure of directed trawl fishing in the GOA, the regulatory area (Central or Western GOA), or the operational sector (CP or CV), depending on how the limit is apportioned.

The Regulatory Impact Review uses a retrospective approach to assess the potential impact of a Chinook PSC limit on non-pollock groundfish trawl harvests. Table ES-3 reports the number of years (from 2003 to 2011) in which the proposed permutations of a Chinook salmon hard cap would have caused a fishery closure. The number of years (out of the nine analyzed) in which a PSC closure would have occurred varies across the Alternative 2 Chinook PSC limit and apportionment options. Both the amount and time-distribution (throughout the calendar year) of Chinook salmon PSC and non-pollock trawl harvests varied annually. As a result, the range of maximum potential direct harvest impacts is large. Direct harvest impacts are defined as the amount of target species harvest that occurred in the weeks after a back-cast PSC closure would have occurred, and thus would not have been harvested if a given PSC limit were in place. Table ES-4 includes the maximum and minimum amount of harvest that would have been forgone under each permutation of Alternative 2. None of the proposed options would have caused a PSC closure in all nine analyzed years, meaning that the minimum direct impact on non-pollock trawl harvest is always zero.

Table ES-3 Number of years (2003 to 2011) during which a trawl fishery closure would have occurred under the analyzed Chinook salmon PSC limits and apportionments thereof

		Total GOA PSC Limit							
		12,500	10,000	7,500	5,000	12,500	10,000	7,500	5,000
Alternative 2	Gulf-wide	0	1	2	6				
	Subdivision	**5-year History**				**10-year History**			
Option 1	Central GOA	0	0	2	6	0	2	3	6
	Western GOA	4	4	4	5	0	2	3	4
Option 2	Catcher/Proccesors	1	1	2	6	0	1	2	6
	Catcher Vessels	0	0	3	4	0	1	3	5
Options 1 & 2	CGOA CP	0	1	2	6	0	1	2	6
	CGOA CV	0	0	2	4	0	2	3	7
	WGOA CP	4	4	4	5	3	3	4	4
	WGOA CV	4	4	5	5	0	0	0	0

Table ES-4 Range of estimated forgone harvest impacts under Alternative 2 options, applied to a characteristic year representative of 2003 to 2011

PSC Limit	GOA-wide		Option 1 - by regulatory area		Option 2 - by operational sector		Options 1 & 2 combined	
	Number of years closed	Forgone Harvest (mt)	Number of years closed	Forgone Harvest (mt)	Number of years closed	Forgone Harvest (mt)	Number of years closed	Forgone Harvest (mt)
12,500	0	0	0-4	0-7,437	0-1	0-1,222	0-4	0-6,774
10,000	1	0-11,181	0-4	0-14,562	0-1	0-17,333	0-4	0-23,047
7,500	2	0-38,351	2-4	0-39,382	2-3	0-32,786	0-5	0-34,642
5,000	6	0-42,208	4-6	0-42,700	4-6	0-50,601	0-7	0-50,977

Note, due to confidentiality restrictions, the harvest impacts are estimated using the week the closure would have occurred in a particular year (2003 to 2011), and applying that closure to a characteristic or average year representing 2003 to 2011.
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Table ES-5 reports the maximum gross first wholesale revenue that would be forgone if the GOA experienced the maximum estimated harvest losses reported above. The estimates in Table ES-5 represent the high end of the harvest impact range (reported in Table ES-4) multiplied by the 2011 average first wholesale value per metric ton for all GOA non-pollock target species ($1,366/mt).[1]

Table ES-5 Maximum estimated forgone gross first wholesale revenue under Alternative 2 options, using 2011 average non-pollock groundfish value per mt

PSC Limit	Estimated maximum gross first wholesale revenue impact (2011$)			
	GOA-wide	Option 1 - by regulatory area	Option 2 - by operational sector	Options 1 & 2 combined
12,500	0	10,158,942	1,669,252	9,253,284
10,000	15,273,246	19,891,692	23,676,878	31,482,202
7,500	52,387,466	53,795,812	44,785,676	47,320,972
5,000	57,656,128	58,328,200	69,120,966	69,634,582

Because historical annual Chinook PSC has varied from year to year, apportioning a PSC limit by either a 5-year or 10-year PSC history can affect the range of target harvest impacts facing a given regulated area

[1] 2011 average first wholesale value per metric ton was computed at the trip report level. As a result, the $/mt values for trip targets that had fewer records (e.g rex sole) are not weighted equal to the value of trip targets that comprised a greater proportion of the year's harvest (e.g. arrowtooth flounder or rockfish).

or operational sector. The Western GOA fishery recorded lower PSC levels during the most recent 5 years, so apportionment on a 5-year basis would result in a lower Chinook PSC allowance for the Western GOA. As expected, a lower Chinook allowance results estimates of earlier PSC closures and larger amounts of forgone harvest. The Western GOA would receive a relatively larger share of Chinook PSC if a 10-year apportionment basis is selected, meaning that estimated PSC closures would occur relatively earlier and in more years for the Central GOA (compared to a 5-year basis under the same total Chinook PSC limit). The choice between a 5-year and a 10-year historical PSC apportionment period makes less of a difference if the total GOA PSC limit is apportioned only between the CV and CP sectors. If Chinook PSC is apportioned to operational sectors within each regulatory area, the choice of historical basis period makes a great difference to the Western GOA CV sector. Western GOA CV trawlers recorded very low amounts of Chinook PSC during the most recent 5 years, so using only those years as a basis would make their Chinook salmon allowance very low, leading to estimates that would preclude a high percentage of their groundfish harvests.

The timing of fishery closures caused by Chinook salmon PSC impacts each of the GOA non-pollock target fisheries differently. 60% of the GOA Pacific cod fishery is harvested during the A-season in the early part of the fishing year; generally, only the smallest Chinook PSC apportionments trigger closures that would preclude this catch. On the other end of the spectrum, a large proportion of the GOA flatfish fisheries (especially shallow water flatfish, which are primarily harvested by Central GOA catcher vessels) are prosecuted late in the year. So, flatfish harvests (and the Central GOA CV sector) are affected by a wider range of the considered PSC limit and apportionment options. The GOA rockfish fisheries are primarily prosecuted between May and August, but the timing of fishing differs by regulatory area and operational type sector. The number of Alternative 2 options that could curtail a sector's rockfish harvest varies accordingly; sectors that begin fishing rockfish later in the year – namely, the CP sectors – are more likely to lose a greater percentage of their typical harvest to a Chinook PSC closure. If members of this sector expect a Chinook PSC closure, they may harvest their allocations earlier in the year.

In addition to potential reductions in the amount of non-pollock groundfish harvested, setting a Chinook salmon PSC limit may alter fishermen's in-season behavior, potentially causing them to incur additional costs or to impose costs on others. Vessels that typically participate in GOA fisheries later in the year may decide to fish earlier, in an attempt to reduce exposure to PSC-related fishery closures. Vessels may also alter the timing of their participation in order to fish during times of lower expected Chinook salmon encounter. Fishermen's ability to alter the timing of their participation may, however, be limited by the other fisheries in which they choose to participate. Fishermen's ability to delay participation in order to reduce expected Chinook salmon PSC may be limited by the decisions of other vessels that do not attempt to avoid PSC. Vessels may also deviate from their historical area participation patterns. These participation patterns will differ based on the options selected by the Council. For example, under a Gulf-wide limit, a vessel that typically fishes an area during a time period with high PSC rates may instead choose to fish in areas where expected PSC rates are lower. On the other hand, if separate PSC limits are established for the different regulatory areas, vessels may move opportunistically between regulatory areas in anticipation of closures. A vessel that historically only fished in one area may choose to move between two areas, if it perceives an opportunity to gain an increased share of total harvests. Fishermen's ability to alter their historical spatial participation pattern may be limited by the permits that they possess, or by their access to processing facilities, among other factors. To the extent that a PSC limit incentivizes competition between vessels to harvest available groundfish before a potential fishery closure, a hard cap may reduce the instances of voluntary coordination to avoid Chinook salmon.

In-season management of a Chinook salmon PSC limit may require NOAA Fisheries to temporarily suspend, and then re-open, fishing in order to fully utilize available TAC within the confines of a hard cap. Temporary closures could impose additional transit costs on vessels, as well as time costs that may affect vessel and crew opportunities to participate in other fisheries.

Shoreside non-pollock groundfish processors may be affected by a Chinook salmon PSC limit that could reduce harvest from fisheries, shorten the length of fishing seasons, or concentrate deliveries into shorter periods of time. Because the time-distribution of Chinook salmon PSC varies from year to year, it is difficult to anticipate the effects of the limit on fishery closures and season lengths. Processors that utilize outside labor may find it difficult to anticipate their labor demand over the course of the year, and could potentially incur additional costs from underutilized labor or increasing their workforce size in response to intensifying effort in the fisheries. Fishery closures and the associated reduction in the amount of deliveries could increase processors' per unit cost of production, which, in extreme cases, could result in an operating loss if processing revenues fall short of the amount needed to meet fixed capital costs. To the extent that vessels alter their spatial pattern of participation, processors could see some amount of the product that they historically receive being delivered to processors in another area. Finally, uncertainty about the amount of groundfish that will be harvested in a hard capped fishery could limit processors' ability to pre-contract their expected production. The effect of these impacts on total processor profitability would likely vary depending on the amount of total production that a processor generates from fisheries that are not included in this action.

Because the causal link between trawl Chinook salmon PSC and the number of Chinook salmon available to Alaskan users is undeveloped, this analysis does not attempt to monetize the effect of Chinook PSC limits on commercial salmon harvesters, subsistence users, or sport fishermen. The Regulatory Impact Review does estimate the potential reduction in non-pollock trawl Chinook PSC under a hard cap. The range of potential salmon savings is reported earlier in the Executive Summary, under the Chinook salmon heading.

Alternative 3

Alternative 3 would require full retention of Chinook salmon by all unobserved non-pollock trawl vessels. Beginning in 2013, under the restructured observer program, most CP vessels will be in the full coverage category, and will always have an observer onboard. In the case of CVs, requiring Chinook salmon to be brought to shore when an observer is not present on board, is not expected to impact deck operations, or to be onerous in terms of utilizing hold space.

Requiring full Chinook salmon retention on unobserved trips could, at some point in the future, increase the amount of biological sampling that occurs on Chinook salmon, and advanced understanding of the stock origin of Chinook salmon taken as PSC will improve managers' ability to assess both impacts on Chinook salmon users and net benefits to the nation. However, as described in the management and enforcement considerations section, the implementation of this alternative as currently considered in the analysis would not result in more genetic data, as it would not allow NMFS to take systematic samples from a census of salmon PSC, in accordance with its current sampling approach.

Management and Enforcement Considerations

Alternative 1

Vessels participating in the non-pollock GOA trawl fisheries sort their catch extensively at sea, because of a larger amount of unmarketable bycatch. Because a large amount of sorting occurs at sea and the observers are unable to monitor this sorting while engaged in other sampling duties, it is extremely difficult to verify that no salmon PSC have been discarded at sea. Unlike the CV pollock vessels, there is a high likelihood that salmon PSC has been sorted from the catch prior to delivery. Offload counts of salmon PSC are not possible in these fisheries because of the amount of sorting that occurs in these fisheries. Therefore, PSC estimates from CVs in other GOA trawl fisheries are all derived from at-sea

samples. Biological data are not collected at sea or shoreside from fish outside of the observers' composition samples.

Sampling methods used on catcher/processors (CPs) allow observers to collect larger samples under more controlled conditions than CVs because the observer is able to collect samples downstream of the fish holding tanks, just prior to the catch sorting area that precedes the fish processing equipment. Additionally, on many CPs that are in the CGOA Rockfish and Amendment 80 Programs, the observer has access to catch weighing scales and an observer sampling station.

Chinook salmon PSC estimates from trawl CP and non-pollock trawl CV fisheries in the GOA are based on at-sea sampling for salmon. NMFS uses the at-sea samples on observed trips and extrapolates the sample to the week (CP) or trip (CV). These estimates are used to create PSC rates that are applied to unobserved vessels. There is a relationship between the abundance of given species in a haul, sample size, and the level of precision in the resulting estimate of species catch from sampling. In general, we can have very high precision in the catch estimate for common (target species) with very small samples of the haul. Conversely, even extremely large samples of a haul provide relatively imprecise estimates of catch for very rare species, such as Chinook salmon.

In addition, from an inseason management perspective, the PSC rates change as additional observer information is obtained. This creates temporal variation in Chinook salmon PSC estimates, resulting in a high degree of uncertainty associated with inseason management of Chinook salmon PSC limits.

Alternative 2

For a PSC limit to be effective, estimation of PSC needs to be credible to create incentives at the vessel level for Chinook salmon and other PSC avoidance. For CVs, this action will not incorporate sophisticated management and enforcement protocols for estimating a rare species such as Chinook salmon, such as those implemented under Amendment 91 in the Bering Sea, since the catch monitoring infrastructure does not exist in the GOA to the same degree that it did in the Bering Sea when Amendment 91 was being developed. Additionally, as described in the status quo, almost all of the catch in non-pollock fisheries is sorted at-sea and the offload sampling of salmon PSC used in the GOA pollock trawl fishery is not a viable option for vessels in the non-pollock CV trawl fisheries. Thus, the PSC estimates for CVs will be based on at sea samples. For CPs it could be possible to incorporate a suite of monitoring requirements under this action to enable PSC census sampling. However, unlike Amendment 91, the basic monitoring requirements are not in place for CPs across the entire GOA. The monitoring that would be required to implement a census on CPs would include: flow scales, 200% observer coverage, observer sampling stations, video monitoring, salmon storage container, reporting of salmon PSC in electronic logbook, and census counting. These monitoring requirements would impose large costs on the industry without the benefit and management infrastructure of a catch share program. Even under Amendment 91, NMFS has concerns with the adequacy of the monitoring and the enforceability of the program, especially in years of high PSC. In an open access fishery, there would be very little incentive to reduce PSC, and high incentive to bias PSC accounting.

In summary, for both CPs and CVs, this action attempts to implement a high-precision management tool in fisheries with very little monitoring infrastructure to support precise PSC estimates and is highly susceptible to introduction of intentional bias into salmon PSC estimation.

NMFS' ability to manage Chinook salmon PSC limits in the GOA non-pollock fisheries is likely to be difficult for several reasons. As such, NMFS would likely need to take a conservative inseason management approach and there is likely to be constraints on the ability of the fleet to fully harvest target species, especially in fast-paced fisheries and in years of high PSC. In addition to posing risk for inseason

management, the PSC limit may be ineffective in reducing salmon PSC in the non-pollock fisheries. The salmon PSC limits proposed under this alternative may prevent harvesters from being able to fully prosecute the target fisheries and this increases incentives for vessels to misreport or under report the amount of salmon caught. Additionally, without the management structure of a catch share program, vessels do not have the incentives to move from an area of higher salmon PSC if the race for fish still exists, particularly in high-paced fisheries.

The current alternatives do not include an option to apportion Chinook salmon PSC limits by non-pollock targets or between the CGOA Rockfish Program and the rest of the non-pollock fisheries. The Central GOA rockfish directed fisheries are managed under the Rockfish Program, a catch share, and participants in cooperatives have tools to reduce Chinook salmon PSC that are not available for vessels not in cooperatives. A Chinook salmon PSC limit for the aggregate non-pollock fisheries could close the Rockfish Program directed fisheries, and this would undermine the Rockfish Program.

Alternative 3

In non-pollock CV trawl fisheries, such as flatfish or Pacific cod fisheries, sorting at sea is very common and some vessels have conveyor systems on deck to facilitate this sorting. Unlike the pollock fishery, the likelihood that full retention of salmon PSC would occur in the non-pollock trawl fisheries aboard vessels without an observer is highly unlikely given the incentives to under-report salmon PSC. The full retention of salmon PSC requirement may be more effective aboard vessels that are required to carry an observer at all times and have some of the monitoring tools (increased observer coverage, flow scales, CMCPs, observer sampling stations) necessary to monitor and enforce a full retention requirement, such as CGOA Rockfish Program CVs and CPs. However, even in these programs, NMFS will have no way of verifying that full retention of salmon has occurred aboard unobserved vessels. Therefore, NMFS would continue to calculate Chinook salmon PSC numbers and manage a PSC cap for Chinook salmon using the existing system of extrapolating PSC rates from observed vessels to the unobserved portion of the fleet

The operational characteristics of the pollock fishery allow full retention of salmon and thus collection of genetic samples following sampling methods developed for the Bering Sea (Pella and Geiger 2009). However, this sampling method does not lend itself to the operational characteristics and current monitoring protocols of non-pollock CV fisheries in the GOA, with the potential exception of the Rockfish Program. The Rockfish Program requires 100% observer coverage, and deliveries are monitored by NMFS staff, which would allow observers to verify full retention and NMFS staff could collect genetic samples at offload.

Roadmap to the Document

The document begins by describing the purpose for this amendment (Section 1) and a description of the alternatives (Section 2). The Environmental Assessment is in Section 3, and discusses the environmental impacts of the proposed action and alternatives for the environmental assessment. Section 4 contains the Regulatory Impact Review, and provides background information for the economic analysis, describes how fleet behavior may change as a result of the alternatives, and evaluates the economic and socioeconomic impacts of the action. The management and enforcement considerations for this action are addressed in Section 5. Section 6 contains the Initial Regulatory Flexibility Analysis, which evaluates the impact of the action on small businesses. Sections 7 and 8 discuss the alternatives with respect to the requirements of the Magnuson-Stevens Fishery Conservation and Management Act and other analytical considerations.

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List of Acronyms and Abbreviations

‘	feet
AAC	Alaska Administrative Code
ABC	acceptable biological catch
ADF&G	Alaska Department of Fish and Game
AEQ	adult equivalent
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AGDB	Alaska Groundfish Data Bank
AKFIN	Alaska Fisheries Information Network
ANILCA	Alaska National Interest Lands Conservation Act
BASIS	Bering Sea-Aleutian Salmon International Survey
BEG	biological escapement goal
BOF	Board of Fish
BSAI	Bering Sea and Aleutian Islands
CAS	Catch Accounting System
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COAR	Commercial Operators Annual Report
Council	North Pacific Fishery Management Council
CP	catcher/processor
CV	catcher vessel
CWT	coded-wire tag
DPS	distinct population segment
E	East
E.O.	Executive Order
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	endangered species unit
FMA	Fisheries Monitoring and Analysis
FMP	fishery management plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRFA	Final Regulatory Flexibility Analysis
ft	foot or feet
GHL	guideline harvest level
GOA	Gulf of Alaska
ID	Identification
IRFA	Initial Regulatory Flexibility Analysis
IPA	Incentive Plan Agreement
IQF	individually quick frozen
JAM	jeopardy or adverse modification
lb(s)	pound(s)
LEI	long-term effect index
LLP	license limitation program
LOA	length overall
m	meter or meters

Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
MSST	minimum stock size threshold
mt	metric ton
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fishery Service
NOAA	National Oceanographic and Atmospheric Administration
NPAFC	North Pacific Anadromous Fish Commission
NPFMC	North Pacific Fishery Management Council
NPPSD	North Pacific Pelagic Seabird Database
Observer Program	North Pacific Groundfish Observer Program
OEG	optimal escapement goal
OMB	Office of Management and Budget
PBR	potential biological removal
PSC	prohibited species catch
PRA	Paperwork Reduction Act
PSEIS	Programmatic Supplemental Environmental Impact Statement
PWS	Prince William Sound
RFA	Regulatory Flexibility Act
RFFA	reasonably foreseeable future action
RIR	Regulatory Impact Review
RPA	reasonable and prudent alternative
RSW	refrigerated seawater
SAFE	Stock Assessment and Fishery Evaluation
SAR	stock assessment report
SBA	Small Business Act
Secretary	Secretary of Commerce
SEG	sustainable escapement goal
SET	sustainable escapement threshold
SNP	single nucleotide polymorphism
SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpbacks
SRKW	Southern Resident killer whales
SSFP	Sustainable Salmon Fisheries Policy
SW	southwest
TAC	total allowable catch
U.S.	United States
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system
W	West
WED	week-ending date

1 Introduction

This document analyzes proposed management measures that would apply to all trawl fisheries in the Central and Western Gulf of Alaska (GOA), except the directed pollock fishery. The measures under consideration include: setting prohibited species catch (PSC) limits in the Central and Western GOA for Chinook salmon (*Oncorhynchus tshawytscha*), which would close fisheries in those regulatory areas once attained, and full retention of salmon species. Implementation of the management measures evaluated in this analysis would require an amendment to the Fishery Management Plan for Groundfish of the Gulf of Alaska (GOA Groundfish FMP), as well as amendments to implementing regulations.

This document is a Regulatory Impact Review/Environmental Assessment /Initial Regulatory Flexibility Analysis (RIR/EA/IRFA). An RIR/EA/IRFA provides assessments of the economic benefits and costs of the action alternatives, as well as their distribution (the RIR), the environmental impacts of an action and its reasonable alternatives (the EA), and the impacts of the action on directly regulated small entities (the IRFA). This RIR/EA/IRFA addresses the statutory requirements of the Magnuson Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the National Environmental Policy Act (NEPA), Presidential Executive Order 12866, and the Regulatory Flexibility Act. An RIR/EA/IRFA is a standard document produced by the North Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) Alaska Region to provide the analytical background for decision-making.

1.1 Purpose and Need

The purpose of this action is to address the capture of Chinook salmon in the trawl fisheries of the GOA. Chinook salmon are a prohibited species in the GOA groundfish fisheries, and, as such, must be returned immediately to the sea with a minimum of injury, if caught incidentally in the groundfish fisheries[2]. While the Council has recently established Chinook salmon PSC limits for the directed pollock trawl fisheries in the GOA, no such PSC limit is currently in effect for any other trawl fishery in the GOA. While it is incumbent upon fishermen, under the regulations, to avoid catching Chinook salmon, the Council has determined that the evaluation of management measures to protect against the risk of high Chinook salmon PSC in future years is necessary.

1.2 Council Problem Statement

The Council adopted the following problem statement in February 2012.

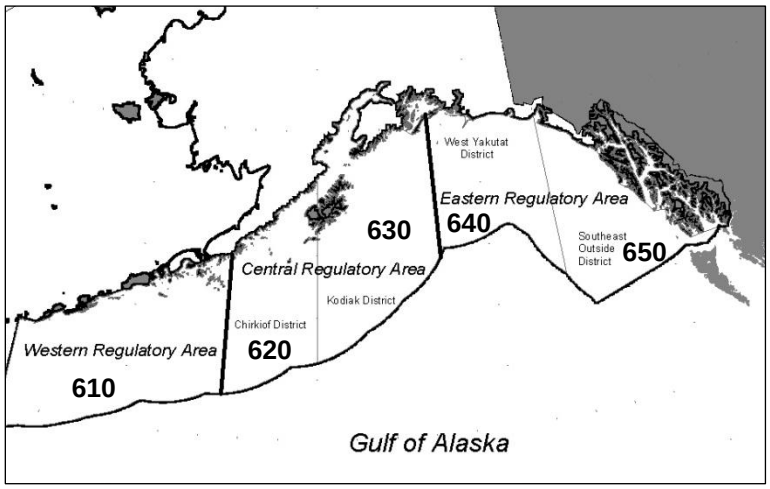
> *Magnuson-Stevens Act National Standards require balancing achieving optimum yield with minimizing bycatch, while minimizing adverse impacts on fishing dependent communities. Chinook salmon prohibited species catch (PSC) taken incidentally in GOA trawl fisheries is a concern, and incidental take is limited in the Biological Opinion for ESA-listed Chinook salmon stocks. The Council recently adopted a PSC limit of 25,000 Chinook salmon for the Western and Central GOA pollock trawl fisheries, while also indicating an intent to evaluate Chinook salmon bycatch in the non-pollock GOA trawl fisheries, which currently do not have a Chinook salmon bycatch control measure.*

[2] Except when their retention is authorized by other applicable law for biological sampling or for programs such as the Prohibited Species Donation Program.

1.3 Action Area

The proposed action would be implemented through an amendment to the GOA Groundfish FMP and through rulemaking. This action specifically regulates the non-pollock trawl fishery in the Western and Central GOA. Figure 1-1 illustrates the action area, spanning regulatory areas 610, 620 and 630. In 1998, a gear type prohibition on trawl fisheries went into effect in the Southeast Outside district (regulatory area 650). The West Yakutat district (area 640) accounts for a negligible portion of the GOA trawl fisheries.

Figure 1-1 GOA regulatory areas, and NMFS reporting areas



1.4 Bycatch and Prohibited Species Catch Terminology

Bycatch, as defined by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; 16 U.S.C. § 1802(2)), "means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards". The term "regulatory discards" refers to harvested fish "which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain but not sell."

Within the GOA Groundfish FMP, several economically, ecologically, and/or culturally important fish species are identified, and their capture is required to be minimized and retention is prohibited[3]. These "Prohibited Species" include all five species of Pacific salmon, Pacific herring, several economically important king crab and Tanner crab species, and Pacific halibut. The Secretary, upon the recommendation of the Council, determined that sufficiently compelling need existed within the management contexts of the GOA Groundfish FMP (as well as the FMP for the Groundfish Fishery of the Bering Sea and Aleutian Islands) to specifically differentiate prohibited species catch (PSC) from incidental removals of other fish species (i.e., bycatch). These two distinct categories of unintended removals are separately monitored and controlled under the Groundfish FMP.

1.5 History of this Action

In December 2010, the Council initiated two sequential amendments to address GOA Chinook salmon PSC. The first amendment package was expedited; it addressed Chinook salmon bycatch in the GOA pollock fisheries through the implementation of a PSC limit for those target fisheries in the Western and Central GOA. At the same time, longer-term amendment packages were initiated to address

[3] Except when retention is authorized by other applicable law for biological sampling or for programs such as the Prohibited Species Donation Program.

comprehensive Chinook salmon bycatch management in all GOA trawl fisheries and to evaluate a broader suite of bycatch reduction management measures.

In June 2011, the Council took final action on Amendment 93 to the GOA Groundfish FMP, which established an overall PSC limit for the Central and Western GOA pollock fisheries of 25,000 Chinook salmon. The Central GOA annual PSC limit was set at 18,316 Chinook salmon, and the Western GOA PSC limit was set at 6,684 Chinook salmon. A provision was made to implement the PSC limits in mid-2012, and prorated PSC limits were established for the C and D seasons of the implementation year. Also, the Council required full retention of all salmon taken in the pollock trawl fishery, in order to allow NMFS to implement a robust sampling protocol for Chinook salmon, and allow for genetic stock identification of Chinook salmon taken as PSC. The final rule to implement Amendment 93 became effective on August 25, 2012 (77 FR 42629).

In February 2012, the Council reviewed a discussion paper on the problem statement and the alternatives in the comprehensive amendment package. The analysis had been initiated with a suite of alternatives evaluating a range of PSC limits for the GOA non-pollock trawl fisheries, the establishment of a bycatch cooperative for these fisheries, and full retention of salmon in all GOA trawl fisheries. Options were included which would allow apportionment of the PSC limits gulf-wide, allocated to the Western and Central GOA trawl fisheries separately, allocated between directed GOA trawl fisheries separately, or allocated by both regulatory area and directed trawl fishery. The Council had also requested discussion of several other potential tools for PSC reduction in the pollock fishery. In response to the analysis in the discussion paper, the Council chose to revise the scope and suite of alternatives of the comprehensive amendment package, and focus specifically on the non-pollock trawl fisheries. Alternatives and discussion items from the discussion paper that were not selected by the Council are described in greater detail in Section 2.4. Note, the Council has also continued the general discussion of tools to help in the reduction of PSC for Central GOA trawl fisheries (including both Chinook salmon and halibut) in a separate discussion paper.

The Council originally derived the range of total Gulf-wide PSC analyzed in this report from the Chinook salmon threshold identified in the incidental take statement accompanying the November 30, 2000 Biological Opinion on the effects of the Alaska groundfish fisheries on Endangered Species Act-listed salmon of the Pacific Northwest (NMFS 2007). The incidental take statement established a threshold of 40,000 Chinook salmon caught in the GOA groundfish fisheries (all targets) annually. According to NMFS, such a level of incidental Chinook salmon catch in the GOA groundfish fisheries would not jeopardize the continued existence of ESA-listed Chinook salmon stocks. In December 2010, the Council reviewed data illustrating that the pollock trawl fishery accounts for approximately 75 percent of Chinook salmon PSC in the GOA groundfish fisheries, based on average bycatch from 2001 to 2010. Amendment 93 to the GOA Groundfish FMP was approved in June 2011, and apportioned 25,000 Chinook salmon PSC to the GOA pollock trawl fishery. At that time, the Council set the upper level of PSC limits considered for the non-pollock trawl fisheries at 10,000 Chinook salmon.

In February 2012, the Council made two substantial changes to the options analyzed in the present analysis. First, the option to apportion PSC among directed fisheries was replaced with an option to apportion PSC limits between operational types (catcher vessels or catcher processors). Second, the Council increased the range of PSC limits under consideration to the present options between 5,000 to 12,500 Chinook salmon. The Council cited recent deliberations in setting the Chinook salmon PSC limits for the pollock fisheries, and noted that it wished to consider a range of PSC limits that encompassed historical catch levels of Chinook salmon in the GOA non-pollock trawl fisheries.[4] Moreover, the Council wanted to maintain the flexibility allowed by analyzing the higher limit, given the imprecision of data on

[4] NOAA catch accounting estimated Chinook salmon PSC at 10,877 in 2003 for the affected fisheries.

actual PSC levels (resulting from relatively low levels of observer coverage in the affected fisheries), and in view of options that could apportion the Council's selected PSC limit among multiple user groups, resulting in very small sector PSC allowances. The Council noted, however, that even if the upper end of the range was selected as a PSC limit for the non-pollock trawl fisheries, the combined PSC limits for GOA trawl fisheries would still remain below the 40,000 Chinook salmon threshold originally identified in the 2000 Biological Opinion (NMFS 2007).

1.6 Other Relevant Council Actions

Over the course of the past few years, the Council has advanced a number of actions to reduce the use of PSC (Chinook salmon, crab, halibut) in the GOA fisheries. While this series of actions reflects the Council's commitment to reduce PSC in the GOA fisheries, participants in these fisheries, particularly in the Central GOA, have raised concerns that the current limited access management creates a substantial disincentive for them to take actions to reduce PSC usage, especially actions that also reduce target species catch rates. Throughout the discussions of PSC avoidance in GOA fisheries, the Council has acknowledged that a more comprehensive consideration of management measures that would help fleets in achieving PSC reductions is needed.

In October 2012, the Council approved a purpose and need statement, and goals and objectives, for a Central GOA trawl catch share action. The purpose of the proposed analysis is to create a new management regime for the Central GOA trawl fisheries. The Council's intention is to create a structure that allocates harvest to individuals, cooperatives, or other entities, in order to eliminate the derby-style race for fish. The program will be designed to provide tools for the effective management and reduction of PSC and bycatch, as well as to promote increased utilization of target and secondary species harvested in the GOA.

The Council also expressed concern that announcing an intention to develop a catch share program could induce speculative entry to the fisheries. Members of the public testified that there is already evidence of increased participation in the fishery. To dampen this effect, the Council stated that it may not credit any catch history after December 31, 2012 for purposes of making any allocation under a future fishery management program.

The Council will be considering a preliminary discussion of catch share options at the February 2013 Council meeting, beginning the Council's process of identifying alternatives for an analysis. The development of alternatives and iterative review of the subsequent analysis will likely mean that this issue will be on the Council's agenda for many meetings before the Council is ready to come to a final recommendation. If the Council continues with the tentative review schedule currently on the agenda for considering GOA Chinook salmon PSC limits for the non-pollock trawl fisheries, under which the Council is scheduled to take final action in April 2013, it is unlikely that even the alternatives for the Central GOA trawl catch share action will be fully specified by that time.

2 Description of Alternatives

The alternatives that are analyzed in this amendment package were approved by the Council in February 2012; they are listed below and detailed in the sections that follow. These alternatives propose management measures that would apply exclusively to the directed non-pollock trawl fisheries in the Western and Central Gulf of Alaska.

Alternative 1: Status quo.

Alternative 2: 5,000, 7,500, 10,000, or 12,500 Chinook salmon PSC limit (hard cap).
Option 1: Apportion limit between Central and Western GOA.
Option 2: Apportion limit by operational type (CV vs. CP).
Applies to both options: Apportion proportional to historic average bycatch of Chinook salmon (5- or 10-year average).
Alternative 3: Full retention of salmon.
Vessels will retain all salmon bycatch until the number of salmon has been determined by the vessel or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed.

Note, both Alternative 2 and Alternative 3 could be selected by the Council in their preferred alternative. Likewise, under Alternative 2, both Option 1 and Option 2 could be selected by the Council.

2.1 Alternative 1: No Action

Alternative 1 is the no action alternative (status quo). There are currently no Chinook salmon PSC limits or specific management measures to address Chinook salmon PSC in the GOA non-pollock trawl fisheries. NMFS regulations require that Chinook salmon PSC be minimized and discarded in the non-pollock GOA groundfish fisheries.

2.2 Alternative 2: PSC limit(s) between 5,000 and 12,500 Chinook Salmon

Alternative 2 would amend the FMP to create GOA Chinook salmon PSC limits for the non-pollock trawl fisheries, with the option for them to be subdivided by management area, operation type (catcher vessel vs. catcher processor), or both simultaneously. The total PSC thresholds under consideration for the entire action area are 5,000, 7,500, 10,000, or 12,500 Chinook salmon. The action area is defined as the Western GOA (610) and Central GOA (620 and 630). The PSC limit would be a hard cap, meaning that any fishery to which the PSC limit applies would be closed for directed fishing if the PSC limit is reached in a particular year.

The PSC limit could be applied to all Western and Central GOA non-pollock trawl fisheries as a whole, or it could be divided between the two regulatory areas, establishing separate PSC limits for each area (Option 1). The limit could also be divided among the operation types (Option 2) – catcher vessels (CV) and catcher processor vessels (CP). Options 1 and 2 could be applied in combination, with separate limits applied to the different operation types (CV/CP) in each regulatory area (Western GOA and Central GOA). Under either option, the PSC limit would be apportioned according to historic average Chinook salmon prohibited species catch, using either a 5- or a 10-year average. Table 2-1 provides the proposed PSC limits for the non-pollock trawl fisheries under Alternative 2, and each option to Alternative 2.

Table 2-1 Proposed PSC limits for non-pollock trawl fisheries, under Alternative 2 and Options 1 and 2

			5-Year Average (2007 to 2011)					10-year Average (2002-2011)				
			%	12,500	10,000	7,500	5,000	%	12,500	10,000	7,500	5,000
Alt. 2	All GOA (W&C)		100%	12,500	10,000	7,500	5,000	100%	12,500	10,000	7,500	5,000
Option 1	WGOA		8%	997	797	598	399	18%	2,210	1,768	1,326	884
	CGOA		92%	11,503	9,202	6,902	4,601	82%	10,291	8,232	6,174	4,116
Option 2	All GOA (W&C)	Catcher Vessels	52%	6,460	5,168	3,876	2,584	49%	6,104	4,883	3,662	2,442
		Catcher Processors	48%	6,039	4,831	3,623	2,416	51%	6,397	5,118	3,838	2,559
Options 1 & 2	WGOA	Catcher Vessels	1%	86	69	52	35	5%	606	485	363	242
		Catcher Processors	7%	910	728	546	364	13%	1,604	1,284	963	642
	CGOA	Catcher Vessels	51%	6,374	5,099	3,824	2,549	44%	5,498	4,399	3,299	2,199
		Catcher Processors	41%	5,129	4,103	3,077	2,052	38%	4,792	3,834	2,875	1,917

2.2.1 Methodology for Determining PSC Limits

The Council has proposed annual gulf-wide Chinook salmon PSC limits of 5,000, 7,500, 10,000 and 12,500 for analysis in this document. The selected limit could be applied to entire action area (Central and Western GOA regions combined), apportioned to the Central and Western GOA separately, apportioned to the CV and CP fleet across the entire action area, or apportioned to the CV and CP fleets within the Central and Western GOA separately. The Council proposes that any PSC apportionment to a subset of the entire GOA non-pollock groundfish trawl fleet should be based on either 5- or 10-year historic average Chinook salmon bycatch.

For this analysis, 5- and 10-year historic average Chinook salmon bycatch is calculated from data covering the 2007 to 2011 and 2002 to 2011 periods, respectively. Equation 1 provides the formula used to apportion Chinook salmon PSC to a given subset of the GOA non-pollock groundfish trawl fishery based on a 5-year average of historic PSC, and Equation 2 provides a like formula for using a 10-year average basis.

Equation 1
$$\boldsymbol{Apportionment_i} = \left(\frac{\sum_{y=2007}^{2011} \boldsymbol{PSC_{i,y}} / 5}{\sum_{y=2007}^{2011} \boldsymbol{PSC_{GOA,y}} / 5} \right) \times \boldsymbol{GOA\ Limit_a}$$

Equation 2
$$\boldsymbol{Apportionment_i} = \left(\frac{\sum_{y=2002}^{2011} \boldsymbol{PSC_{i,y}} / 10}{\sum_{y=2002}^{2011} \boldsymbol{PSC_{GOA,y}} / 10} \right) \times \boldsymbol{GOA\ Limit_a}$$

GOA represents the entire action area (Central and Western GOA); i represents any of the potential subsets of the GOA trawl fishery that could receive an apportionment of PSC, as described in Alternative 2; and a represents the set of proposed gulf-wide PSC limits (5,000, 7,500, 10,000 or 12,500). This methodology arrives at the apportionment by multiplying the ratio of the basis average PSC for a subset of the GOA and the basis average PSC of the entire GOA by the proposed gulf-wide PSC limit for non-pollock groundfish trawl. Table 2-2 summarizes historic average Chinook salmon PSC by the GOA-subsets defined in Alternative 2. The percentage value listed next to the period average indicates a given potential subset's proportional share of average historic PSC within each Alternative 2 option. Table 2-1, above, reports the resulting proposed PSC caps, by option.

Table 2-2 Historic Chinook salmon PSC and 5- & 10-year basis averages, by apportionment subsets defined in Alternative 2

Fishery		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	5-Year Average (2007-2011)		10-Year Average (2002-2011)	
All GOA non-pollock trawl		7,758	10,877	4,593	3,343	3,060	5,304	5,157	5,075	9,694	6,902	**6,427**	**100%**	**6,176**	**100%**
Western GOA		2,420	2,122	1,850	1,616	351	304	282	117	1,277	582	**512**	**8%**	**1,092**	**18%**
Central GOA		5,338	8,755	2,743	1,728	2,709	5,000	4,876	4,958	8,418	6,320	**5,914**	**92%**	**5,084**	**82%**
WGOA & CGOA	Catcher Vessels	4,629	4,601	2,271	617	1,431	2,329	2,506	2,793	5,064	3,916	**3,322**	**52%**	**3,016**	**49%**
	Catcher/Processors	3,129	6,275	2,322	2,726	1,628	2,975	2,651	2,282	4,631	2,986	**3,105**	**48%**	**3,161**	**51%**
WGOA	Catcher Vessels	2,349	143	20	58	201	9	107	10	0	96	**44**	**1%**	**299**	**5%**
	Catcher/Processors	72	1,979	1,830	1,558	150	295	174	107	1,277	487	**468**	**7%**	**793**	**13%**
CGOA	Catcher Vessels	2,281	4,458	2,251	559	1,230	2,320	2,399	2,783	5,064	3,821	**3,277**	**51%**	**2,717**	**44%**
	Catcher/Processors	3,057	4,297	492	1,168	1,479	2,680	2,477	2,175	3,354	2,499	**2,637**	**41%**	**2,368**	**38%**

2.3 Alternative 3: Full Retention

Alternative 3 would require full retention of Chinook salmon by all non-pollock trawl vessels. This provision would require a regulatory change to existing requirements prohibiting salmon retention in the GOA non-pollock fisheries. Current regulations require vessel operators to discard salmon when an observer is not aboard. When an observer is aboard, they are required to allow for sampling by an observer before discarding prohibited species.

Under this alternative, all trawl vessels targeting groundfish in the Central and Western GOA would be required to retain all salmon of any species. The retention requirement does not focus specifically on Chinook salmon, because it can be difficult to identify salmon species unless the fish is in hand. Salmon retained under this provision would not be allowed to be kept for human consumption, and would be discarded, following collection of any scientific data or biological samples. An exception is provided if the Chinook salmon are delivered under an authorized prohibited species donation program.

2.4 Alternatives Considered but not Advanced

In the December 2010 Council motion initiating this analysis as a longer-term amendment package, the Council had included other alternatives, and discussion items to potentially address Chinook salmon PSC reduction goals. Following the development of Amendment 93 (PSC limits for the GOA pollock fishery), and a staff discussion paper preparing for this analysis in February 2012, the Council chose to eliminate some alternatives from consideration.

PSC limits for the non-pollock trawl fisheries, subdivided by directed fishery

After reviewing the range of proposed PSC limits by target fishery resulting from this option, the Council determined that apportioning PSC limits across the many GOA target species, according to historical catch levels, would likely result in very low PSC limits for some directed fisheries. The ability of NMFS to manage such small PSC allocations inseason, especially considering that Chinook salmon encounters can be low and unpredictable in these fisheries, would be extremely challenging, and would likely involve frequent and onerous standdowns. Additionally, the directed fishery for a trip is determined ex post facto, and in special cases may be an artifact of unexpected high levels of incidental catch. Data from catcher vessels, for which target species are not determined until landing at port, are particularly exposed to misidentification. Consequently, the Council chose to replace this option with the option to subdivide Chinook salmon PSC by operation type.

Mandatory Chinook Salmon PSC Cooperatives

The Council initially included an alternative requiring membership in Chinook salmon PSC cooperatives, similar to the alternative considered in an earlier action to set Chinook PSC limits in the GOA pollock fisheries (Amendment 93). These cooperatives were intended to facilitate a coordinated effort among participants to avoid Chinook salmon. Sharing information on the timing and location of Chinook PSC

could promote Chinook salmon avoidance by enhancing fishers' ability to schedule fishing activity in avoidance of Chinook. Mandatory membership could ameliorate any competitive imbalance caused by the reduced catch rates of those fishers who are actively avoiding Chinook salmon. For example, if a vessel delays fishing or moves from an area of relatively high Chinook catches, that vessel would lose fishing time relative to other vessels that might have chosen not to alter their fishing.

In considering the alternative, NOAA Fisheries suggested that given the mandatory cooperative membership, in the absence of specific approval of annual cooperative contracts and any penalties for violations of those contracts, NMFS' management authority over the fishery may not be adequately maintained. In essence, allowing cooperatives to define certain management measures and define and enforce penalties for failure to comply with those measures without agency oversight could be considered a delegation of management authority in the fishery. Whether cooperatives would be able to serve their intended purpose, while maintaining a level of oversight that maintains that authority, is uncertain. For example, the imposition of certain cooperative penalties would likely require notice, and an opportunity for a hearing, consistent with applicable Magnuson-Stevens Fishery Conservation and Management Act and Administrative Procedures Act requirements. These administrative reviews typically take several weeks (or even months). These delays may make time sensitive penalties (such as standdowns) wholly ineffective.

The staff discussion paper indicated that it could be possible to develop a cooperative alternative that maintains NMFS management authority while providing flexibility, though the development of an option to allow for fishing outside of a cooperative. However, measures intended to provide reasonable fishing opportunities for non-cooperative members are likely to constrain their catches more some years than others. More problematic is that the opportunity to fish may be greatest for these non-cooperative vessels in years of high bycatch. Consequently, it is uncertain whether an alternative can be developed that maintains Chinook avoidance incentives for cooperatives while maintaining a reasonable fishing opportunity for vessels that choose not to join a cooperative. As a result, the Council chose not to proceed with this alternative.

Discussion items for PSC reduction tools for the pollock fishery

The Council had also requested discussion of several other potential tools for PSC reduction in the pollock fishery, such as trip limits, development of a bycatch cooperative, cooperative management of the pollock fishery, restricting fisheries by season or time of day in order to reduce bycatch, and salmon excluders. These were included in the Council's February 2012 discussion paper. The only tool that appeared promising was the development of a cooperative management program for the GOA pollock fishery. The Council chose to focus the current amendment package exclusively on the non-pollock fihseries, and advance the consideration of a cooperative management program on a separate track.

3 Environmental Assessment

There are four required components for an environmental assessment. The need for the proposal is described in Section 1, and the alternatives in Section 2. This section addresses the probable environmental impacts of the proposed action and alternatives. Information with which to understand the affected environment for each resource component is summarized in the relevant subsection, however a more detailed description is also available in the Alaska Groundfish Fisheries Harvest Specifications Environmental Impact Statement (EIS) (NMFS 2007a), and the Final Programmatic Supplemental EIS on the Alaska Groundfish Fisheries (NMFS 2004a). A list of agencies and persons consulted is included in Section 10.

3.1 Methodology for Impacts Analysis

This document analyzes proposed Chinook salmon prohibited species catch (PSC) control measures for the Western and Central Gulf of Alaska (GOA) non-pollock trawl fisheries. Alternative 2 proposes Chinook salmon PSC limits for the Western and Central GOA regulatory areas, while Alternative 3 would require full retention of all salmon in the non-pollock trawl fisheries. There are no environmental impacts for requiring full retention of salmon, as this alternative will not change fishing practices. Potential economic and management impacts of this alternative area addressed in Section 4.8 of the RIR, and Section 5.3. Consequently, the Environmental Assessment focuses on the impacts of the status quo (Alternative 1) and the implementation of PSC limits (Alternative 2).

The proposed action affects vessels fishing in the federal non-pollock trawl fisheries in the Central and Western GOA and may affect vessels fishing in "parallel" Pacific cod fisheries in the adjacent waters of the State of Alaska. In this section, the impacts of the alternatives and options on the various environmental components are evaluated. The socio-economic impacts of this action are described in detail in the Regulatory Impact Review (RIR) and Initial Regulatory Flexibility Analysis portions of this analysis (Sections 3 and 6).

Analysis of the potential cumulative effects of a proposed action and its alternatives is a requirement of the National Environmental Protection Act (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*).

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 reasonably foreseeable future actions is addressed in Section 3.8.

Section 5 addresses the management and enforcement considerations of the proposed alternatives and options.

In the relevant subsection for each resource component, criteria are identified to evaluate the significance of impacts. If significant impacts are likely to occur, preparation of an EIS is required. Although an EIS should evaluate economic and socioeconomic impacts that are interrelated with natural and physical environmental effects, economic and social impacts by themselves are not sufficient to require the preparation of an EIS (see 40 CFR 1508.14).

The documents listed below contain information about the fishery management areas, fisheries, marine resources, ecosystem, social, and economic elements of the GOA groundfish fisheries, and are referenced in the analysis of impacts in this chapter.

Alaska Groundfish Harvest Specifications Final Environmental Impact Statement (NMFS 2007a).

This EIS provides decision makers and the public an evaluation of the environmental, social, and economic effects of alternative harvest strategies for the federally managed groundfish fisheries in the GOA and the Bering Sea and Aleutian Islands management areas and is referenced here for an

understanding of the state of the fishery.[5] The EIS examines alternative harvest strategies that comply with federal regulations, the Fishery Management Plan (FMP) for Groundfish of the GOA, and the Magnuson-Stevens Fishery Conservation and Management Act. These strategies are applied to the best available scientific information to derive the total allowable catch (TAC) estimates for the groundfish fisheries. The EIS evaluates the effects of different alternatives on target species, non-specified species, forage species, prohibited species, marine mammals, seabirds, essential fish habitat, ecosystem relationships, and economic aspects of the GOA fisheries.

Stock Assessment and Fishery Evaluation (SAFE) Report for the Groundfish Resources of the GOA (NPFMC 2011).

Annual SAFE reports review recent research and provide estimates of the biomass of each species and other biological parameters. The SAFE report includes the acceptable biological catch (ABC) specifications used by NMFS in the annual harvest specifications. The SAFE report also summarizes available information on the GOA ecosystem and the economic condition of the groundfish fisheries off Alaska. This document is available from: http://www.afsc.noaa.gov/refm/stocks/assessments.htm.

Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis to Revise Gulf of Alaska Halibut Prohibited Species Catch Limits (NPFMC 2012).

This analysis accompanied proposed Amendment 95 to the GOA Groundfish FMP, recommending a change to the process for setting halibut PSC limits applicable to GOA groundfish fisheries. The amendment also proposes reducing limits for the groundfish trawl gear sector, the groundfish catchvher vessel hook-and-line sector, and the catcher processor hook-and-line sector. The environmental assessment includes an evaluation of the environmental impacts of the non-pollock trawl fisheries.

Final Programmatic Supplemental Environmental Impact Statement (PSEIS) on the Alaska Groundfish Fisheries (NMFS 2004a).

The PSEIS evaluates the Alaska groundfish fisheries management program as a whole, and includes analysis of alternative management strategies for the GOA and Bering Sea/Aleutian Islands (BSAI) groundfish fisheries. The EIS is a comprehensive evaluation of the status of the environmental components and the effects of these components on target species, non-specified species, forage species, prohibited species, marine mammals, seabirds, essential fish habitat, ecosystem relationships, and economic aspects of the GOA fisheries.

3.2 Groundfish Species

The non-pollock directed trawl fisheries in the GOA include rockfish species, arrowtooth flounder, Pacific cod, shallow water flatfish, rex sole, flathead sole and deep water flatfish. The primary rockfish species harvested in the GOA are Pacific ocean perch, northern rockfish, and dusky rockfish (formerly part of the pelagic shelf rockfish complex). Shortraker, rougheye, and thornyhead rockfish are also caught incidentally in directed rockfish fisheries, as are "other rockfish" species. Pacific ocean perch is the highest biomass rockfish species, with a wide distribution throughout the Gulf of Alaska and beyond. The primary species in the shallow water flatfish complex are Northern rock sole and Southern rock sole; other shallow water flatfish species include Alaska plaice, starry flounder, yellowfin sole, sand sole, butter sole and English sole. Dover sole is the primary harvest species in the deep water flatfish complex, with deep-sea sole and Greenland turbot making up the remainder.

[5] The alternatives considered in this EA will not cause any of the potentially significant impacts addressed in the Alaska Groundfish Harvest Specifications Final EIS to recur.

Many of the non-pollock trawl fisheries are multi-species fisheries, and catch other groundfish species incidentally, in addition to the trip's assigned target. The assessments also list non-FMP species that are caught incidentally in the non-pollock trawl fisheries, such as grenadiers. The SAFE report (NPFMC 2011) includes an appendix on grenadiers, which the Council is considering moving into the FMP.

Annual stock assessments include a comprehensive evaluation of their biology and distribution. Consequently, the GOA Stock Assessment and Fishery Evaluation (SAFE) report is incorporated by reference (NPFMC 2011). All groundfish harvest during the GOA groundfish fisheries is counted toward the total allowable catch (TAC) for that species or species group. Groundfish stocks are assessed annually, and are managed using conservative catch quotas. Biomass trends for each of the trawl target species are available in NPFMC (2011).

TACs and harvests, especially in the GOA, are often set lower than they would be otherwise, in order to protect other species, especially halibut, which may be taken as incidental removals. Some flatfish quotas are set well below the acceptable biological levels (ABCs) due to halibut PSC constraints. Directed fishing for many species is frequently restricted before TACs are reached, in order to comply with PSC limits. Inseason management closes directed fisheries when TACs are harvested, and restricts fishing in other fisheries taking the species as incidental removals when OFLs are approached.

3.2.1 Effects of the Alternatives

The effects of the GOA non-pollock trawl fisheries on groundfish stocks are assessed annually in the GOA SAFE report (NPFMC 2011), and were also evaluated in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007a). Table 3-1 and Table 3-2 describe the criteria used to determine whether the impacts on target and ecosystem component fish stocks are likely to be significant. The effects of the GOA non-pollock trawl fisheries on fish species that are caught incidentally have been comprehensively analyzed in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007a). These fisheries were also evaluated recently under the GOA halibut PSC EA/RIR/IRFA (NPFMC 2012). These analyses concluded that under the status quo, neither the level of mortality nor the spatial and temporal impacts of fishing on fish species or prey availability are likely to jeopardize the sustainability of the target and ecosystem component fish populations. The groundfish stocks are neither overfished nor subject to overfishing (see Figure 3-1 for age-structured GOA stocks).

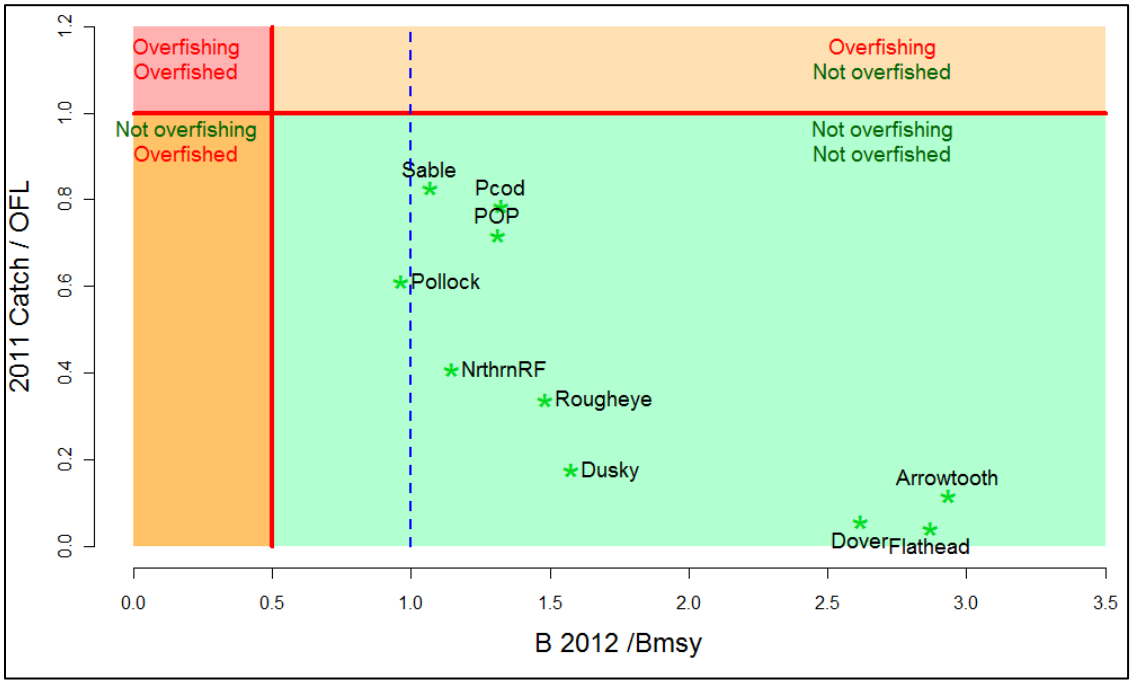
Table 3-1 Criteria used to determine significance of effects on target groundfish stocks.

Effect	Criteria			
	Significantly Negative	**Insignificant**	**Significantly Positive**	**Unknown**
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 (minimum standing stock threshold)	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

Table 3-2 Criteria used to determine significance of effects on ecosystem component (including prohibited) species.

No impact	No incidental take of the ecosystem component species in question.
Adverse impact	There are incidental takes of the ecosystem component species in question
Beneficial impact	Natural at-sea mortality of the ecosystem component 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	An action that diminishes protections afforded to prohibited species in the groundfish fisheries would be a significantly adverse impact.
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the ecosystem component species, and significantly beneficial impacts are not defined for these species.
Unknown impact	Not applicable

Figure 3-1 Summary status of age-structured GOA species relative to 2011 catch levels (vertical axis) and projected 2012 spawning biomass relative to B_{msy} levels



Note that the 2010 MSY level is defined as the 2011 catch at F_{OFL}.

Alternative 2 would establish a hard cap that limits PSC of Chinook salmon in the GOA non-pollock trawl fisheries. A lower hard cap may result in the non-pollock trawl fisheries closing before the TACs are reached, while a higher hard cap would allow for groundfish fishing at current levels, and impacts would likely be similar to the status quo fishery. Table 4-50, in Section 4.7.1 of the RIR, shows when the fishery would have been closed in the past nine years, applying the PSC limits retrospectively to the non-pollock trawl fisheries in the Central and Western GOA. Appendix 1 identifies what proportion of the groundfish harvest would have been forgone each year, had the closures gone into place on those dates.

If the groundfish TACs are not fully harvested, fishing will have less impact on the stocks, and there will be no significantly adverse impact on the groundfish stocks from the fisheries. If the implementation of a PSC limit curtails the fisheries, it is likely the fall seasons that will be most impacted, that is, fishing in the early part of the year is most likely to remain unchanged, while fishing patterns may be altered later in the year when the fisheries are approaching the PSC limit. Changing fishery patterns or seasonal changes in the timing of the fishing pressure may result in the fisheries focusing on different ages of groundfish than would otherwise have been taken. These changes, however, would be monitored and updated in future stock assessments.

The risk to the stocks is considered minor, since conservation goals for maintaining spawning biomass would remain central to the assessments. None of the options considered under Alternative 2 would affect the annual assessment process, and inseason monitoring of catch quotas. Thus any changes in fishing patterns or the timing of fishing pressure would not be expected to affect the sustainability of the stocks. However, the change in fishing pattern could result in lower overall ABC and TAC levels, depending on how the age composition of the catch changed.

The potential biological effects of the alternatives are expected to be correctly incorporated in the present groundfish stock assessment and harvest specifications system, and there is no anticipated adverse impact to the target or incidental catch groundfish stocks that would result from a fishery with lower catch per

unit effort. Consequently, Alternative 2 is not likely to result in adverse impacts to groundfish stocks, and are likely insignificant.

Similarly, with respect to the ecosystem component and non-FMP species, the implementation of a PSC limit under Alternative 2 is not likely to increase fishing pressure, as even if there is a redistribution of effort to avoid Chinook salmon, the fishery, overall, will likely remain within the established footprint of the non-pollock trawl fishing grounds. If the fisheries close early because the PSC limit has been reached, impacts on these species may be reduced. The impacts of Alternative 2 are expected to be insignificant compared to the status quo.

3.3 Chinook Salmon

3.3.1 Overview of Biology and Ecological Role

Overview information on Chinook salmon can be found at:
http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main.

The Chinook salmon (*Oncorhynchus tshawytscha*) is the largest of all Pacific salmon species, with weights of individual fish commonly exceeding 30 pounds. In North America, Chinook salmon range from the Monterey Bay area of California to the Chukchi Sea area of Alaska. On the Asian coast, Chinook salmon occur from the Anadyr River area of Siberia southward to Hokkaido, Japan. In Alaska, they are abundant from the southeastern panhandle to the Yukon River. In summer, Chinook salmon concentrate around the Aleutian Islands and in the Western GOA. Chinook salmon typically have relatively small spawning populations and the largest river systems tend to have the largest populations. Major populations of Chinook salmon return to the Yukon, Kuskokwim, Nushagak, Susitna, Kenai, Copper, Alsek, Taku, and Stikine rivers with important runs also occurring in many smaller streams.

Like all species of Pacific salmon, Chinook salmon are anadromous. They hatch in fresh water and rear in main-channel river areas for one year. The following spring, Chinook salmon turn into smolt and migrate to the salt water estuary. They spend anywhere from one to five years feeding in the ocean, then return to spawn in fresh water. All Chinook salmon die after spawning. Chinook salmon may become sexually mature from their second through seventh year, and as a result, fish in any spawning run may vary greatly in size. Females tend to be older than males at maturity. In many spawning runs, males outnumber females in all but the 6- and 7-year age groups. Small Chinooks that mature after spending only one winter in the ocean are commonly referred to as “jacks” and are usually males. Alaska streams normally receive a single run of Chinook salmon in the period from May through July.

Chinook salmon often make extensive freshwater spawning migrations to reach their home streams on some of the larger river systems. Yukon River spawners bound for the headwaters in Yukon Territory, Canada will travel more than 2,000 river miles during a 60-day period. Chinook salmon do not feed during the freshwater spawning migration, so their condition deteriorates gradually during the spawning run as they use stored body materials for energy and gonad development.

Each female deposits between 3,000 and 14,000 eggs in several gravel nests, or redds, which she excavates in relatively deep, fast moving water. In Alaska, the eggs usually hatch in the late winter or early spring, depending on time of spawning and water temperature. The newly hatched fish, called alevins, live in the gravel for several weeks until they gradually absorb the food in the attached yolk sac. These juveniles, called fry, wiggle up through the gravel by early spring. In Alaska, most juvenile Chinook salmon remain in fresh water until the following spring when they migrate to the ocean as smolt in their second year.

Juvenile Chinook salmon in freshwater feed on plankton and then later eat insects. In the ocean, they eat a variety of organisms including herring, pilchard, sand lance, squid, and crustaceans. Salmon grow rapidly in the ocean and often double their weight during a single summer season.

Food Habits and Ecological Role

For Pacific salmon, oceanic foraging conditions and food relationships are important to growth. They are omnivorous and opportunistic feeders. Major categories of prey found in stomach contents of Pacific salmon species usually include either one or a combination of fish, squid, euphausiids, amphipods, copepods, pteropods, larval crustaceans, zooplankton, polychaetes, ostracods, mysids, and shrimps. By switching their diets to micronekton (fish and squid), salmon can sustain themselves through seasons or years of low zooplankton production. At the same time, Pacific salmon are selective feeders. Prey selectivity in salmon is related to inter- and intra-specific differences in functional morphology, physiology, and behavior. In general, Chinook salmon tend to feed on large prey (Kaeriyama et al. 2000).

The Bering Sea-Aleutian Salmon International Survey (BASIS) is a program of pelagic ecosystem research on salmon and forage fish in the Bering Sea coordinated by the North Pacific Anadromous Fish Commission (NPAFC). A major goal of this program is to understand how changes in the ocean conditions affect the survival, growth, distribution, and migration of salmon in the Bering Sea. At this time, no such coordinated research plan exists for the GOA. As a result, ecological information specifically related to Chinook salmon in the GOA is limited.

Ocean salmon feeding ecology is highlighted by the BASIS program given the evidence that salmon are food limited during their offshore migrations in the North Pacific and Bering Sea. Increases in salmon abundance in North America and Asia stocks have been correlated to decreases in body size of adult salmon, which may indicate a limit to the carrying capacity of salmon in the ocean. International high seas research results suggest that inter- and intra-specific competition for food and density-dependent growth effects occur primarily among older age groups of salmon particularly when stocks from different geographic regions in the Pacific Rim mix and feed in offshore waters (Ruggerone et al. 2003).

Results of a fall study to evaluate food habits data in 2002 indicated Chinook salmon consumed predominately small nekton and did not overlap their diets with sockeye and chum salmon. Shifts in prey composition of salmon species between season, habitats, and among salmon age groups were attributed to changes in prey availability (Davis et al. 2004).

Stomach sample analysis of ocean age .1 and .2 fish from basin and shelf area Chinook salmon indicated that their prey composition was more limited than chum salmon. This particular study did not collect many ocean age .3-year or .4-year Chinook salmon although those collected were located predominantly in the basin. Summer Chinook salmon samples contained high volumes of euphausiids, squid, and fish while fall stomach samples in the same area contained primarily squid and some fish. The composition of fish in salmon diets varied with area with prey species in the basin primarily northern lamp fish, rockfish, Atka mackerel, pollock, sculpin, and flatfish while shelf samples contained more herring, capelin, pollock, rockfish, and sablefish. Squid was an important prey species for ocean age .1, .2, and .3 Chinook salmon in summer and fall. The proportion of fish was higher in summer than fall as was the relative proportion of euphausiids. The proportion of squid in Chinook salmon stomach contents was larger during the summer in year (even numbered) when there was a scarcity of pink salmon in the basin (Davis et al. 2004).

Results from the Bering Sea shelf on diet overlap in 2002 indicated that the overlap between chum and Chinook salmon was moderate (30%), with fish constituting the largest prey category, results were similar in the basin. However, notably on the shelf, both chum and Chinook salmon consumed juvenile pollock,

with Chinook salmon consuming somewhat larger than those consumed by chum salmon. Other fish consumed by Chinook salmon included herring and capelin while chum salmon stomach contents also included sablefish and juvenile rockfish (Davis et al. 2004).

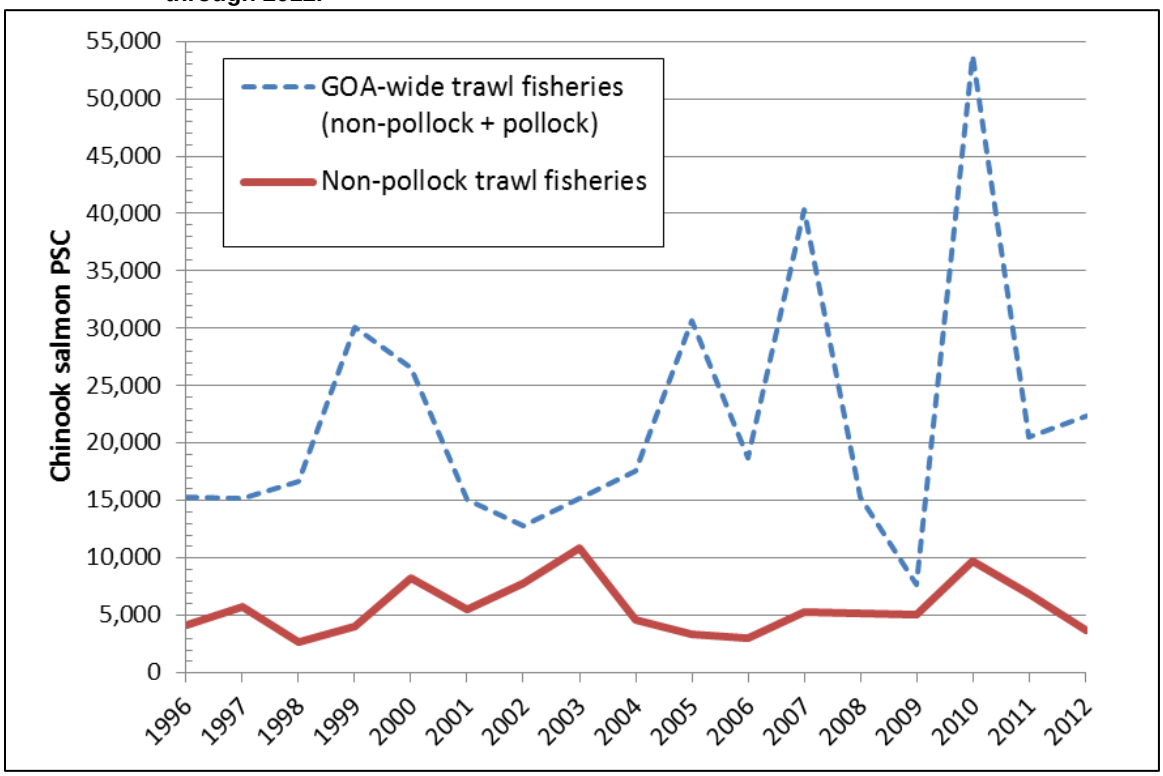
General results from the study found that immature chum salmon are primarily predators of macrozooplankton while Chinook salmon tend to prey on small nektonic prey such as fish and squid. Prey compositions shift between species and between seasons in different habitats and a seasonal reduction in diversity occurs in both chum salmon and Chinook salmon diets from summer to fall. Reduction in prey diversity was noted to be caused by changes in prey availability due to distribution shifts, abundance changes, or progression of life-history changes which could be the result of seasonal shift in environmental factors such as changes in water temperature and other factors (Davis et al. 2004).

Diet overlap estimates between Chinook salmon and sockeye salmon and Chinook salmon and chum salmon were lower than estimates obtained for sockeye and chum salmon, suggesting a relatively low level of inter-specific food competition between immature Chinook salmon and immature sockeye of chum salmon in the Bering Sea because Chinook salmon were more specialized consumers. In addition, the relatively low abundance of immature Chinook salmon compared to other species may serve to reduce intra-specific competition at sea. Consumption of nektonic organisms (fish and squid) may be efficient because they are relatively large bodied and contain a higher caloric density then zooplankton. However, the energetic investment required of Chinook salmon to capture actively swimming prey is large, and if fish and squid prey abundance is reduced, a smaller proportion of ingested energy will be available for salmon growth. It is hypothesized that inter- and intra-specific competition in the Bering Sea could negatively affect the growth of chum salmon and Chinook salmon particularly during spring and summer in odd-numbered years when the distribution of Asian and North American salmon stocks overlap. Decreased growth could lead to reduction in salmon survival by increasing predation, decreasing lipid storage to the point of insufficiency to sustain the salmon through the winter when consumption rates are low, and increasing susceptibility to parasites and disease due to poor salmon nutritional condition (Davis et al. 2004, 1998; Ruggerone et al. 2003).

3.3.2 Prohibited Species Catch of Chinook Salmon in the GOA Non-pollock Fisheries

Figure 3-2 shows the PSC of Chinook salmon in the GOA non-pollock trawl fisheries since 1996, compared to the total PSC of Chinook salmon the GOA trawl fisheries over that time period. Chinook salmon PSC in the non-pollock trawl fisheries accounts for approximately one-quarter of total Chinook salmon PSC in the GOA on average; the majority of Chinook salmon is taken in the pollock trawl fishery. As can be seen from Figure 3-2, PSC levels are highly variable from year to year. The highest Chinook salmon loss in the non-pollock trawl fisheries occurred in 2003. Chinook salmon loss was also high in 2010. It is assumed that salmon caught in groundfish fisheries have a 100% mortality rate.

Figure 3-2 Prohibited species catch of Chinook salmon in Gulf of Alaska non-pollock trawl fisheries, 1996 through 2012.



Source: NMFS PSC database, prepared by AKFIN.
2012 data reported through 11/4/2012.

Historical Chinook salmon PSC is discussed in detail in the RIR, Sections 4.4.9 and 4.4.10. Figure 3-3 illustrates Chinook salmon PSC in the non-pollock trawl fisheries for 1996 through 2011, among catcher vessels and catcher processors in the Western and Central GOA (see also Table 2-2 in the RIR). The Western GOA accounted for approximately 16% of the PSC during this time period, although in the last five years, the Western GOA has accounted for only 8% of total Chinook salmon PSC, on average. In recent years, the CP and CV sectors have each intercepted approximately half of the Chinook salmon caught as PSC in the non-pollock fisheries, although the ratio was higher for CPs in the late 1990s as well as in 2005.

Figure 3-3 Annual estimated Chinook salmon PSC in non-pollock groundfish fisheries, 1996 to 2012, for the Western (WG) and Central GOA (CG), catcher processors (CP) and catcher vessels (CV).

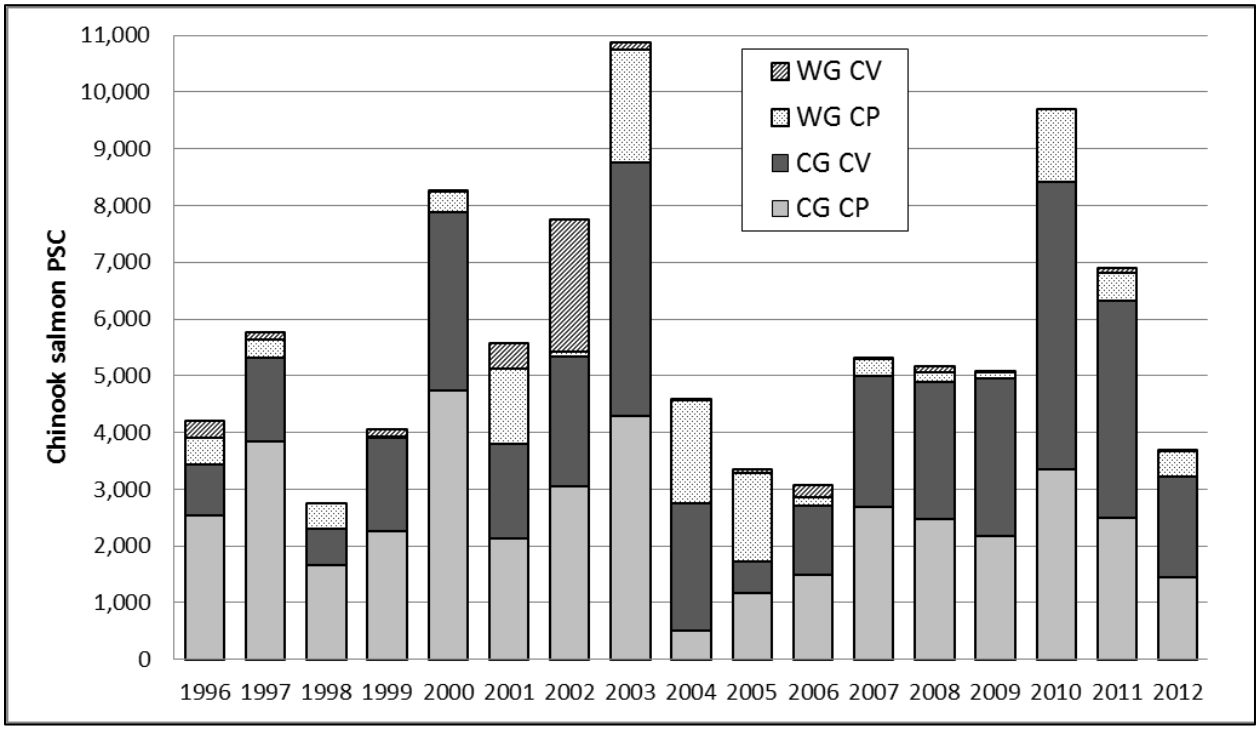
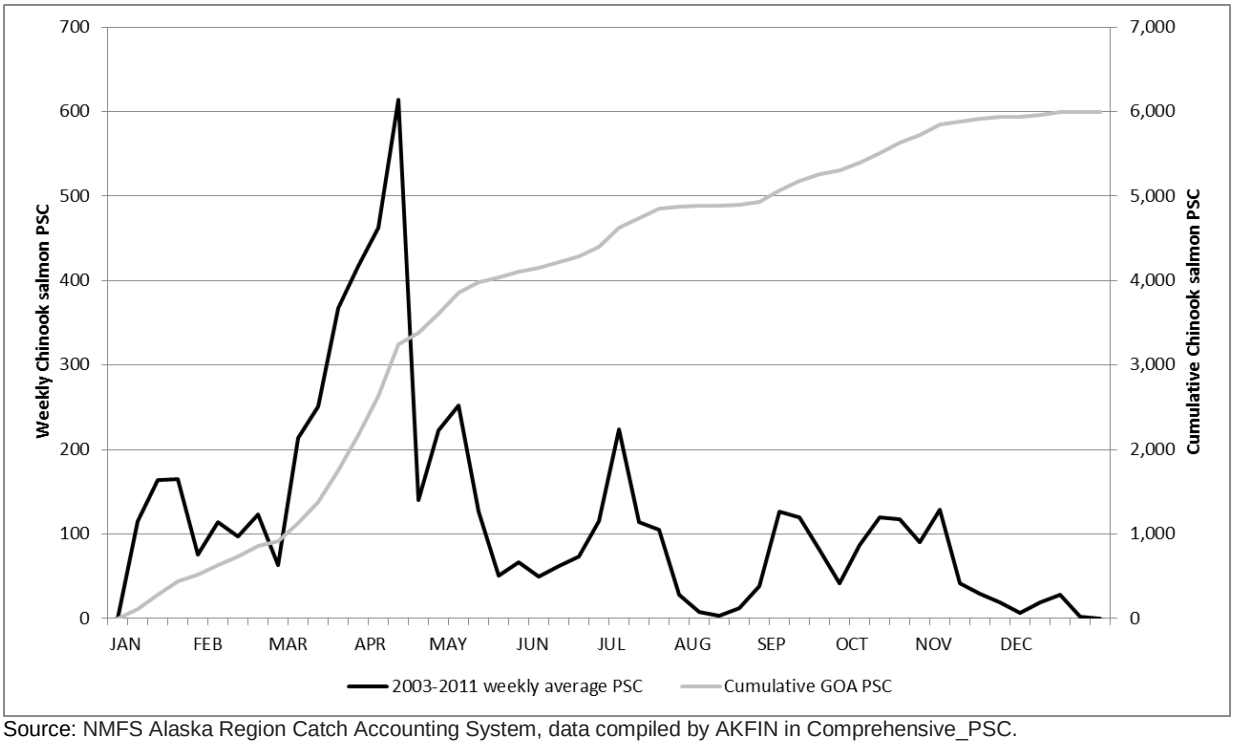


Figure 3-4 illustrates the distribution of Chinook salmon PSC throughout the calendar year, based on 2003 to 2011. In the general pattern, Chinook PSC is first taken in the Pacific cod A-season fishery in January and early February. The early spring (March – April) spike in PSC represents increasing PSC in the rex sole fishery, as well as the most intense period of arrowtooth flounder-related PSC. The rockfish fishery drives non-pollock PSC from the typical season opening in May, through August (when rockfish volume falls off significantly, although the fishery can occur as late as November). Some additional PSC during the late spring occurs in the arrowtooth and rex sole fisheries, but rockfish trips are the predominant source of summer PSC. Much of the September and October PSC is recorded in B-season Pacific cod trips, though shallow water flatfish trips emerge as a PSC source in late-September and continue through November, once the cod season has ended. After the end of the cod season, trips targeting arrowtooth also contribute to increased Chinook catch.

Figure 3-4 Seasonal distribution of Gulf-wide Chinook salmon PSC, average Chinook PSC from 2003 to 2011



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

3.3.2.1 Size and Weight of Chinook Salmon Prohibited Species Catch

Chinook salmon PSC in the GOA non-pollock trawl fisheries in the Central and Western GOA tend to be smaller fish, averaging between 5 and 9 pounds, based on observer samples taken during 2002 through 2012. Because there is more observer coverage in the Central GOA groundfish fisheries, the number of samples for the Central GOA is considerably higher than is available for the Western GOA.

3.3.3 River of Origin Information and Prohibited Species Catch Composition Sampling

3.3.3.1 Genetic Analysis of Salmon Prohibited Species Catch

While genetic and scale pattern-derived stock composition analyses have been completed for available sample sets from the Chinook salmon PSC of the BSAI pollock trawl fishery (Myers and Rogers 1988; Myers et al. 2004; NMFS 2009b; Guyon et al. 2010a; Guyon et al. 2010b), limited sampling has precluded stock composition of the salmon PSC in the GOA trawl fisheries. Table 3-3 shows the number of genetic samples that are available for the GOA trawl fisheries, from 2007 to 2012. The small number of Chinook salmon PSC samples is insufficient to represent the annual catch for stock composition analysis, especially for an average annual PSC of approximately 26,700 Chinook salmon (over the period 2007 to 2012, for all GOA trawl fisheries combined, including pollock). In 2011, efforts were instituted to improve genetic sampling in the GOA, so that stock composition analysis of the GOA PSC can be accurately completed. More refined regional stock composition analyses than those currently available using the Alaska Department of Fish and Game (ADF&G) single nucleotide polymorphism (SNP) baseline (Templin et al. 2011) will require a combined approach using both coded-wire tag (CWT) information (Celewycz et al. 2012; Section 3.3.3.2) and increased baseline coverage of Pacific Northwest salmon populations.

Table 3-3 Number of Chinook salmon genetic samples available from GOA groundfish trawl fisheries, 2007 to 2012.

Year	Number of samples	Samples as proportion of total GOA PSC	Notes
2007	19	0.0005	From the 2007 pollock B season
2008	38	0.0025	
2009	10	0.0013	
2010	161	0.0030	116 from area 610 (Western GOA), 45 from area 620
2011	222	0.0108	214 from the pollock fishery (majority from area 620), 6 from the cod fishery, 2 from the rockfish fishery
2012	366 (preliminary)	0.0160	365 from the pollock fishery, 1 from the cod fishery

In 2009, a study was completed providing recommendations for improving sample representation to meet the data requirements for estimating geographic stock origins of the Bering Sea salmon PSC based on genetic markers (Pella and Geiger 2009). The report proposed a systematic random sampling regimen for the collection of both Chinook salmon and chum PSC samples, whereby observers would sample every n^{th} fish from the census of salmon. Because all Chinook salmon stocks are not randomly distributed at sea (Guyon et al. 2010a; NMFS 2009b), systematic random sampling was preferred as a means to generate a random sample set from a non-uniform distribution. An unbiased sample set, achieved by incorporating randomness at all levels of sampling so that each fish caught has an equal probability of being included in the sample set, is required for producing unbiased stock composition estimates of the salmon PSC, both in the Bering Sea and the GOA. In addition, the sample set must be large enough to facilitate analysis of stock identification at pre-determined time and space domains. Due to the presence of a wide variety of salmon stocks in both the GOA and the Bering Sea, a goal of 400 representative genetic samples was established, based on (1) sample sizes used in previous genetic analyses (Guyon et al. 2010a; Guyon et al. 2010b; NMFS 2009b), and (2) recommendations that the coefficient of variation be no greater than 50% (defined as Standard Deviation/Estimated Value) for estimates with a 95% confidence that the individual stock contributed to the fishery (Marlowe and Busack 1995). Even with these criteria, a sample set of 400 would only be 2% of a hypothetical total PSC of 20,000. Given the non-random distribution of stocks, it is possible that even with a sample set size of 400, that the sample set may not be fully representative of rare stocks.

The majority of genetic samples are from Chinook salmon caught incidentally in GOA directed pollock trawl fisheries. This is both because the majority of Chinook salmon intercepted in the GOA are captured in the pollock fishery, and also because, for many years, the observer program has conducted an offload census of catch in the observed pollock fisheries, in order to accurately monitor salmon PSC (Section 5.1.2.1). Beginning in 2011, the agency's sampling procedures for Chinook (and chum) salmon were revised to be consistent with the Pella and Geiger (2009) report. Changes were made to sampling procedures in the Bering Sea pollock fishery under Amendment 91 to the FMP for Groundfish of the BSAI (75 FR 53026, August 30, 2010), and were also revised in the GOA pollock fishery to be consistent with this protocol to the extent possible. From 2011 forward, genetic samples of salmon were taken systematically from all salmon encountered in observed pollock deliveries. This should provide representative samples from throughout the observed deliveries in the GOA. Beginning in the second half of 2012, GOA Amendment 93 also required full retention of salmon from unobserved pollock deliveries. The 2013 Observer Annual Deployment Plan (NMFS 2012) identifies that in 2013, dockside observers will be deployed to conduct the same systematic sampling for unobserved pollock deliveries. Under the revised sampling protocol, however, observers no longer take salmon genetic samples from the non-pollock trawl fisheries[6], as a census of salmon is not available for these fisheries. Instituting offload sampling for these fisheries, as occurs with pollock deliveries, is not viable, as most of the catch is sorted

[6] Note, observers will still collect data for Chinook salmon that are present in at-sea composition samples, such as length, weight, and sex data, and in some instances, may collect a scale for species verification or other purposes. This data will be used to estimate species composition on observed trips.

at sea (Section 5.1.2). Therefore, a future stock composition analysis for Chinook salmon PSC in the GOA will be specific to the GOA pollock fishery, although it should still provide perspective on PSC composition in other GOA trawl fisheries.

The most recent year for which genetic samples have been analyzed is 2010. Samples for 2011 are currently being genotyped, and information will be available to the Council by April 2013. For the 2010 genetic analyses, approximately 116 Chinook salmon axillary process samples from the Western GOA, and 45 samples from statistical area 620 in the Central GOA were received by the NMFS Auke Bay Lab from the Alaska groundfish fisheries PSC. The overall fraction sampled was 0.4% and did not exceed 0.8% for any area. The lack of representative samples and small sample sizes preclude calculating statistically reliable stock composition estimates of the 2010 GOA Chinook salmon PSC as a whole. The statistical area 610 sample set of 116 samples originated from 5 cruises from 34 offloads/hauls. The statistical area 620 sample set of 45 samples originated from 5 cruises (36 were from 1 cruise) from 9 hauls/offloads (Guyon et al. 2011). Samples were genotyped for 43 SNP markers represented in the ADF&G coastwide Chinook salmon baseline (Templin et al. 2011). The 2010 GOA samples were predominantly from Chinook salmon stocks from the Pacific Northwest, British Columbia, and coastal Southeastern Alaska. The results provide "presence" indicators of Chinook salmon stocks, rather than relative abundance (Guyon et al. 2011).

Salmon scales have also been collected by the North Pacific Groundfish Observer Program (Observer Program) from the Alaska groundfish fisheries. Collected scales are placed in envelopes, and each scale packet contains several scales from the same fish. These scales have been used to verify the observer's species identification, to age the salmon, and to identify life history characteristics. A report prepared for the North Pacific Fishery Management Council (Council) in 1983 found higher percentages of ocean-type (freshwater age-0) Chinook salmon in the GOA than in the Bering Sea (Myers and Rogers 1983). Age information is listed for both the Shumagin and Chirikof International North Pacific Fisheries Commission statistical areas. This information highlights that the age compositions of Chinook salmon intercepted in the Bering Sea and GOA are very different, and suggests stock compositions may also be different (Kate Myers and Jeff Guyon, personal communication, January 2011). Freshwater age-0 fish are more common in the Pacific Northwest and California. However, hatcheries in Alaska have also released freshwater age-0 Chinook salmon. A stock identification analysis of freshwater age-0 fish was not conducted.

Through 2010, the Observer Program had 28,389 Chinook salmon scales from the BSAI (taken from 1986 to 2010, excluding 1991 through 1996) and 8,138 Chinook salmon scales from the GOA (taken from 1987 to 2010, excluding 1991 through 1996) (Patti Nelson, personal communication, January 2011). Of the 264 scale samples that were collected from GOA trawl fisheries in 2011, 197 are from fish for which genetic samples were already taken, so there are 67 scales from additional fish available. For 2012, 305 of 328 scale samples are from fish for which genetic samples were already taken, yielding a potential 23 additional fish. Scales are collected by the Observer Program for species identification purposes. While possible, genetic stock composition analysis from scales can be difficult due to: (1) low yield of DNA from scales, (2) lack of available scales in the preferred area due to loss during capture, and/or (3) potential contamination issues from mixing of scales between fish during hauls. Most importantly, the scales would have to have been collected in a representative manner, without bias.

3.3.3.2 Origins of Coded-Wire Tagged Chinook Salmon in the GOA

Coded-wire tags (CWTs) are an important source of information for the stock-specific ocean distribution of those Chinook salmon stocks that are tagged and caught as PSC in the BSAI and GOA groundfish fisheries. The Regional Mark Processing Center operated by the Pacific States Marine Fisheries Commission provides the regional coordination of the organizations involved in marking anadromous

salmonids throughout the Pacific Region. The coastwide CWT system is coordinated through the activities of two principal organizations: (1) Regional Mark Committee, and (2) Pacific Salmon Commission (established by the United States–Canada Pacific Salmon Treaty) (Nandor et al. 2010). The Regional Mark Processing Center is the United States site for exchanging United States CWT data with Canada for Pacific Salmon Treaty requirements. After 40 years, the CWT program in the greater Pacific region of North America continues to be an important tool for salmonid research and management and remains the only stock identification tool that is Pacific coastwide in scope and provides unparalleled information about ocean distribution patterns, fishery impacts, and survival rates for Pacific salmon along the Pacific coast (Nandor et al. 2010).

Although CWT recoveries provide reliable documentation of the presence of a stock that is caught by the groundfish fisheries, the recoveries to date cannot be used to establish the relative abundance of stocks, nor to estimate the number harvested from any one stock as PSC, due to sampling issues. CWTs do not represent the true composition of all stocks of Chinook salmon PSC in the GOA groundfish fisheries. For instance, there are no CWT tagging programs on Western Alaska Chinook salmon stocks, so these stocks are not represented in stock composition estimates based on CWT recoveries. Additionally, not all Chinook salmon stocks along the Pacific coast are marked at equal rates. Furthermore, although there are CWT tagging programs on wild stocks of Chinook salmon all along the Pacific coast, wild stocks are probably under-represented by CWTs as compared with hatchery stocks, which are much easier to tag in large numbers. Exploitation rates for naturally spawning populations of Chinook salmon are difficult to estimate. The capture and tagging of juveniles and enumeration of adult escapement from wild stocks is logistically challenging and costly. The impacts of fisheries on naturally spawning populations can be estimated based on CWT-based age- and fishery-specific exploitation rates of hatchery stock indicators. However, direct validation of the assumption that selected hatchery indicator stocks are representative of their associated natural stocks is also difficult and costly (PSC 2005).

Information on high seas salmonid CWT recoveries has been reported annually to the International North Pacific Fisheries Commission (1981 through 1992) and to the NPAFC (1993 to present). Reports are available at http://www.npafc.org. In 2012, 279 salmonids with CWTs were reported to the Pacific States Marine Fisheries Commission/Regional Mark Processing Center for the first time. Of these recoveries, 13 Chinook salmon were recovered from the 2011 and 2012 GOA pollock trawl fishery (Celewycz et al. 2012), and one Chinook salmon was recovered in the U.S. trawl research in the GOA.

From 1995 through 2010, the majority of CWT Chinook salmon recovered as PSC in the GOA originated from British Columbia and Alaska. Recoveries of CWT Chinook salmon in the GOA groundfish fishery are summarized by state or province of origin (Table 3-4). Since 1995, 32% of the observed CWTs of Chinook salmon in the GOA fishery have originated each from British Columbia and Alaska, followed by Oregon (21%), Washington (15%), and Idaho (<1%). When accounting for mark expansions for each tag code (see section on Recovery Estimation Techniques), British Columbia provided 50% of Chinook salmon PSC, followed by Alaska (35%), Oregon (8%), Washington (7%), and Idaho (<1%). In 6 out of those 16 years, however, Alaska was the major provider of the year's CWT Chinook salmon PSC in the GOA.

Table 3-4 Observed Number and Mark Expansion of CWT Chinook salmon prohibited species catch of the GOA groundfish fishery by run year and state or province of origin, 1995 through 2010.

	Total		Mean		Average % of Total	
Region	**Observed Number**	**Mark Expansion**	**Observed Number**	**Mark Expansion**	**Observed Number**	**Mark Expansion**
Alaska	192	1326.7	12.0	82.9	32%	35%
British Columbia	196	1876.7	12.3	117.3	32%	50%
Idaho	1	1.0	0.1	0.1	0%	0%
Oregon	130	293.2	8.1	18.3	21%	8%
Washington	90	259.6	5.6	16.2	15%	7%
Total	**609**	**3757.2**	**38.1**	**234.8**	**100%**	**100%**

Source: NMFS 2011a.

Alaskan Chinook salmon represented by CWTs and harvested in the GOA originated from two basins, Cook Inlet and Southeast Alaska. Most of the CWT Alaskan Chinook salmon recovered in the GOA originated from Southeast Alaska (Table 3-5). Since 1995, 75% of the observed CWTs of Alaska-origin Chinook salmon in the GOA originated from Southeast Alaska and 25% from Cook Inlet. When accounting for mark expansions, Southeast Alaska provided 92% of Alaska-origin Chinook salmon PSC in the GOA, with Cook Inlet at 8%. However, as discussed above, CWTs do not represent the true composition of all stocks of Chinook salmon in the PSC of GOA groundfish fisheries.

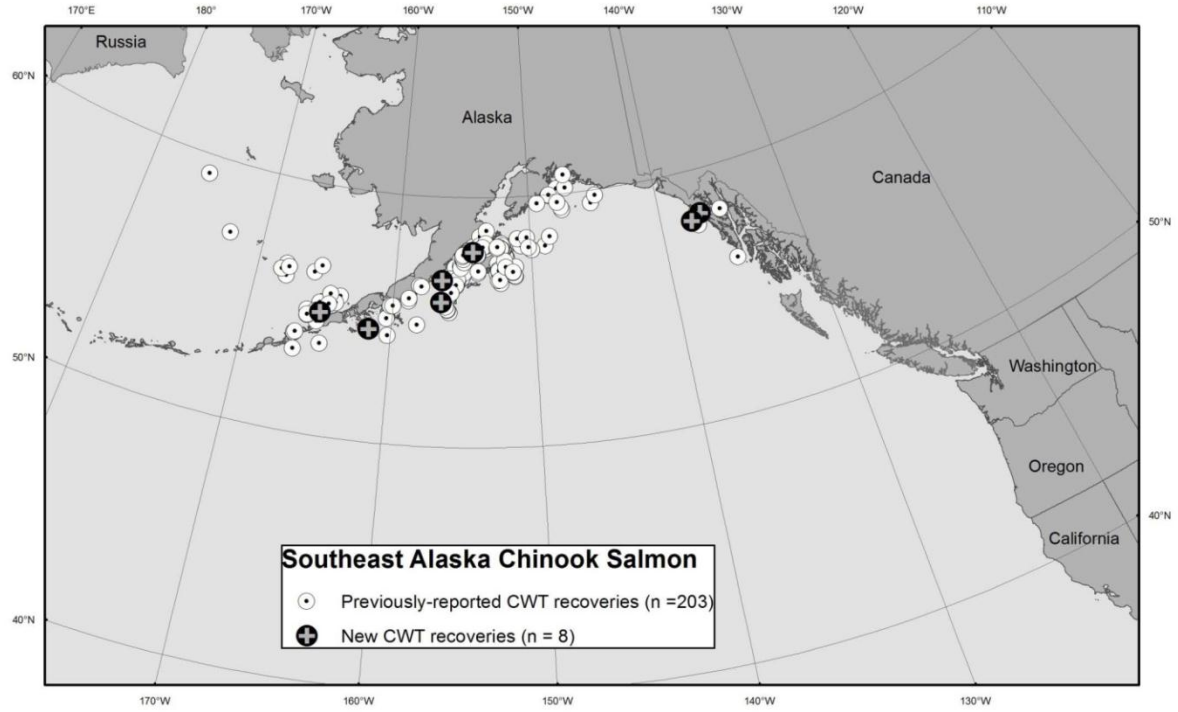
Table 3-5 Observed Number and Mark Expansion of CWT Alaska-origin Chinook salmon prohibited species catch of the GOA groundfish fishery by run year and release basin, 1995 through 2010.

	Cook Inlet, Alaska		Southeast Alaska		Alaska TOTAL	
Run Year	**Observed Number**	**Mark Expansion**	**Observed Number**	**Mark Expansion**	**Observed Number**	**Mark Expansion**
1995	1	4.0	3	8.0	4	11.9
1996	4	10.7	10	81.7	14	92.4
1997	1	5.3	1	12.1	2	17.4
1998	14	41.4	16	116.4	30	157.8
1999	20	37.6	25	206.6	45	244.3
2000	2	4.2	22	220.7	24	224.9
2001	2	2.0	8	98.2	10	100.2
2002	1	1.0	9	46.2	10	47.2
2003	0	0.0	2	22.4	2	22.4
2004	0	0.0	3	30.5	3	30.5
2005	0	0.0	3	33.6	3	33.6
2006	0	0.0	10	58.3	10	58.3
2007	0	0.0	13	99.1	13	99.1
2008	2	2.0	4	50.3	6	52.3
2009	1	1.0	4	40.4	5	41.4
2010*	0	0.0	11	93.1	11	93.1
TOTAL	48	109.2	144	1217.5	192	1326.7
mean	3.0	6.8	9.0	76.1	12.0	82.9
average % of total	25%	8%	75%	92%	100%	100%

Source: NMFS 2011a.

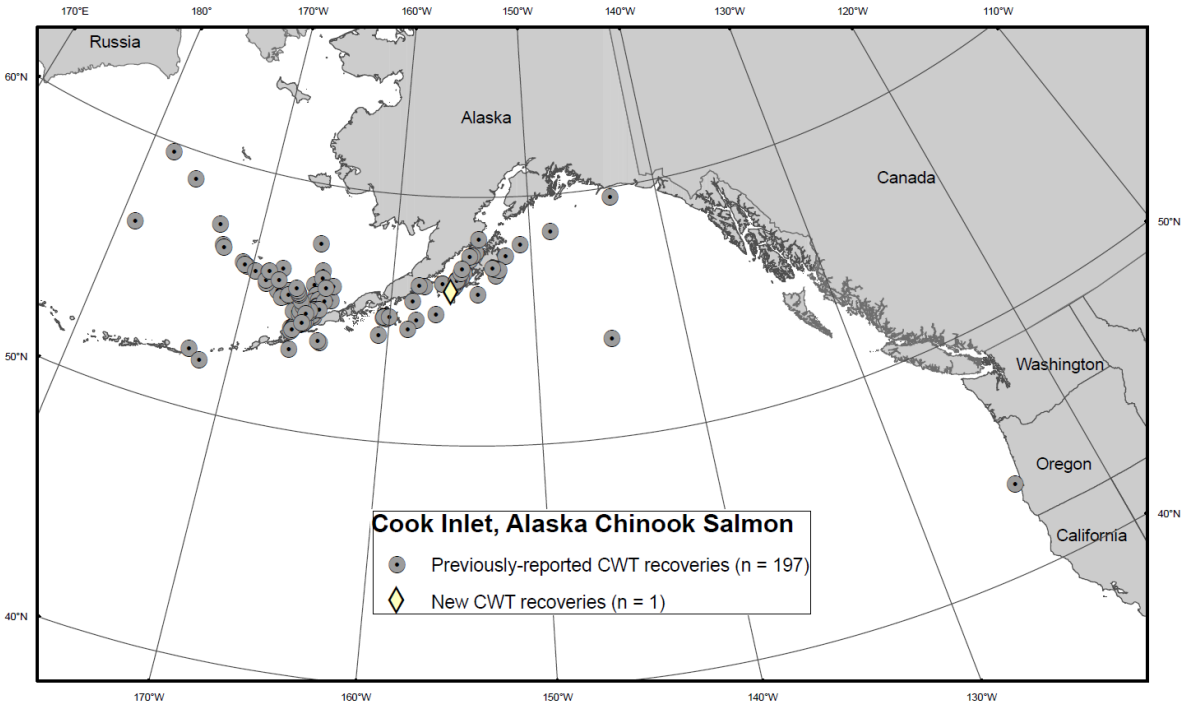
Maps of CWT Chinook salmon distribution in the North Pacific Ocean, GOA, and Bering Sea by state or province of origin are shown (Figure 3-5 through Figure 3-11). These maps are compiled from CWT recoveries from high seas commercial fisheries and research surveys, 1981 through 2012, and are updated annually (Celewycz et al. 2012). High seas commercial fisheries include fisheries that occur in the exclusive economic zone (EEZ) off Alaska.

Figure 3-5 Ocean distribution for Southeast Alaska Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981 through 2012. Points reflect recovery locations.



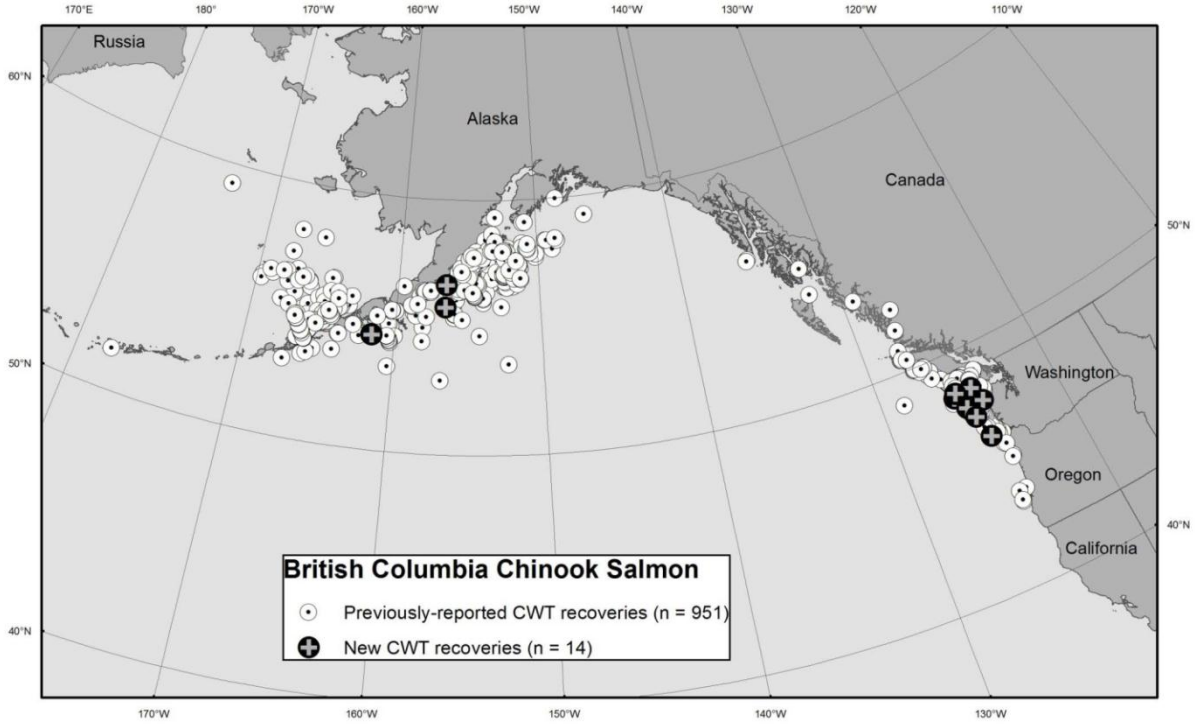
Source: Celewycz et al. 2012

Figure 3-6 Ocean distribution for Cook Inlet Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981 through 2011. Points reflect recovery locations.



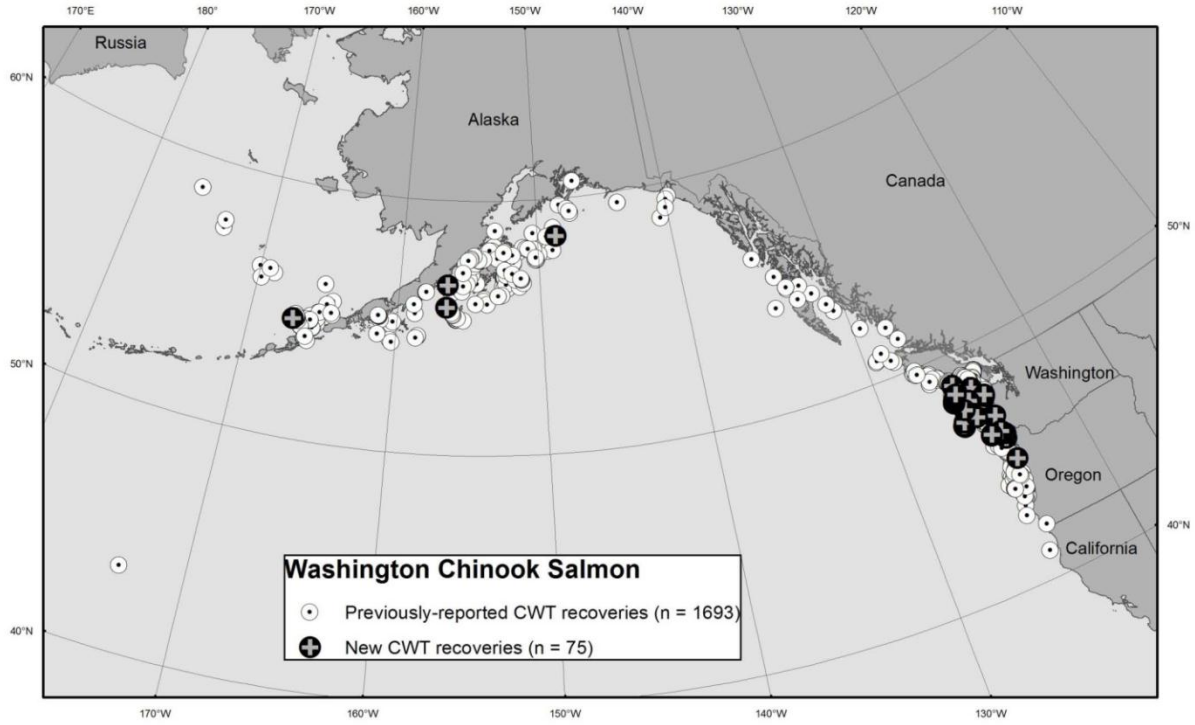
Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 10/27/2011.

Figure 3-7 Ocean distribution for British Columbia Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981 through 2012. Points reflect recovery locations.



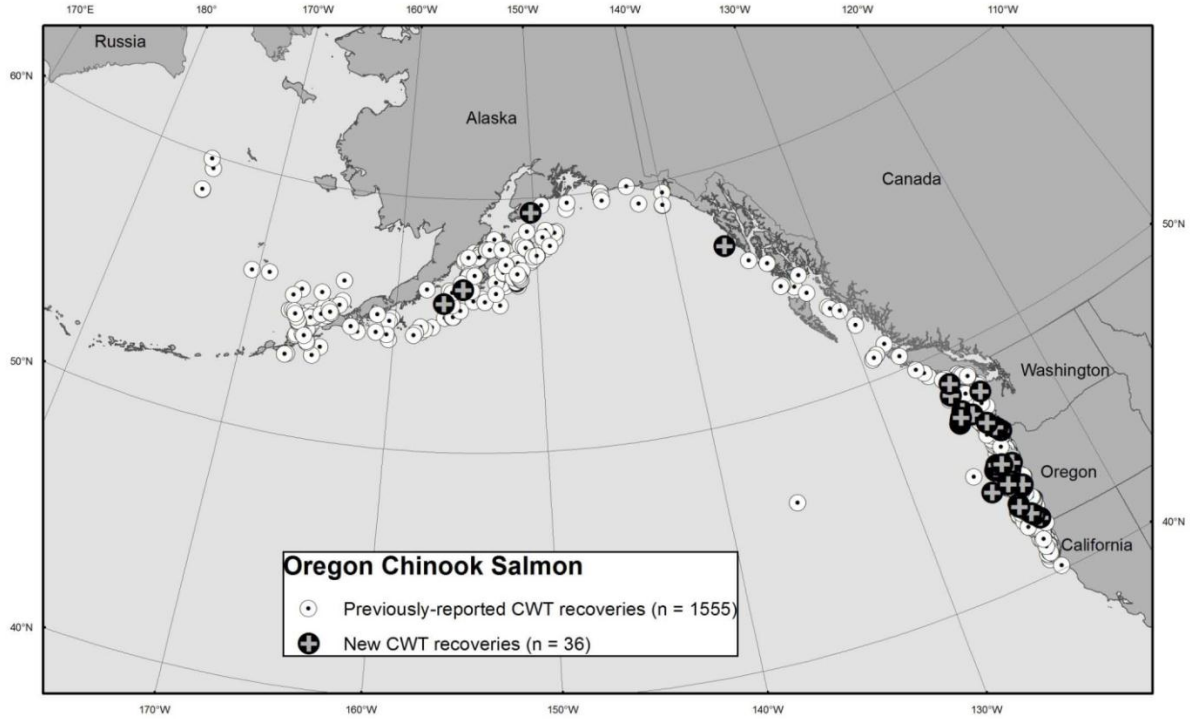
Source: Celewycz et al. 2012

Figure 3-8 Ocean distribution for Washington Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981 through 2012. Points reflect recovery locations.



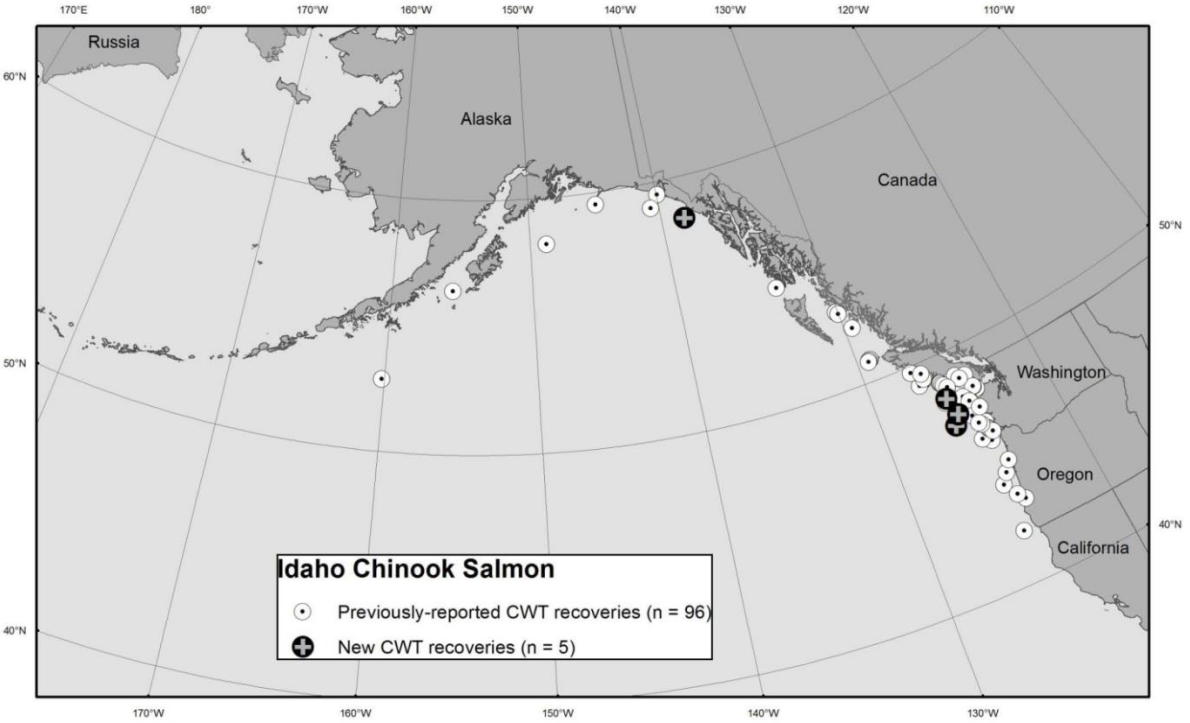
Source: Celewycz et al. 2012

Figure 3-9 Ocean distribution for Oregon Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981 through 2012. Points reflect recovery locations.



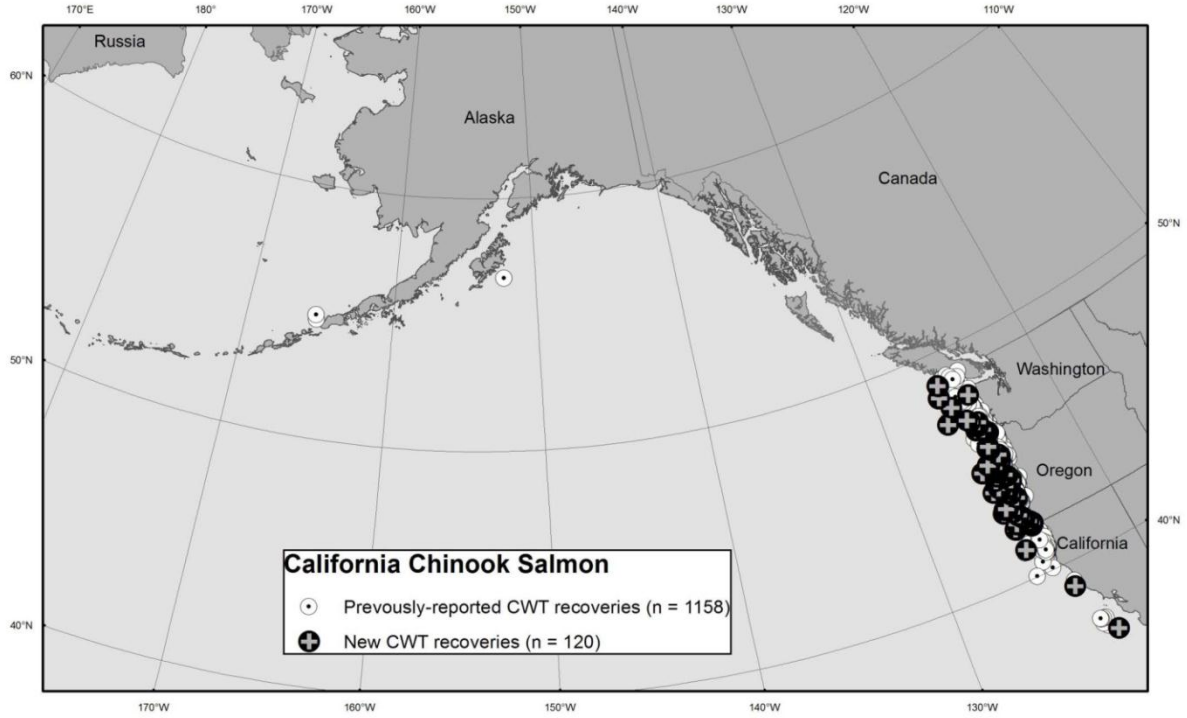
Source: Celewycz et al. 2012

Figure 3-10 Ocean distribution for Idaho Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981 through 2012. Points reflect recovery locations.



Source: Celewycz et al. 2012

Figure 3-11 Ocean distribution for California Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981 through 2012. Points reflect recovery locations.



Source: Celewycz et al. 2012

Most of the Chinook salmon represented by CWTs and harvested in the GOA originated from hatchery production (Table 3-6). Overall since 1995, 95% of the CWT Chinook salmon PSC was of hatchery origin, 3% from wild stocks, and 2% of mixed hatchery-wild stocks. For Alaska-origin CWT Chinook salmon however, wild stocks increased to 9% of the PSC of Alaskan stocks in the GOA, with hatcheries providing the other 91%. For all the CWT Chinook salmon that have been released in Alaska from the 1992 brood onward, 87% were of hatchery origin, and 13% were from wild stocks. Washington was the only other state of origin for wild stocks recovered in the GOA. However, as discussed above, CWTs do not represent the true composition of all stocks of Chinook salmon in the PSC of GOA groundfish fisheries.

Table 3-6 Observed Number of CWT Chinook salmon captured in the prohibited species catch of the GOA groundfish fishery by state or province of origin, 1995 through 2010.

	Rearing Type				
Origin	**Unknown**	**Hatchery**	**Mixed**	**Wild**	**TOTAL**
Alaska	0	174	0	18	192
British Columbia	0	196	0	0	196
Idaho	1	0	0	0	1
Oregon		130	0	0	130
Washington	0	76	11	3	90
TOTAL	**1**	**576**	**11**	**17**	**605**
average % of total	0%	95%	2%	3%	100%

Source: NMFS 2011a.

Chinook salmon represented by CWTs and recovered in the GOA were composed of a variety of run-types, and the percentage of each run-type varied by state or province of origin (Table 3-7). The different designated run-types are determined by the tagging agency. Overall, the most prevalent run-type of CWT

Chinook salmon in the GOA was Spring, followed by Fall, Summer, and small numbers of other run-types. Percent composition of different run-types varied by state or province of origin. For Alaska stocks, 99% of CWT recoveries were Spring run-type. For British Columbia, the most prevalent run-type was Summer (41%), followed by Fall (32%) and Spring (27%). Washington Chinook salmon were predominantly Fall run-type (54%), followed by Summer (30%), Spring (8%), Late Fall (4%), and Late Fall Upriver Bright (3%). Oregon Chinook salmon were predominantly Spring (54%), followed by Fall (45%) and Winter (2%).

Table 3-7 Percent run-type of CWT Chinook salmon captured in the prohibited species catch of the GOA groundfish fishery by state or province of origin, 1995 through 2010.

Origin	Run-type						TOTAL
	Spring	Summer	Fall	Winter	Late Fall	Late Fall Upriver Bright	
Alaska	99%	1%	0%	0%	0%	0%	100%
British Columbia	27%	41%	32%	0%	0%	0%	100%
Oregon	54%	0%	45%	2%	0%	0%	100%
Washington	8%	30%	54%	0%	4%	3%	100%
Mean	48%	20%	31%	0%	1%	1%	100%

Source: NMFS 2011a.

3.3.4 Management and Assessment of Chinook Salmon Stocks

North Pacific Chinook salmon are the subject of commercial, subsistence, personal use, and sport/recreational (used interchangeably) fisheries. Chinook salmon are the least abundant of the five salmon species found on both sides of the Pacific Ocean and the least numerous in the Alaska commercial harvest. The majority of the Alaska commercial catch is made in Southeast Alaska, Bristol Bay, and the Arctic-Yukon-Kuskokwim area. The majority of catch is made with troll gear and gillnets. Approximately 90% of the subsistence harvest is taken in the Yukon and Kuskokwim rivers. The Chinook salmon is one of the most highly prized sport fish in Alaska and is extensively fished by anglers in the Southeast and Cook Inlet areas. The sport fishing harvest of Chinook salmon is over 170,000 fish annually with Cook Inlet and adjacent watersheds contributing over half the catch. Unlike other Pacific salmon species, Chinook salmon rear in inshore marine waters and are, therefore, available to commercial and sport fishers all year round (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main).

The Alaska State Constitution establishes, as state policy, the development and use of replenishable resources, in accordance with the principle of sustained yield, for the maximum benefit of the people of the state. In order to implement this policy for the fisheries resources of the state, the Alaska Legislature created the Alaska Board of Fisheries (BOF) and the ADF&G. The BOF was given the responsibility to establish regulations guiding the conservation and development of the state's fisheries resources, including the distribution of benefits among subsistence, commercial, recreational, and personal uses. ADF&G was given the responsibility to implement the BOF's regulations and management plans through the scientific management of the state's fisheries resources. Scientific and technical advice is provided by ADF&G to the BOF during its rule-making process. The first priority for management is to meet spawning escapement goals in order to sustain salmon resources for future generations. The highest priority use is for subsistence under both state and federal law. Salmon surplus above escapement needs and subsistence uses are made available for other uses (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management).

ADF&G's fishery management activities fall into two categories: inseason management and applied science. For inseason management, the division employs fishery managers near the fisheries. Local fisheries managers are given authority to open and close fisheries to achieve two goals: the overriding

goal is conservation to ensure an adequate escapement of spawning stocks, and the secondary goal is an allocation of fish to various user groups based upon management plans developed by the BOF. The BOF develops management plans in open, public meetings after considering public testimony and advice from various scientists, advisors, fishermen, and user interest groups (Woodby et al. 2005). Decisions to open and close fisheries are based on the professional judgment of area managers, the most current biological data from field projects, and fishery performance. Research biologists and other specialists conduct applied research in close cooperation with the fishery managers. The purpose of the division's research staff is to ensure that the management of Alaska's fisheries resources is conducted in accordance with the sustained yield principle and that managers have the technical support they need to ensure that fisheries are managed according to sound scientific principles and utilizing the best available biological data. The division works closely with the Division of Sport Fisheries in the conduct of both management and research activities (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management).

By far, most salmon in Alaska are caught in commercial troll, gillnet, and purse seine fisheries in which participation is restricted by a limited entry system. Troll gear works by dragging baited hooks through the water. Gillnet gear works by entangling the fish as they attempt to swim through the net. Gillnets are deploying in two ways: from a vessel that is drifting and from an anchored system out from the beach. Purse seines work by encircling schools of fish with nets that are drawn up to create giant "purses" that hold the school until the fish can be brought aboard. Other kinds of gear used in Alaska's smaller fisheries include fishwheels, which scoop fish up as the wheel is turned by river currents (Woodby et al. 2005). More information on the management of Alaska Chinook salmon commercial, sport/recreational, and subsistence fisheries may be found in the RIR, Section 4.5.

3.3.4.1 Escapement Goals and Stock of Concern Definitions

The Alaska State Constitution, Article VII, Section 4, states that "Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial users." In 2000, the Alaska BOF adopted the Sustainable Salmon Fisheries Policy (SSFP) for Alaska, codified in 5 AAC 39.222. The SSFP defines sustained yield to mean an average annual yield that results from a level of salmon escapement that can be maintained on a continuing basis; a wide range of average annual yield levels is sustainable and a wide range of annual escapement levels can produce sustained yields (5 AAC 39.222(f)(38)).

The SSFP contains five fundamental principles for sustainable salmon management, each with criteria that will be used by ADF&G and the BOF to evaluate the health of the state's salmon fisheries and address any conservation issues and problems as they arise. These principles are (5 AAC 39.222(c)(1-5):

- Wild salmon populations and their habitats must be protected to maintain resource productivity;
- Fisheries shall be managed to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning;
- Effective salmon management systems should be established and applied to regulate human activities that affect salmon;
- Public support and involvement for sustained use and protection of salmon resources must be maintained;
- In the face of uncertainty, salmon stocks, fisheries, artificial propagation, and essential habitats must be managed conservatively.

This policy requires that ADF&G describe the extent salmon fisheries and their habitats conform to explicit principles and criteria. In response to these reports the board must review fishery management plans or create new ones. If a salmon stock concern is identified in the course of review, the management

plan will contain measures, including needed research, habitat improvements, or new regulations, to address the concern.

A healthy salmon stock is defined as a stock of salmon that has annual runs typically of a size to meet escapement goals and a potential harvestable surplus to support optimum or maximum yield. In contrast, a depleted salmon stock means a salmon stock for which there is a conservation concern. Further, a stock of concern is defined as a stock of salmon for which there is a yield, management, or conservation concern (5 AAC 39.222(f)(16)(7)(35)). A conservation concern may arise from a failure to maintain escapements above a sustained escapement threshold. Yield concerns arise from a chronic inability to maintain expected yields or harvestable surpluses above escapement needs. Management concerns are precipitated by a chronic failure to maintain escapements within the bounds, or above the lower bound, of an established goal.

Escapement is defined as the annual estimated size of the spawning salmon stock. Quality of the escapement may be determined not only by numbers of spawners, but also by factors such as sex ratio, age composition, temporal entry into the system, and spatial distribution within salmon spawning habitat ((5 AAC 39.222(f)(10)). Scientifically defensible salmon escapement goals are a central tenet of fisheries management in Alaska. It is the responsibility of ADF&G to document, establish, and review escapement goals, prepare scientific analyses in support of goals, notify the public when goals are established or modified, and notify the board of allocative implications associated with escapement goals.

The key definitions contained in the SSFP with regard to scientifically defensible escapement goals and resulting management actions are: biological escapement goal, optimal escapement goal, sustainable escapement goal, and sustained escapement threshold. Biological escapement goal (BEG) means the escapement that provides the greatest potential for maximum sustained yield. BEG will be the primary management objective for the escapement unless an optimal escapement or inriver run goal has been adopted. BEG will be developed from the best available biological information and should be scientifically defensible on the basis of available biological information. BEG will be determined by ADF&G and will be expressed as a range based on factors such as salmon stock productivity and data uncertainty (5 AAC 39.222(f)(3)).

Optimal escapement goal (OEG) means a specific management objective for salmon escapement that considers biological and allocative factors and may differ from the sustainable escapement goal (SEG) or BEG. An OEG will be sustainable and may be expressed as a range with the lower bound above the level of sustained escapement threshold (SET) (5 AAC 39.222(f)(25)).

SEG means a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5- to 10-year period, and used in situations where a BEG cannot be estimated or managed for. The SEG is the primary management objective for the escapement, unless an optimal escapement or inriver run goal has been adopted by the board. The SEG will be developed from the best available biological information, and should be scientifically defensible on the basis of that information. The SEG will be determined by the ADF&G, and will be stated as a range (SEG Range) or a lower bound (Lower Bound SEG) that takes into account data uncertainty. ADF&G will seek to maintain escapements within the bounds of the SEG Range or above the level of a Lower Bound SEG (5 AAC 39.222(f)(36)).

SET means a threshold level of escapement, below which the ability of the salmon stock to sustain itself is jeopardized. In practice, SET can be estimated based on lower ranges of historical escapement levels, for which the salmon stock has consistently demonstrated the ability to sustain itself. The SET is lower than the lower bound of the BEG and also lower than the lower bound of the SEG. The SET is established

by ADF&G in consultation with the board for salmon stocks of management or conservation concern (5 AAC 39.222(f)(39)).

The Policy for Statewide Salmon Escapement Goals is codified in 5 AAC 39.223. In this policy, the board recognizes ADF&G's responsibility to document existing salmon escapement goals; to establish BEGs, SEGs, and SETs; to prepare scientific analyses with supporting data for new escapement goals or to modify existing ones; and to notify the public of its actions. As such, the board will take regulatory actions as may be necessary to address allocation issues arising from new or modified escapement goals and determine the appropriateness of establishing an OEG. In conjunction with the SSFP, this policy recognizes that the establishment of salmon escapement goals is the responsibility of both the board and ADF&G.

3.3.5 Chinook Salmon Stocks by area

A brief overview of Chinook salmon stocks by area is included in this section. Available information on individual stocks and run strengths varies greatly by river and management area. The 2011 escapement goals, and escapement for 2003 through 2011, are provided by river for each Alaska region in Appendix 2. Section 3.3.5.11 provides a summary of Alaska Chinook salmon stock performance in 2012.

3.3.5.1 Southeast Alaska and Yakutat

Native Chinook salmon stocks occur throughout Southeast Alaska and Yakutat, primarily in the large mainland rivers and their tributaries. Of the 34 known rivers that produce runs of Chinook salmon the Alsek, Taku, Stikine, Chilkat, and the Behm Canal Rivers (i.e., Unuk, Chickamin, Blossom, and Keta Rivers) are the most important (Pahlke 2010). Some of these important rivers are transboundary systems which originate in Canada and flow through Alaska to the Pacific Ocean. The Pacific Salmon Commission, under the terms of the Pacific Salmon Treaty, address shared ownership and coordinated management of the Taku, Stikine, and Alsek rivers.

Commercial Chinook salmon harvests are based on three components: (1) the all-gear Pacific Salmon Treaty defined harvest ceiling, based on coastwide abundance forecasts; (2) directed fisheries on returns to the Stikine and/or Taku rivers, also based on forecasts and harvest sharing agreements contained in the Pacific Salmon Treaty; and (3) production from Alaska enhancement programs (Der Hovanisian et al 2011). In addition to commercial fisheries, Chinook salmon are also taken in sport, personal use, and subsistence fisheries. A majority of the Chinook salmon sport harvest occurs in the Ketchikan, Sitka, and Juneau areas.

Spawning escapement is monitored on eleven river systems as biological escapement goals (Munro and Volk 2012) and these counts are used as indicators of relative salmon abundance as part of a coast-wide Chinook salmon model. The Taku, Stikine, and Chilkat rivers make up over 75% of the summed escapement goals in the region.

3.3.5.2 Prince William Sound

The Prince William Sound (PWS) management area encompasses all coastal waters and inland drainages entering the north Central GOA between Cape Suckling and Cape Fairfield. Chinook salmon are harvested in commercial fisheries (primarily by drift gillnets), sport, personal use, and subsistence fisheries. The entire Chinook salmon run originates from wild upriver stocks (Botz et al. 2010).

The Copper River is the only river in the PWS area where Chinook salmon escapement is monitored. In 2003 the Department established a SEG of 24,000 Chinook salmon for the Copper River. With the exception of 2005 and 2010, this lower-bound SEG has been achieved in all years since implementation.

3.3.5.3 Cook Inlet

The Cook Inlet management area is divided into two areas, the Upper Cook Inlet (northern and Central districts) and the Lower Cook Inlet. The Upper Cook Inlet commercial fisheries management area consists of that portion of Cook Inlet north of the latitude of the Anchor Point Light. There is one optimal escapement goal (Kenai River early run) and 21 sustainable escapement goals in effect for Chinook salmon in the Upper Cook Inlet area. Chinook salmon are harvested in the commercial fishery by set and drift gillnet gear and are an important component of subsistence and sport fisheries in the area. Chinook salmon may not be retained in most of the personal use fisheries of Upper Cook Inlet; exceptions include the Kenai River dip net fishery and the Kasilof River set gillnet personal use fishery (Shields 2010).

Chinook salmon runs in a number of areas of the state, including Upper Cook Inlet, have fallen below expected levels in recent years. Strict fishery management actions were made in the efforts to meet escapement objectives and ensure sustained yield. Chinook salmon fisheries were curtailed and fisheries for other more abundant salmon species were limited in areas where their harvest could affect weakened Chinook runs. In Upper Cook Inlet, emergency orders were issued restricting sport fisheries for Chinook salmon in fresh and salt waters. Commercial set gillnetting was closed for much of the season in the Kenai Kasilof, and East Foreland sections of the Upper Subdistrict. In the Northern District, the commercial setnet fishery was restricted and in river sport fisheries were tightly constrained to conserve Chinook salmon.

Chinook salmon runs in Upper Cook Inlet were below average to poor in recent years (Table 3-8 and Appendix 2). The majority of the Chinook salmon escapement goals in Upper Cook Inlet were not met in 2011 or 2012.

The Lower Cook Inlet management area is comprised of all waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point. There are three SEGs in effect for Chinook salmon in the Lower Cook Inlet area. Chinook salmon are not a commercially important species in Lower Cook Inlet and most of the catch occurs incidental to fisheries targeting sockeye (Hammarstrom and Ford 2010). Chinook salmon are monitored in Lower Cook Inlet: Deep Creek, and Anchor and Ninilchik rivers. Chinook salmon runs have been below average in recent years (Table 3-8 and Appendix 2). However, escapement goals have generally been met, but only with restrictions and/or closures to sport fisheries.

3.3.5.4 Alaska Peninsula

The North Alaska Peninsula portion of the Alaska Peninsula Management Area includes those waters of the Alaska Peninsula from Cape Sarichef to Cape Menshikof. The majority of Chinook salmon harvest occurs incidental to sockeye salmon fisheries, although directed fisheries do occur. Sport and subsistence fisheries also harvest Chinook salmon in the North Alaska Peninsula area.

The Nelson River is the only river on the North Alaska Peninsula with a Chinook salmon escapement goal. The biological escapement goal was set at 2,400 to 4,400 Chinook salmon. In both 2011 and 2012 the Chinook salmon escapement goal was not met however the goal was met in 2010.

The South Alaska Peninsula Area includes waters from Kupreanof Point west to Scotch Cap. No Chinook salmon are known to spawn in South Alaska Peninsula streams. Chinook salmon are commercially

harvested by purse seine, drift gillnet, and set gillnet gear. Most of the Chinook salmon are taken by seine gear incidental to other fisheries. The 10-year average commercial harvest is approximately 5,000 fish (Poetter et al. 2011). Chinook salmon are also taken in subsistence and sport fisheries.

3.3.5.5 Chignik

The Chignik Management Area encompasses all coastal waters and inland drainages of the northwest GOA between Kilokak Rocks and Kupreanof Point. Chinook salmon are harvested in commercial, sport, and subsistence fisheries.

The Chignik River is the only stream with substantial Chinook salmon production in the Chignik area. In 2002, a biological escapement goal was established for the Chignik River at 1,300 to 2,700 Chinook salmon (Jackson and Anderson 2010). The BEG has been met or exceeded in all years since implementation.

3.3.5.6 Kodiak

The Kodiak Management Area comprises the waters of the Western GOA surrounding the Kodiak Archipelago and that portion of the Alaska Peninsula bordering the Shelikof Straight between Cape Douglas and Kilokak Rocks. The majority of commercial Chinook salmon harvest is taken by seine fishermen during June and early July in the Afognak, Northwest Kodiak, Eastside Kodiak and Mainland districts. Chinook salmon harvest also occurs in sport and subsistence fisheries.

Chinook salmon occur in six streams and biological escapement goals are established for both the Karluk and Ayakulik rivers. In 2012 fisheries targeting sockeye salmon occurred along the Westside of Kodiak Isalnd and in the Outer Karluk Section of the Southwest Kodiak District. During these fishing periods nonretention of Chinook salmon by purse seine gear was implemented from Cape Kuliuk to Low Cape. After not achieving the escapement goal from 2007-2010, Karluk Chinook salmon escapement was within the escapement goal range of 3,000 to 6,000 fish in 2011 and 2012. Ayakulik Chinook salmon have achieved the escapement goal of 4,000 to 8,000 fish every year since 2008.

3.3.5.7 Bristol Bay

The Bristol Bay Area includes all coastal waters and inland waters east of a line from Cape Newenham to Cape Menshikof. The area is further divided into five fishing districts: Togiak, Nushagak, Naknek-Kvichak, Egegik, and Ugashik. Harvests of Chinook salmon in the commercial fishery predominantly occur in the Nushagak District (Morstad et al. 2010). Chinook salmon are popular targets in both the sport and subsistence fisheries.

Chinook salmon runs in Bristol Bay were poor to below average in recent years (Table 3-8 and Appendix 2). Directed commercial fishing for Chinook salmon was limited in Nushagak District in some recent years. In addition, sport and subsistence fisheries were also restricted and/or closed in some recent years.

The Nushagak River has an SEG of 40,000 to 80,000 Chinook salmon and the Togiak, Naknek, Alagnak, and Egegik rivers all have lower-bound SEGs. The escapement goal for the Nushagak River was not met in 2010, met in 2011, and exceeded 2012 (Table 3-8 and Appendix 2). The other Chinook salmon goals in Bristol Bay are based on aerial surveys. Most of these aerial survey-based escapement goals were not assessed due to inclement weather or poor survey conditions in 2011 and 2012; therefore we do not know if the escapement goals were met for these systems.

3.3.5.8 Kuskokwim

The Kuskokwim Management Area includes the Kuskokwim River drainage, all waters of Alaska that flow into the Bering Sea between Cape Newenham and the Naskonat Peninsula, and Nunivak and St. Mathew Islands. Kuskokwim River Chinook salmon are harvested primarily for subsistence use, although incidental harvest in the chum salmon commercial fisheries does occur during late June and July, and some sport fishing occurs (Bavilla et al. 2010).

Chinook salmon escapements are evaluated through aerial surveys, by enumeration at weirs, and through mark and recapture at the mainstem tagging project near Upper Kalskag. The Middle Fork Goodnews River has a biological escapement goal of 1,500 to 2,900 Chinook salmon. The remaining 13 streams have SEGs which were implemented in either 2005 or 2007. Escapement goals have not been achieved on most river systems since implementation.

3.3.5.9 Yukon River

The Yukon Salmon Management Area encompasses the largest river in Alaska. The Yukon River and its tributaries drain an area of approximately 220,000 square miles within Alaska, while the Canadian portion of the river accounts for another 110,000 square miles. The river flows 2,300 miles from its origin 30 miles from the GOA to its terminus in the Bering Sea. Spawning populations of Chinook salmon occur throughout the Yukon River drainage in tributaries from as far downstream as the Archuelinuk River to as far upstream as the headwaters of the Yukon River in Canada.

The Yukon is managed as a single river and catches are reported by district and use (sport, commercial, personal use, and subsistence). Chinook salmon production for many Yukon River stocks has been declining in recent years and the Yukon River Chinook salmon was designated as a Stock of Yield Concern in 2000 (Hayes and Norris 2010). Biological escapement goals have been established for the Chena and Salcha rivers, while SEGs have been established for the East and West Fork Andreafsky, Anvik, and Nulato rivers.

3.3.5.10 Norton Sound

Norton Sound, Port Clarence, and Kotzebue Sound management districts include all waters from Point Romanof in southern Norton Sound to Point Hope at the northern edge of Kotzebue Sound, and St. Lawrence Island. There are few Chinook salmon in the Port Clarence District. In the Norton Sound District, only the eastern area has sizeable runs of Chinook salmon and the primary salmon producing rivers are the Shaktoolik and Unalakleet subdistricts. The Shaktoolik and Unalakleet Chinook salmon stock was classified as a stock of yield concern in 2004. Commercial fishing typically begins in June and targets Chinook salmon if sufficient run strength exists (Menard et al. 2010). Sport and subsistence fisheries for Chinook salmon also occur in the Norton Sound area.

Escapement goals are established for five stocks in the Norton Sound Area, all are SEGs: Fish River/ Boston Creek, Kwiniuk River, North River (Unalakleet River), Shaktoolik River, and Unalakleet/ Old Woman River. Norton Sound Chinook salmon run since 2008 have been among the poorest on record.

3.3.5.11 Summary of 2012 Alaska Chinook Salmon Stock Status

Chinook salmon runs in Western Alaska have been below average since 2007, and management of the fisheries has been conservative in many systems. No directed Chinook salmon commercial fisheries occurred in the Yukon River, Kuskokwim River, or in Norton Sound in 2012, and only small commercial fisheries occurred in the Nushagak and Kuskokwim Bay (Table 3-8). Sport fisheries were restricted or

closed in the Nushagak River, Yukon (Chena River), Kuskokwim (Kwethluk and Tuluksak rivers), and Unalakleet and Shaktoolik rivers of Norton Sound Management Area. More significantly, subsistence fisheries in the Nushagak River, two tributaries of the Kuskokwim River (Kwethluk and Tuluksak rivers; U.S. Fish and Wildlife Service [USFWS] federal closure), and Norton Sound (Unalakleet and Shaktoolik rivers) were restricted or closed. In spite of conservative management strategies, which in some cases were at great cost to the people who rely on these resources for food and income, few escapement goals were achieved in Western Alaska.

Kodiak Island Chinook salmon escapement was well below the previous 10-year average. Returns to the Karluk River barely met the escapement goal despite restrictions of nonretention implemented preseason so the sport and commercial fisheries. Escapement through the Ayakulik weir was within the established escapement goal due in part to preseason emergency order fishery restrictions to the sport fishery. The 2012 escapement to the Chignik River was approximately 100 fish above the lower end of the escapement goal. Only 4 of 17 Chinook salmon escapement goals were met in northern Cook Inlet, despite preseason restrictions to sport and commercial fisheries, and inseason closures of several inriver sport fisheries. At this time it does not appear the escapement goal was met for early-run Kenai River Chinook salmon and, if achieved for late-run Kenai River Chinook salmon, it happened at the cost of closure of the inriver and marine sport fisheries and the Upper Subdistrict set gillnet commercial fishery.

Table 3-8 Overview of Alaskan Chinook salmon stock performance, 2012.

Chinook salmon stock	Total run size?	Escapement goals met?[a]	Subsistence fishery?	Commercial fishery?	Sport fishery?	Stock of concern?
Bristol Bay	Below average	0 of 1[b] (4 not surveyed)	Yes	Limited in Nushagak	Restricted on Nushagak for a portion of the season	No
Kuskokwim	Poor	2 of 7 (5 not surveyed)	Restricted on Kuskokwim River	None on Kuskokwim River, limited in Bay	Closed on Kuskokwim River, not in Bay	No
Yukon	Poor	3 of 5 (1 not surveyed)	Restricted	No	Bag limit reduced in all tributaries, no retention in mainstem and Tanana, no bait allowed on Tanana tributaries; Chena closed	Yield
Norton Sound	Poor	0 of 2 (3 not surveyed)	Restricted	No	No	Yield
Alaska Peninsula	Below average	0 of 1	Yes	Yes	Closed	No
Kodiak	Below average	2 of 2	Yes	Restricted, nonretention in Karluk and Ayakulik areas	Restricted, nonretention in Karluk, reduced bag and annual limits in Ayakulik	Management (Karluk)
Chignik	Below average	1 of 1	Yes	Yes	Restricted, nonretention, reduced bag and annual limits	No
Upper Cook Inlet	Poor	4 of 21[c]	Yes, with restrictions	Restricted in Northern District and Eastside set gillnets in Central District	Various restrictions including complete closure	6 stocks of conern
Lower Cook Inlet	Below average	3 of 3	Yes	Yes	Restricted; Closed Anchor River	No
Prince William Sound	Below average	1 of 1	Yes	Yes	Yes	No
Southeast	Below average	N/A	Yes	Yes	Yes	No

[a] Some aerial survey-based escapement goals were not assessed due to inclement weather or poor survey conditions, therefore we do not know if the escapement goals were met for these systems.
[b] The Chinook salmon escapement goal of 40,000 – 80,000 and the inriver goal of 75,000 were exceeded on the Nushagak River in 2012.
[c] Uncertainty in measuring the inriver abundance of early- and late-run Kenai River Chinook salmon do not provide clear assessment if the escapement goal of these two stocks were met.

3.3.5.12 Pacific Northwest Stocks

Chinook salmon stocks in the Pacific Northwest include over 200 stocks from British Columbia, Oregon and Washington State. The specific stocks are listed in 2010 BSAI Chinook salmon EIS (Chapter 3, NMFS 2009b). A specific discussion of Chinook salmon stocks in the Pacific Northwest listed under the Endangered Species Act (ESA) is addressed in Section 3.3.6, and more information on non-ESA-listed species may be found on the NMFS Northwest Region website, http://www.nwr.noaa.gov/.

3.3.5.13 Asian Stocks

On the Asian coast, Chinook salmon occur from the Anadyr River area of Siberia southward to Hokkaido, Japan.[7] Chinook salmon occur primarily in Russia, from the Amur River, northward to the Anadyr River

[7] http://www.adfg.state.ak.us/pubs/notebook/fish/chinook.php

(center of abundance is the Kamchatka Peninsula). High seas tagging experiments have provided little information on ocean ranges of Asian Chinook salmon. There are only two Asian coastal recoveries of high-seas tagged Chinook salmon. One was a fish released just off the coast of Hokkaido, Japan, and recovered in Japan, and the other released south of the Aleutians in the Central North Pacific (172°03´W, 49°35´N) and recovered in East Kamchatka (Kamchatka River).

3.3.6 ESA-listed Chinook Salmon Stocks in the Pacific Northwest

Of the nine Chinook salmon Evolutionarily Significant Units (ESUs) in the Pacific Northwest that are listed under the ESA, three are known to have been taken as PSC in the Alaska groundfish fisheries. The information currently available on Chinook salmon ESA-listed ESUs in the GOA is from CWTs. Chinook salmon from the Lower Columbia River, Upper Columbia River, and Upper Willamette River Spring ESUs have been recovered in the GOA trawl fishery. Small numbers of the Puget Sound Chinook salmon ESU, the Snake River Spring/Summer Chinook salmon ESU, and the Snake River Basin steelhead ESUs have been documented by research surveys in the GOA, indicating that these stocks also occur in the GOA. All of the Chinook salmon from ESA-listed ESUs that have been recovered in the GOA trawl fishery have been spring run. One of the Lower Columbia River CWTs recovered in high seas research (2001) was a fall run (Adrian Celewycz, personal communication, November 2010).

In January 2007, the NMFS Northwest Region completed a supplemental biological opinion to the November 30, 2000 biological opinion on the effects of the Alaska groundfish fisheries on ESA-listed salmon (NMFS 2007c). An incidental take statement was included in the 2000 and 2007 biological opinions, which established a threshold of 40,000 Chinook salmon caught as PSC in the GOA groundfish fisheries. The 2000 biological opinion concluded that the GOA groundfish fisheries are not likely to jeopardize the continued existence of ESA-listed Chinook salmon stocks. If, during the course of the fisheries, the specified level of take is exceeded, a reinitiation of consultation is required, along with a review of the reasonable and prudent measures identified in the 2007 supplemental biological opinion.

Because of the high number of Chinook salmon taken in the GOA groundfish fisheries in 2010, the NMFS Alaska Region reinitiated ESA section 7 formal consultation with NMFS Northwest region on the 2010 incidental take of Chinook salmon (Balsiger 2010). The incidental take of Chinook salmon in the 2010 GOA groundfish fisheries was 54,576 fish (NMFS Alaska Region Catch Accounting System February 10, 2011). In 2012, the Northwest Region responded that, given the recently adopted Council actions to further reduce Chinook PSC and improve PSC estimation, monitoring, and sampling, the effect of the GOA groundfish fishery on listed Chinook salmon is likely to remain within the limits proscribed n the supplemental 2007 biological opinion (Stelle 2012).

Detailed information on listed stocks is available in updated status reports of listed ESUs (Good et al. 2005; McElheny et al. 2007), and in the Interim Regional Recovery Plan for Washington management units of the listed ESUs in the Lower Columbia River (LCFRB 2004). Additional information related to the status of Lower Columbia River and Upper Willamette River Chinook salmon is summarized in biological opinions (NMFS 1999; NMFS 2005a; NMFS 2007c; NMFS 2009a) and the EIS for Amendment 91 (NMFS 2009b). No critical habitat is designated in Alaska waters for the Chinook salmon ESA-listed stocks.

In 2010, NMFS initiated a planned 5-year review of Pacific salmon and steelhead populations listed under the ESA to ensure the accuracy and classification of each listing. The review addresses the salmon species taken in the GOA fisheries and research cruises. NMFS has developed a strategy for recovery planning in Washington, Idaho, Oregon, and California that combines ESA-listed salmon and steelhead distinct population segments into geographic areas. The Northwest Region has identified its four recovery planning areas, or recovery domains, and has established technical recovery teams of scientists for each

domain. Recovery plans in each domain will address all salmon species within that geographic area, and will involve stakeholders on a local level. Draft recovery plans for some regions are available for public review. More information on the recovery activities is available from http://www.nwr.noaa.gov/Salmon-Recovery-Planning/index.cfm.

The only Chinook salmon ESA-listed ESUs that have been documented in the BSAI groundfish fisheries are from the Lower Columbia River and Upper Willamette River, suggesting that spring-run populations from the Lower Columbia River (the Willamette River is a tributary that enters the lower Columbia near Portland, Oregon) are distinct in having the most northerly distribution, at least among the ESA-listed Chinook salmon from the southern United States (NMFS 2009b). Chinook salmon from ESA-listed ESUs are observed more frequently in the GOA groundfish fishery than the BSAI groundfish fishery because the GOA is closer to the streams from which these stocks originate (NMFS 2009b). The probability that an ESA-listed Chinook salmon will be taken in the GOA groundfish fishery depends on the duration of the time period considered and the cumulative total Chinook salmon PSC over that time. During 2003 through 2011, the total catch of Chinook salmon in the GOA groundfish fisheries was 219,785 (Section 3.3.2).

3.3.6.1 Observer Program Prohibited Species Catch Sampling

Genetic samples, comprised of a pelvic axillary processes, maturity information, sex/length/weight and five scales were collected from Chinook salmon in the 2012 GOA pollock fisheries. In addition, scale samples for species identification and snouts from salmon with a missing adipose fin (CWT recovery) were collected. Genetic samples were taken systematically from all salmon encountered in observed pollock deliveries. This provides samples from throughout the observed deliveries in the GOA. Detailed instructions on the procedures observers use to collect the data, which are inputs into the estimation process, are in the series of observer manuals available at: http://www.afsc.noaa.gov/FMA/document.htm.

3.3.6.2 Coded-Wire Tag Results

The Regional Mark Processing Center maintains a coastwide database for CWT releases and recoveries, as well as associated catch and sample data. Over 50 million salmonids with CWTs are released yearly by 54 federal, provincial, state, tribal, and private entities. This database dates back to the 1970s and contains data contributed by the states of Alaska, Washington, Oregon, Idaho, and California; the province of British Columbia; federal agencies including NMFS, U.S. Fish and Wildlife Service, and Canadian Department of Fisheries and Oceans; and tribal groups including the Columbia River Inter-Tribal Fish Commission, Metlakatla Indian Community, and the Northwest Indian Fisheries Commission. The coastwide CWT database is the authority on the historic and current use of CWTs in West Coast salmon populations, both wild and hatchery. For a complete overview of the Regional Mark Processing Center and the coastwide CWT database go to: http://www.rmpc.org/.

Through this coordinated coastwide system, CWT recovery data have enabled scientists and managers to determine exploitation patterns for individual groups of fish and to assist in decision-making to manage salmon populations. CWTs have been used for cohort analysis into simulation models, identification of migration and exploitation patterns, estimating and forecasting abundance, and in-season regulation of fisheries (PSC 2005). CWTs are increasingly being used with other stock identification technologies such as genetic markers, scale pattern, and otolith banding to provide a better analysis of salmonid population dynamics.

After the CWT tags are decoded, processed, and validated, data from the "observed recoveries" are made available for use in preliminary reports. This includes expansion of the observed recoveries into

"estimated recoveries" for the given area time stratum once the catch sample data are available (Nandor et al. 2010). The estimated recoveries and expansion factors are explained below in the discussion on ESA-listed salmon.

3.3.6.3 Processing Snouts from Adipose Fin-Clipped Salmon at Auke Bay Laboratories CWT Lab

A missing adipose fin indicates that a salmon may have a CWT. Salted snouts from adipose fin-clipped salmon collected by the Observer Program from the salmon PSC in the GOA and BSAI groundfish fisheries are periodically sent to the NMFS Auke Bay Laboratories (Auke Bay Lab) CWT Lab from Observer Program offices in Seattle, Dutch Harbor, and Kodiak. After the snouts are processed with the CWT extracted from each snout, read under a microscope, and verified under a microscope, then recovery data associated with each snout are entered into a Microsoft Access database. At this point, the recovery data included with each snout are considered preliminary because they are often incomplete (e.g., missing recovery dates, missing recovery locations). The recovery data are sent to the Observer Program for error checking, verification, and filling in the blanks. Once the corrected data are received back at Auke Bay Lab, they are incorporated into the master historical database of all CWTs processed by Auke Bay Lab's CWT Lab. At that point the data are finalized and then available for further analysis.

3.3.6.4 CWT Expansions

Ideally, it would be preferable to calculate a total estimated contribution of Chinook salmon from ESA-listed ESUs harvested in the GOA in order to determine the impact of the fishery on these stocks. Total estimated contributions for CWT recoveries can be calculated in a two-step process involving a sampling expansion factor and a marking expansion factor. For an explanation of Recovery Estimation Technique see Appendix 7 in NMFS (2011).

Unfortunately, sampling expansion factors cannot be calculated for the CWT recoveries of ESA-listed ESUs in the GOA because of data limitations. For most of the recoveries of CWTs in the GOA trawl fishery, it is unknown whether the CWTs were collected systematically from inside the observers' species composition sample or non-systematically from outside the observers' species composition sample. A sampling expansion factor can only be calculated from CWTs recovered from inside a sample where the total number of sampled fish is known, as in the percent composition samples. CWT recoveries from outside the percent composition sample ("select" or opportunistic recoveries where the total number of fish examined is unknown) cannot be used to calculate a sampling expansion factor.

However, marking expansions can still be calculated for each CWT recovery from the mark expansion factors for each tag code. Because not all fish in a tag release group are actually tagged with CWTs, marking expansion factors account for the fraction of each release group that is tagged (NMFS 2011a, Appendix 7). Without being able to calculate total estimated contributions because of unknown sampling expansion factors, mark expansions offer the closest approximation to the contribution of Chinook salmon from ESA-listed ESUs in the GOA and BSAI. Mark expansions should be considered a very minimal estimate for the actual total contribution of Chinook salmon from ESA-listed ESUs in the GOA and BSAI.

3.3.6.5 Occurrence of ESA-listed Chinook Salmon ESUs in the GOA

Recoveries of CWTs from outside the sample (or from unknown sample origin) are still important for documenting occurrence of ESA-listed ESUs in the GOA trawl fisheries. Chinook salmon from the Lower Columbia River, Upper Willamette River, and Upper Columbia River Spring ESUs have been recovered in the GOA trawl fishery. Since 1984, CWTs have been recovered from 23 Lower Columbia River, 97 Upper Willamette River, and 1 Upper Columbia River Chinook salmon in the GOA trawl

fishery, both pre- and post-listing (Table 3-9). By applying mark expansion factors, the estimated numbers increase to 112 Lower Columbia River, 275 Upper Willamette River, and 1 Upper Columbia River Chinook salmon in the GOA (Table 3-9). These numbers should be considered as very minimum estimates of the number of ESA-listed ESUs in the GOA groundfish fisheries. Until adequate numbers of CWTs are recovered from inside the observers' samples, where the total number of fish sampled is known, an estimate of total contribution of ESA-listed ESUs in the GOA fishery will remain indeterminable.

Table 3-9 Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU captured in the prohibited species catch of the GOA trawl fisheries, summed over pre-listing and post-listing periods, 1984 through 2010.

		Chinook salmon in GOA Trawl Fisheries	
Listing Status	**ESU Name**	Observed Number	Mark Expansion
Pre-listing	Lower Columbia River spring Chinook	12	82.1
	Upper Willamette River Chinook	40	129.7
Post-listing	Lower Columbia River spring Chinook	11	29.8
	Upper Willamette River Chinook	57	145.4
	Upper Columbia River spring Chinook	1	1.0

Source: NMFS 2011a.

NMFS research surveys, a majority of which were conducted for salmon research, have documented the occurrence of other ESUs of ESA-listed Chinook salmon in the GOA besides the Lower Columbia River, Upper Willamette River, and Upper Columbia River. Small numbers of the Puget Sound Chinook salmon ESU, the Snake River Spring/Summer Chinook salmon ESU, and the Snake River Basin steelhead ESUs have also been recovered in the GOA in addition to the three Chinook salmon ESUs that have been documented in the GOA fishery. Since 1991, CWTs have been recovered from 3 Lower Columbia River, 1 Puget Sound, 5 Snake River Spring/Summer, 4 Upper Columbia River, 11 Upper Willamette River Chinook salmon, and 1 Snake River Basin steelhead in domestic and foreign research surveys in the GOA (Table 3-10). By applying mark expansion factors, the estimated numbers increase to 6 Lower Columbia River, 1 Puget Sound, 9 Snake River Spring/Summer, 4 Upper Columbia River, 72 Upper Willamette River Chinook salmon, and 1 Snake River Basin steelhead.

Table 3-10 Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys, post-listing, 1991 through 2010.

		Chinook salmon in GOA Research Surveys	
Listing Status	**ESU Name**	Observed Number	Mark expansion
Post-listing	Lower Columbia River Chinook	3	6.5
	Puget Sound Chinook	1	1.0
	Snake River spring/summer Chinook	5	9.2
	Upper Columbia River spring Chinook	4	4.1
	Upper Willamette River Chinook	11	72.0
	Snake River Basin steelhead	1	1.0

Source: NMFS 2011a.

The Council and NMFS contracted with Cramer Fish Sciences in 2010 to develop information to improve estimates of the potential impact of Chinook salmon PSC on ESA-listed ESUs from the Pacific Northwest. Since 2011, the database now includes all production (counted and estimated, tagged and untagged) of both wild and hatchery components of each ESU on an annual basis, dating back to when each ESU was first defined by NMFS.

3.3.7 Hatchery Releases

Commercial salmon fisheries exist around the Pacific Rim with most countries releasing salmon fry in varying amounts by species. The North Pacific Anadromous Fish Commission (NPAFC) summarizes

information on hatchery releases by country and by area where available. Reports submitted to the NPAFC were used to summarize hatchery information by country and by U.S. state below (Table 3-11, Table 3-12). For more information see the following: Russia (Akinicheva and Volobuev 2008; Anon. 2007; TINRO-centre 2006, 2005); Canada (Cook et al. 2008); United States (Volk and Josephson 2010, 2009; Josephson 2008, 2007; Eggers 2006, 2005; Bartlett 2007, 2006, 2005); all (Irvine et al. 2009).

Chinook salmon hatchery releases by country are shown below in Table 3-11. There are no hatchery releases of Chinook salmon in Japan and Korea and only a limited number in Russia.

Table 3-11 Hatchery releases of juvenile Chinook salmon in millions of fish.

Year	Russia	Japan	Korea	Canada	USA	TOTAL
1999	0.6	-	-	54.4	208.1	263.1
2000	0.5	-	-	53.0	209.5	263.0
2001	0.5	-	-	45.5	212.1	258.1
2002	0.3	-	-	52.8	222.1	275.2
2003	0.7	-	-	50.2	210.6	261.5
2004	1.17	-	-	49.8	173.6	224.6
2005	0.84	-	-	43.5	184.0	228.3
2006	0.78	-	-	40.9	181.2	223.7
2007	0.78	-	-	44.6	182.2	227.6
2008	1	-	-	38	198.4	237.4
2009	0.78	-	-	41.6	201.0	243.4
2010	0.88	-	-	44.1	201.9	246.9

For Chinook salmon fry, the United States has the highest number of annual releases (72% of total in 2009), followed by Canada (~27%). In Canada, enhancement projects have been on-going since 1977 with approximately 300 different projects for all salmon species (Cook and Irvine 2007). Maximum production for Chinook salmon releases was reached in 1991 with 66 million fish in that year (Cook and Irvine 2007). Releases of Chinook salmon in 2006 occurred in the following regions: Yukon and Transboundary River, Skeena River, North Coast, Central Coast, West Coast and Vancouver Island, Johnstone Strait, Straits of Georgia, and the Lower and Upper Fraser rivers. Of these the highest numbers were released in the West Coast Straits of Georgia (20 million fish) followed by Vancouver Island area (12.4 million fish) the Lower Fraser River (3.3 million fish) (Cook and Irvine 2007).

Of the releases from the United States, however, a breakout by area shows that the highest numbers are coming from the State of Washington (63% in 2007), followed by California (19% in 2007), and then Oregon (7% in 2007) (Table 3-12).

Table 3-12 USA west coast hatchery releases of juvenile Chinook salmon in millions of fish.

Year	Alaska	Washington	Oregon	California	Idaho	WA/OR/CA/ID (combined)	TOTAL
1999	8.0	114.5	30.5	45.4	9.7		208.1
2000	9.2	117.4	32.3	43.8	6.8		209.5
2001	9.9	123.5	28.4	45.0	5.4		212.1
2002	8.4					213.6	222.0
2003	9.3					201.3	210.6
2004	9.35	118.2	17.0	27.4	1.7	164.2	173.6
2005	9.46	117.7	19.2	28.8	8.7	174.5	184.0
2006	10.2	110.5	19.2	29.4	12.0	171.0	181.2
2007	10.5	114.5	13.2	34.8	9.2	171.7	182.2
2008	11.4					201.4	212.4
2009	10.5					201.0	211.5
2010	11.0					201.9	212.9

Hatcheries in Alaska are located in southcentral and southeast Alaska. Prince William Sound and Southeast Alaska are the regions in the state with the greatest amount of salmon enhancement, and pink and chum salmon are the predominant species produced. The Cook Inlet and Kodiak regions also have salmon enhancement programs. Production levels, in terms of egg takes and releases, have largely remained stable. Enhancement programs have matured and are generally operating at current planned capacities (Vercessi 2012).

The private nonprofit hatchery corporations produce salmon mainly for commercial harvest. They recoup their operational costs from a special harvest of returning adult fish, called a cost recovery harvest. All other returning adult fish are available for harvest in Alaska's common property fisheries open to the public (sport, personal use, and subsistence). ADF&G Division of Sport Fish operates two hatcheries, primarily to produce salmonid species intended for both salt and freshwater recreational fisheries at many locations along the coast and in numerous interior lakes (Vercessi 2012).

In 2011, the statewide commercial salmon harvest was 177 million fish. The Alaska salmon enhancement program produced an estimated 48 million returning adult salmon (dominated by pink and chum salmon). Statewide, the program is credited with contributing 53% of the chum, 26% of the coho, 21% of the pink, 16% of the Chinook, and 6% of the sockeye salmon to the commercial common property harvest. An estimated 45 million enhanced salmon were harvested commercially, and the remaining 3 million enhanced salmon were used for broodstock, or harvested in the personal use/ sport/ subsistence fishery. Hatchery-produced Chinook salmon returned to Southeast Alaska, where the enhancement program accounted for 22% of the Chinook salmon in the common property commercial harvest (Vercessi 2012).

3.3.8 Effects of Alternatives on Chinook Salmon

The impact of the GOA groundfish fisheries on Chinook salmon was analyzed most recently in the Alaska Groundfish Fisheries Harvest Specifications Supplemental EIS (NMFS 2007a). Table 3-13 describes the criteria used to determine whether the impacts on Chinook salmon stocks are likely to be significant.

Table 3-13 Criteria used to estimate the significance of impacts on incidental catch of Chinook salmon.

No impact	No incidental take of the prohibited species in question.
Adverse impact	There are incidental takes of the prohibited species in question
Beneficial impact	Natural at-sea mortality of the 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	An action that diminishes protections afforded to prohibited species in the groundfish fisheries would be a significantly adverse impact.
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the prohibited species, and significantly beneficial impacts are not defined for these species.
Unknown impact	Not applicable

The non-pollock trawl fisheries have an adverse impact on Chinook salmon through direct mortality due to PSC. Under the status quo, there are no additional management measures to reduce PSC of Chinook salmon in the GOA non-pollock trawl fisheries, however, Chinook salmon are a prohibited species, and it is incumbent upon fishermen, under the regulations, to avoid catching Chinook salmon. The EIS also considered impacts of the fisheries on the genetic structure of the population, reproductive success, and habitat, and concluded that it is unlikely that groundfish fishing has indirect impacts on these aspects of Chinook salmon sustainability. The non-pollock trawl fisheries also incidentally catch salmon prey species, including squid, capelin, eulachon, and herring, however the catches of these prey species are very small relative to the overall populations of these species. Thus, non-pollock trawl fishing activities are considered to have minimal and temporary effects on prey availability for salmon (NMFS 2005b).

With respect to direct mortality, the 2007 analysis indicates that there is insufficient information available to directly link PSC in the groundfish fisheries to salmon stock biomass levels; therefore there is an inability to discern very small scale impacts because data are not available at the individual stock level. The first priority of the State of Alaska in managing Chinook salmon is to meet spawning escapement goals, in order to sustain salmon resources for future generations. Salmon surplus above escapement needs are made available for subsistence and other uses. The 2007 analysis concludes that minimum escapement had generally been met in the preceding years, despite increasing levels of Chinook and chum salmon PSC in the Bering Sea pollock fishery.

Since 2007, there have been poor or below average Chinook salmon runs in Western Alaska (Table 3-8). In 2010 and 2011, monitored Chinook salmon run sizes were also below average in most of the GOA, except in Chignik and Southeast Alaska where escapement goals were largely met. In 2012, however, all Chinook salmon runs in the GOA were below average, and in the Upper Cook Inlet, only four escapement goals of 21 were met (Table 3-8). The Chinook salmon stock composition of the GOA non-pollock trawl fishery PSC is not available, however the GOA groundfish fisheries have been documented to catch Chinook salmon both from Southeast Alaska and Cook Inlet, in the GOA. The average PSC for the non-pollock trawl fisheries is 6,176 Chinook salmon over the last ten years (Table 2-2). Chinook salmon PSC in the GOA non-pollock trawl fisheries was highest in the Central GOA in 2003 and 2010, particularly low in 2005 and 2006, and at approximately average levels in the remaining years. It is not possible to draw any correlation between patterns of PSC and the status of salmon stocks, especially given the uncertainty associated with estimates of PSC in the groundfish fisheries, and the lack of data on river of origin of Chinook salmon PSC. This results in the inability to discern and accurately describe small scale impacts on particular individual stocks; nonetheless, we understand that setting PSC limits will likely reduce the potential to impact salmon stocks in the aggregate, and therefore are more likely to be beneficial to Chinook salmon stocks as a whole compared to status quo. There is also no evidence to indicate that the groundfish fisheries' take of Chinook salmon is causing escapement failures in Alaska rivers. Since in 2011, efforts have been underway to improve genetic sampling of salmon PSC in the GOA pollock fishery, which should, in time, allow for a better understanding of the stock composition of PSC in that GOA trawl target fishery. While it is not one of the target fisheries that is subject to the PSC limits that are currently under consideration, the pollock target fisheries occur in similar geographical areas, and with a somewhat similar gear type, to the non-pollock trawl fisheries. As such, understanding the stock composition of PSC in that fishery would provide an additional perspective on the non-pollock trawl fisheries' Chinook salmon PSC.

Alternative 2 would establish a PSC limit that would be an upper limit on the PSC of Chinook salmon in the GOA non-pollock trawl fisheries in the Western and Central GOA. This limit would represent an upper threshold of Chinook salmon PSC in the GOA non-pollock trawl fisheries, as the non-pollock trawl fisheries will be closed when the limit is reached.

One way to evaluate the effect of the alternative PSC limits is to look retrospectively at Chinook salmon PSC levels from 2003 through 2011, and see how many Chinook salmon would not have been caught had the cap been in place. This, of course, assumes that there would have been no change in fleet behavior under a PSC limit, which is unlikely. It does, however, provide some sense of whether a PSC limit would have resulted in salmon savings during a particular year.

Under the 12,500 Chinook salmon PSC limit at the GOA-wide level, the limit would not have triggered any closures in the past 9 years. For all other apportionment options for that PSC limit, and for all of the lower PSC limits, some portion of the fishery would have closed early during one to seven of the nine years that were evaluated. Table 3-14 summarizes the number of years that some or all sectors of the non-pollock trawl fisheries would have closed early under the various alternatives. The table also identifies the maximum salmon savings that would have accrued in a single year, under the options. The number of

years in which the fishery would have closed, and the potential salmon savings, increases as the PSC limit lowers, and the fishery is more impacted. A more detailed analysis of the closures, identifying how each individual apportionment option specifically relates to salmon savings and groundfish harvest foregone, is provided in the RIR in Section 4.7.1.

Table 3-14 Number of years the fishery would have closed under the PSC limits and Alternative 2 options applied retrospectively to 2003 to 2011, and range of estimated salmon savings that could have occurred in a single year.

PSC Limit	GOA-wide		Option 1 - by regulatory area		Option 2 - by operational sector		Options 1 & 2 combined	
	Number of years closed	Salmon savings	Number of years closed	Salmon savings	Number of years closed	Salmon savings	Number of years closed	Salmon savings
12,500	0	0	0-4	0-502	0-1	0-113	0-4	0-554
10,000	1	0-1,057	0-4	0-1,102	0-1	0-754	0-4	0-1,732
7,500	2	0-2,384	2-4	0-2,704	2-3	0-1,918	0-5	0-2,372
5,000	6	0-3,361	4-6	0-3,598	4-6	0-3,893	0-7	0-4,415

Note, due to confidentiality restrictions, the salmon savings are estimated using the week the closure would have occurred in a particular year (2003 to 2011), and applying it to a characteristic or average year representing 2003 to 2011.

Evaluating what salmon savings may occur under the alternatives does not necessarily provide insight into potential impacts to the Chinook salmon stocks, however. The PSC limit and potential salmon savings in years of high Chinook salmon PSC do not translate directly into adult salmon that would otherwise have survived to return to its spawning stream. As described in Section 3.3.2.1, salmon caught as PSC in the GOA groundfish trawl fisheries are generally immature salmon, with an average weight varying between 5 and 9 pounds. Some proportion of the Chinook salmon caught as PSC would have been consumed as prey to other marine resources, or been affected by some other source of natural or fishing mortality.

In the Bering Sea Chinook salmon PSC analysis (NMFS 2009b), an adult equivalent (AEQ) model was used to estimate (a) how many of the bycaught salmon were likely to have returned to their streams as adults, and (b) to which river system or region they would likely have returned. Many more Chinook salmon samples have been taken in the Bering Sea pollock fishery, which is subject to much higher levels of observer coverage. Consequently, in the Bering Sea, sufficient age and length data were available to construct a model estimating how many salmon are likely to have survived to adults. Additionally, PSC composition estimates were available to provide some indication as to the origin of Chinook salmon PSC in the fishery. This meant that the Bering Sea analysis could include a quantitative impact analysis of salmon savings on salmon fisheries or communities. This analysis was not without controversy, since the underlying data was largely obtained from relatively small sample sizes, collected opportunistically. For this GOA non-pollock trawl fisheries analysis, we do not have sufficient data to develop an AEQ model. It is assumed that the non-pollock trawl fisheries could be catching Chinook salmon that originate from anywhere in Alaska or elsewhere (see Section 3.3.3), and it is not possible to estimate the proportion any stock has contributed to the Chinook salmon PSC. Therefore our ability to assess the impacts of reducing salmon PSC on salmon populations is constrained.

Some information is available from genetic analysis of samples taken in the GOA groundfish fisheries, which originate primarily from the GOA pollock fishery (as the target fishery where most Chinook salmon PSC is intercepted; see Section 3.3.3.1). To date, the number of samples has not been sufficient to be able to produce a stock composition analysis, but rather documents the presence of a particular salmon stock in the Chinook salmon PSC. In 2010 (the most recent year for which analysis is available), GOA samples were predominantly from Chinook salmon stocks from the Pacific Northwest, British Columbia, and coastal Southeastern Alaska (Section 3.3.3.1).

Information is also available from CWT recoveries in GOA groundfish fisheries and research surveys (see Section 3.3.3.2). CWT recoveries provide reliable documentation of the presence of a specific salmon stock in the Chinook salmon PSC, although the recoveries, to date, cannot be used to establish the relative abundance of stocks in the PSC, nor to estimate the number harvested from any one stock as PSC, due to sampling issues. There are also likely to be other Chinook salmon stocks that are taken in the GOA non-pollock trawl fisheries that originate in river systems with no tagging program. Since 1995, however, CWTs of Chinook salmon recovered in the GOA groundfish fisheries have originated from British Columbia, Alaska, Oregon, Washington, and Idaho.

While it is not possible to assess the impacts to individual Chinook salmon stocks that are being taken in the GOA non-pollock trawl fisheries, nonetheless, it is possible to develop general conclusions for the action that is being proposed. If Chinook salmon PSC is reduced in some years as a result of this action, it would likely have beneficial impacts on Chinook salmon stocks, and the harvesters and consumers of Chinook salmon, compared to the status quo. With a PSC limit in place, it is likely that Chinook salmon PSC will be curtailed in years of otherwise high PSC, such as 2003. To the extent that Alternative 2 reduces a source of direct mortality on Chinook salmon stocks, the impact to Chinook salmon overall is likely to be beneficial. Because we do not know the relative abundance of specific stocks in the GOA non-pollock trawl fisheries PSC, however, it is not possible to determine which, nor to what degree, individual stocks are likely to be affected.

There are currently no specific prohibited species control measures in place for Chinook salmon in the GOA non-pollock trawl fisheries, although the regulations require that the operator of each vessel engaged in directed fishing for groundfish in the GOA, including non-pollock trawl fisheries, minimize its catch of prohibited species, including Chinook salmon. The Council's consideration of this amendment has emphasized the importance of Chinook salmon avoidance among the non-pollock trawl fleet. Under a PSC limit, and especially if the attainment of the threshold appears to be imminent, the non-pollock trawl fleet may be active in making efforts to avoid high PSC rates, in order to preserve the opportunity to fully harvest the groundfish TACs. Efforts to avoid Chinook PSC could take a variety of forms. Particularly at the outset, these efforts may have limited effect, as participants have little understanding of the means of avoiding Chinook PSC. Yet, the adoption of a Chinook PSC limit likely will prompt efforts to gain better information concerning Chinook avoidance, improving the ability of participants to avoid Chinook in the long run. As information concerning Chinook avoidance is improved, participants may use that information to redirect effort to times and areas with lower Chinook catch rates. Over time, effort may become more concentrated in areas that experience lower Chinook salmon PSC rates and decrease (or may be eliminated altogether) in areas of higher Chinook salmon catch rates. The extent of any redistribution of effort is difficult to predict and will depend not only on the distribution of Chinook salmon catch rates on the fishing grounds and the participants' ability to accurately estimate Chinook salmon catch rates, but also participants' flexibility to alter their temporal and spatial fishing behavior (see Section 4.7.3). It is possible that shifting the spatial or temporal distribution of the non-pollock trawl fisheries may impact some particular Chinook salmon stocks more than others, but as we do not currently know how effort may shift in the non-pollock trawl fisheries, nor the stock composition of Chinook salmon PSC, this impact is not possible to assess.

Under Alternative 2, it appears unlikely that Chinook salmon PSC would increase from the status quo. Any impact to the Chinook salmon stocks as a whole, is likely to represent either no change from the status quo, or to be beneficial, as PSC levels either remain the same or are reduced. None of the options considered under Alternative 2, would have a significant adverse impact to Chinook salmon stocks.

As described in the methodology for the environmental assessment, there are no environmental impacts of implementing full retention of salmon, as proposed in Alternative 3. The retention of salmon would not

affect fishing practices, or Chinook salmon PSC in the affected fisheries. Requiring full salmon retention on non-pollock trawl fisheries could, at some point in the future, increase the amount of biological sampling that occurs on Chinook salmon, and advanced understanding of the stock origin of Chinook salmon taken as PSC will improve managers' ability to assess impacts on individual Chinook salmon stocks. However, as described in the management and enforcement considerations section (Section 5.3), the implementation of this alternative, as currently considered in the analysis, would not result in more genetic data, as it would not allow NMFS to take systematic samples from a census of salmon PSC, in accordance with NMFS' current sampling approach.

3.4 Marine Mammals

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

- competition with fisheries for prey species;
- disturbance by fishing activities; or
- vulnerability to direct or indirect adverse effects from some fishing activities.

Marine mammals have been given various levels of protection under the current fishery management plans 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 GOA Halibut PSC EA/RIR/IRFA (NPFMC 2012) provides the most recent analysis of the potential impacts of GOA non-pollock trawl fisheries on marine mammals. The most recent status information is available in the 2011 Marine Mammal Stock Assessment Reports (SARs) (Allen and Angliss 2012).

Marine mammals, including those currently listed as endangered or threatened under the ESA, that may be present in the action area are listed in Table 3-15. All of these species are managed by NMFS, with the exception of Northern sea otters, which are managed by USFWS. ESA Section 7 consultations with respect to the actions of the federal groundfish fisheries have been completed for all of the ESA-listed species, either individually or in groups. Of the species listed under the ESA and present in the action area, several species may be adversely affected by commercial groundfish fishing. These include Steller sea lions, humpback whales, fin whales, and sperm whales (NMFS 2006a; NMFS 2010a). In 2000, a Biological Opinion concluded that the FMPs, as then implemented, were likely to jeopardize the continued existence of the Western distinct population segment (DPS) of Steller sea lions and adversely modify its designated critical habitat (NMFS 2000). In 2001, a Biological Opinion was released that provided protection measures that did not jeopardize the continued existence of the Steller sea lion or adversely modify its designated critical habitat; that opinion was supplemented in 2003.

In 2006, NMFS reinitiated a FMP-level Section 7 consultation on the effects of the groundfish fisheries on Steller sea lions, humpback whales, and sperm whales to consider new information on these species and their interactions with the fisheries (NMFS 2006a). The Biological Opinion (NMFS 2010a) concluded that the groundfish fisheries may be likely to jeopardize the continued existence or adversely modify designated critical habitat (JAM) for the western Distinct Population Segment (DPS) of Steller sea lions. An Interim Final Rule (75 FR 77535, December 13, 2010, corrected 75 FR 81921, December 29, 2010) implemented a reasonable and prudent alternative (RPA) to remove the likelihood of JAM for Steller sea lions. The RPA did not change Steller sea lion protection measures in the GOA.

Table 3-15 Marine mammals likely to occur in the Gulf of Alaska.

	Species	Stocks
NMFS Managed Species		
Pinnipeds	Steller sea lion*	Western U.S (west of 144° W long.) and Eastern U.S. (east of 144° W long.)
	Northern fur seal**	Eastern Pacific
	Harbor seal	Southeast Alaska, Gulf of Alaska
	Ribbon seal	Alaska
	Northern elephant seal	California
Whales and dolphins	Beluga Whale*	Cook Inlet
	Killer whale	Eastern North Pacific Northern Resident, Eastern North Pacific Alaska Resident, Eastern North Pacific GOA, Aleutian Islands, and Bering Sea transient, AT1 transient**, West Coast Transient
	Pacific White-sided dolphin	North Pacific
	Harbor porpoise	Southeast Alaska, Gulf of Alaska, and Bering Sea
	Dall's porpoise	Alaska
	Sperm whale*	North Pacific
	Baird's beaked whale	Alaska
	Cuvier's beaked whale	Alaska
	Stejneger's beaked whale	Alaska
	Gray whale	Eastern North Pacific
	Humpback whale*	Western North Pacific, Central North Pacific
	Fin whale*	Northeast Pacific
	Minke whale	Alaska
	North Pacific right whale*	North Pacific
	Blue whale*	North Pacific
	Sei whale*	North Pacific
USFWS Managed Species		
	Northern sea otter*[3]	Southeast Alaska, Southcentral Alaska, Southwest Alaska

Source: Allen and Angliss 2012.
*ESA-listed species; **Listed as depleted under the MMPA.
[1] Steller sea lions are listed as endangered west of Cape Suckling and threatened east of Cape Suckling.
[2] NMFS designated critical habitat for the northern right whale on July 6, 2006 (71 FR 38277).
[3] Northern sea otters are under the jurisdiction of the USFWS

3.4.1 Marine Mammals Status

The GOA supports one of the richest assemblages of marine mammals in the world. Twenty-two species are present from the orders Pinnipedia (seals and sea lions), Carnivora (sea otters), and Cetacea (whales, dolphins, and porpoises). Some marine mammal species are resident throughout the year, while others migrate into or out of Alaska fisheries management areas. Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf (Lowry et al. 1982).

The PSEIS (NMFS 2004a) provides descriptions of the range, habitat, diet, abundance, and population status for marine mammals. The most recent marine mammal stock assessment reports for the strategic GOA marine mammal stocks (Steller sea lions, northern fur seals, harbor porpoise, North Pacific right whales, humpback whales, sperm whales, and fin whales) were updated in the 2011 SARs (Allen and Angliss 2012). Northern sea otters were assessed in 2008. The information from NMFS (2004a) and Allen and Angliss (2012) are incorporated by reference. The SARs provide population estimates, population trends, and estimates of the potential biological removal (PBR) levels for each stock. The SARs also identify potential causes of mortality and whether the stock is considered a strategic stock under the MMPA.

The GOA halibut PSC limits EA/RIR/IRFA provides information on the effects of the GOA non-pollock trawl fisheries on marine mammals (NPFMC 2012), and concluded that the fisheries, as currently prosecuted, do not result in significantly adverse impacts to marine mammals in the GOA. That analysis

is incorporated here by reference. This discussion presents new information, where applicable, and analyzes the potential effects of alternate Chinook salmon PSC management options on species that may be affected by non-pollock trawl fisheries in the GOA. These species are listed in Table 3-16 and Table 3-17. Note that Table 3-17 includes Southern Resident killer whales. This stock does not occur in the GOA, but this analysis considers the potential effects of Chinook salmon PSC in the GOA non-pollock trawl fisheries on prey availability for this population of killer whales. The GOA non-pollock trawl fisheries take Chinook salmon from Pacific Northwest stocks, which are important prey for the Southern Resident killer whales. Additional background information is provided here on the status of ESA-listed species.

Steller Sea Lion

The Steller sea lion inhabits many of the shoreline areas of the GOA, 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, two distinct population segments, the Western and eastern (wDPS and eDPS) were recognized based on genetic and demographic dissimilarities. Because of a pattern of continued decline, the Western DPS was listed as endangered on May 5, 1997 (62 FR 30772), while the eastern DPS remained listed as threatened. NMFS is currently considering delisting the eDPS (75 FR 77602, December 13, 2010). 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 (west of 144° W longitude).

Throughout the 1990s, particularly after critical habitat was designated, various fishing closures around rookeries, haulouts, and some offshore foraging areas were designated. These closures affect commercial harvests of pollock, Pacific cod, and Atka mackerel, which are important components of the western DPS diet. In 2001, a Biological Opinion was released that provided protection measures to prevent jeopardy to the continued existence of the Steller sea lion or adverse modification to its designated critical habitat; that opinion was supplemented in 2003 (NMFS 2001a, Appendix A, NMFS 2003). In 2006, NMFS reinitiated a FMP-level Section 7 consultation on the effects of the groundfish fisheries on Steller sea lions, humpback whales, and sperm whales to consider new information on these species and their interactions with the fisheries (NMFS 2006a). The Biological Opinion (NMFS 2010a) concluded that the groundfish fisheries may be likely to jeopardize the continued existence or adversely modify designated critical habitat (JAM) for the western Distinct Population Segment (DPS) of Steller sea lions. An Interim Final Rule (75 FR 77535, December 13, 2010, corrected 75 FR 81921, December 29, 2010) implemented a reasonable and prudent alternative (RPA) to remove the likelihood of JAM for Steller sea lions. The RPA did not change Steller sea lion protection measures in the GOA.

In the GOA, extensive closures are in place for Steller sea lions including no transit zones and closures of critical habitat around rookeries and haulouts. Pollock is an important prey species for Steller sea lions (NMFS 2010a). The harvest of pollock in the GOA is temporally dispersed into 4 seasons (§ 679.23). Based on the most recent completed biological opinion, 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, NMFS 2001a, and NMFS 2010a).

A detailed discussion of Steller sea lion population trends in the GOA is included in the most recent Biological Opinion (NMFS 2010a) and is summarized here. Based on non-pup counts of Steller sea lions on trend sites throughout the range of the western DPS in the GOA and Aleutian Islands, the overall population trend for the western DPS of Steller sea lions is stable and may be increasing, but the trend is not statistically significant. The number of non-pups counted at trend sites increased by 12% between 2000 and 2008. However, counts increased by only 1% between 2004 and 2008 (DeMaster 2009).

Population trends differ across the range of the western DPS. Non-pup counts have declined severely in the western Aleutian Islands, and less severely in the eastern Aleutian Islands (7% decline in management area 543, 1% to 4% decline in management areas 542 and 541; NMFS 2010a). Pup and non-pup counts in the remainder of the western DPS range are either stable or increasing, ranging from 0% to 5% increases in population growth from 2000 to 2008 (NMFS 2010a).

Northern Sea Otter

The southwest Alaska DPS of northern sea otter is listed as threatened under the ESA (70 FR 46366, August 9, 2005). This population segment ranges from the Western Aleutian Islands to the Central GOA. NMFS completed an informal consultation on Northern sea otters in 2006 and found that the Alaska fisheries were not likely to adversely affect Northern sea otters (Mecum 2006). The USFWS has determined that, based on available data, Northern sea otter abundance is not likely to be significantly affected by commercial fishery interaction at present (Allen and Angliss 2012), and commercial fishing is not likely a factor in the population decline (70 FR 46366, August 9, 2005). Otters feed primarily in the rocky near shore areas on invertebrates, while groundfish fisheries are conducted further offshore on groundfish species (Funk 2003). Trawl closures where sea otters feed reduce potential interaction between trawl vessels and sea otters and ensure the clam habitat used by sea otters is not disturbed. Critical habitat for sea otters has been designated and is located primarily in nearshore waters (74 FR 51988, October 8, 2009), reducing the potential for effects by federal fisheries. The USFWS is developing a recovery plan for the southwest Alaska DPS of northern sea otters.

Table 3-16 Status of Pinnipedia and Carnivora stocks potentially affected by the action.

Pinnipedia and Carnivora species and stock	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
Steller sea lion – Western (W) and Eastern (E) Distinct Population Segment (DPS)	Endangered (W) Threatened (E)	Depleted & a strategic stock	For the WDPS, 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 WDPS appears to have stabilized (NMFS 2010a). The EDPS is steadily increasing and is being considered for delisting.	WDPS inhabits Alaska waters from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. EDPS inhabit waters east of Prince William Sound to Dixon Entrance. Occur throughout AK waters, terrestrial haulouts and rookeries on Pribilof 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 show a continuing decline in the number of pups surviving in the Pribilof Islands. NMFS researchers found an approximately 9% decrease in the number of pups born between 2004 and 2006. The pup estimate decreased most sharply on 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	None	None	A moderate to large population decline has occurred in the GOA stock.	GOA stock found primarily in the coastal waters and may cross over into the Bering Sea coastal waters between islands.
Ribbon seal Alaska	None*	None	Reliable data on population trends are unavailable.	Widely dispersed throughout the Bering Sea and Aleutian Islands in the summer and fall. Associated with ice in spring and winter and may be associated with ice in summer and fall. Occasional movement into the GOA (Boveng et al. 2008)
Northern sea otters – SW Alaska	Threatened**	Depleted & a strategic stock	The overall population trend for the southwest Alaska stock is believed to be declining, particularly in the Aleutian Islands.	Coastal waters from Central GOA to W Aleutians within the 40 m depth contour. Critical habitat designated in primarily nearshore waters with few locations into federal waters in the GOA.

Source: Allen and Angliss 2012; List of Fisheries for 2011 (75 FR 68468, November 8, 2010).
Northern fur seal pup data available from http://www.alaskafisheries.noaa.gov/newsreleases/2007/fursealpups020207.htm.

*NMFS determined that ribbon seals were not to be listed on September 23, 2008. The Center for Biological Diversity and Greenpeace filed suit against NMFS regarding this decision on September 3, 2009.

**Northern sea otter information from http://www.nmfs.noaa.gov/pr/pdfs/sars/seaotter2008_ak_sw.pdf and 74 FR 51988, October 8, 2009

Cook Inlet Beluga Whale

In 2008, the Cook Inlet DPS of beluga whales was listed as an endangered species under the ESA following a significant population decline. NMFS has identified more than one third of Cook Inlet as critical habitat. In 2011, NMFS estimated the Cook Inlet beluga whale population to be 284 individuals, nearly 20% lower than the 2010 estimate, and the second lowest since aerial surveys began in 1993. The 2011 estimate remains within the 10-year annual trend, which shows an annual decline of 1.1% per year. Historical abundance is estimated at approximately 1,300 whales (NMFS 2008b). Cook Inlet belugas primarily occur in the northern portion of Cook Inlet. Beluga whales do not normally transit outside of Cook Inlet, and thus are unlikely to encounter vessels fishing in the federal groundfish fisheries. NMFS

has determined that the only potential impact of the groundfish fisheries on Cook Inlet belugas is though competition for prey species (Brix 2010).

Southern Resident Killer Whale

The Southern Resident killer whale (SRKWs) was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). SRKWs range from the Queen Charlotte Islands to Central California. The population declined from historical abundance estimates of 140 to200 whales in the 1960s and 1970s to fewer than 90 whales in recent years, and was listed as endangered under the ESA in 2005. The stock is currently under a 5-year status review (75 FR 17377, April 6, 2010). Numerous factors have likely caused the decline, including a reduction in availability of preferred prey. SRKWs forage selectively for Chinook salmon which are relatively large compared with other salmon species, have high lipid content, and are available year-round (Ford and Ellis 2006). In inland waters, the diet of SRKWs consists of 82% Chinook salmon during May through September (Hanson et al. 2010). Stock of origin investigations have found that SRKWs forage on Chinook salmon from the Fraser River, Puget Sound runs, and other Washington and Oregon runs. There have been recent reports of SRKWs in poor body condition (Durban et al. 2009). Ford et al. (2005) found a correlation between the reduction in Chinook salmon abundance off Alaska, British Columbia, and Washington and decreased survival of Northern and SRKWs. In 2009, NMFS released a Biological Opinion that evaluates the effects of the ocean salmon fisheries off Washington, Oregon, and California on SRKWs, and found that the proposed action is not causing jeopardy or adverse modification (NMFS 2009d). NMFS is currently conducting a scientific review of new evidence that strongly suggests that Chinook salmon abundance is very important to the survival and recovery of SRKWs, which may have implications for salmon fisheries and other activities that affect Chinook salmon abundance.

Table 3-17 Status of Cetacea stocks potentially affected by the action.

Cetacea species and stock	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
Killer whale – AT1 Transient, E N Pacific transient, W Coast transient, Alaska resident, Southern resident	Southern resident endangered; remaining stocks none	AT1 depleted and a strategic stock, Southern Resident depleted. The rest of the stocks: None	Southern residents have declined by more than half since 1960s and 1970s. 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 resident do not occur in GOA. Transient-type killer whales from the GOA, Aleutian Islands, and Bering Sea are considered to be part of a single population.
Dall's porpoise Alaska	None	None	Reliable data on population trends are unavailable.	Found in the offshore waters from coastal Western Alaska throughout the GOA.
Pacific white-sided dolphin	None	None	Reliable data on population trends are unavailable.	Found throughout the GOA.
Harbor porpoise GOA	None	Strategic	Reliable data on population trends are unavailable.	Primarily in coastal waters in the GOA, usually less than 100 m.

Cetacea species and stock	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
Humpback whale – Western and 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 North Pacific represents an annual increase of 4.9% since 1991–1993. SPLASH abundance estimates for Hawaii show annual increases of 5.5% to 6.0% since 1991–1993 (Calambokidis et al. 2008).	W. Pacific and C. North Pacific stocks occur in GOA waters and may mingle in the North Pacific feeding area.
North Pacific right whale Eastern North Pacific	Endangered	Depleted & a strategic stock	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 GOA, eastern Aleutian Islands, south-Central Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). During 1965–1999, 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). Critical habitat near Kodiak Island in the GOA
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 GOA, Bering Sea and coastal waters of the Aleutian Islands.
Beluga whale-Cook Inlet	Endangered	Depleted & a strategic stock	2008 abundance estimate of 375 whales is unchanged from 2007. Trend from 1999 to 2008 is not significantly different from zero.	Occurrence only in Cook Inlet.
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. Not common in the Aleutian Islands.
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. Widely distributed in North Pacific. Found year-round In GOA.
Baird's, Cuvier's, and Stejneger's beaked whale	None	None	Reliable data on population trends are unavailable.	Occur throughout the GOA.

Sources: Allen and Angliss 2012; List of Fisheries for 2011 (75 FR 68468, November 8, 2010); http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm. North Pacific right whale included based on NMFS (2006a) and Salveson (2008). AT1 Killer Whales information based on 69 FR 31321, June 3, 2004. North Pacific Right Whale critical habitat information: 73 FR 19000, April 8, 2008. For beluga whales: 73 FR 62919, October 27, 2008.

3.4.2 Effects on Marine Mammals

3.4.2.1 Significance Criteria for Marine Mammals

Table 3-18 contains the significance criteria for analyzing the effects of the proposed action on marine mammals. The Status Quo alternative is the non-pollock trawl fisheries as currently prosecuted in the GOA. These fisheries were evaluated under the GOA halibut PSC EA/RIR/IRFA (NMFS 2012) and were determined not to cause significant adverse impacts to marine mammals. As such, the Status Quo alternative is not considered to cause significant adverse impacts to marine mammals in this analysis. The other alternatives being considered constitute a change from status quo management, and impacts are assessed as a change from status quo. Although impacts to marine mammals from commercial fisheries cannot be considered beneficial (incidental take, reduced prey availability, and increased disturbance are all adverse impacts), it is possible that alternatives considered in this analysis could reduce the harmful effects of commercial fisheries on marine mammals and seabirds if it can be demonstrated that they reduce incidental take, competition for prey, or disturbance.

Table 3-18 Criteria for determining significance of impacts to marine mammals.

	Incidental take and entanglement in marine debris	**Prey availability**	**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 is no beneficial impact.	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 marine 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 is 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.

3.4.2.2 Incidental Take Effects

The GOA Halibut PSC EA/RIR/IRFA (NPFMC 2012) contains a detailed description of the incidental take effects of the groundfish fisheries on marine mammals and is incorporated by reference. Marine mammals can be taken in groundfish fisheries by entanglement in gear (e.g., trawl, longline, and pot) and, rarely, by ship strikes for some cetaceans. Steller sea lion (western U.S.), Fin whale, and Northern elephant seal were taken in the GOA non-pollock trawl fisheries during the most recent five years of observer data that have been analyzed (Allen and Angliss 2012). In addition to these species, the List of Fisheries for 2011 reports that fin whale and northern elephant seal have been taken in previous years in the GOA non-pollock trawl fishery, but not recently (75 FR 68468, November 8, 2010). Other marine mammals are assumed to be unlikely to be incidentally taken by any of the alternatives due to the absence of incidental take and entanglement records. No records exist of Alaska groundfish fisheries takes of North Pacific right whales.

Potential take in the GOA non-pollock trawl fisheries is well below the PBR for all marine mammals for which PBR has been determined. The GOA non-pollock trawl fisheries are Category III fisheries based on annual mortality and serious injury of a stock being less than or equal to 1% of the PBR level. Overall, very few marine mammals are reported taken in the GOA non-pollock trawl fisheries, and estimated mortality from federally managed fisheries has not been estimated. Considering the number of marine mammals taken incidentally in the fishery in relation to the PBR, it is unlikely that incidental takes would impact the subsistence harvest of marine mammals. While possible, the incidence of ship strikes and/or serious injury to whales from ships involved in the Alaska groundfish fisheries are likely to be minimal and not expected to result in an adverse population level effects.

Incidental Take Effects under Alternative 1: Status Quo

The effects of the status quo fisheries on incidental takes of marine mammals are detailed in the 2007 harvest specifications EIS (NMFS 2007a). The potential take of marine mammals in the GOA non-pollock trawl fisheries is well below the PBRs or a very small portion of the overall human caused mortality for those species for which a PBR has not been determined. No significantly adverse effects are expected.

Incidental Take Effects under Alternative 2: Hard Caps

The range of hard caps under Alternative 2 may result in different potential for incidental takes of marine mammals. A lower hard cap may result in the trawl fisheries closing early, before the TACs are reached, which would reduce the potential for incidental takes in areas where marine mammals may interact with trawl fishing vessels. If the fleet is able to identify hotspots with high Chinook salmon catch rates, and avoid fishing in these areas, the distribution of effort in the fishery may change to some extent. A higher hard cap would allow for more groundfish fishing and more potential for interaction and incidental takes of marine mammals than a lower cap.

Alternative 2 may reduce the potential adverse effects of incidental takes on marine mammals, compared to the status quo, if the fisheries close early. To the extent that the redistribution of effort results in more vessel-days of effort, there could potentially be an increase in the likelihood of incidental takes of marine mammals compared to the status quo. However, the likely closures are relatively small compared to the capacity of the GOA groundfish trawl fleet, and seasons are likely to remain short. Under the status quo fisheries, the number of incidental takes is well below the PBRs, and is a very small proportion of overall total human caused mortality. No substantial change in the number of incidental takes is expected under Alternative 2, and the impacts of Alternative 2 on incidental takes of marine mammals are likely to be insignificant.

3.4.2.3 Harvest of Prey Species

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the effects of the groundfish fisheries on prey species for marine mammals (NMFS 2007a) and is incorporated by reference. Harvests of marine mammal prey species in the GOA groundfish fisheries may limit foraging success through localized depletion, overall reduction in prey biomass, and dispersion of prey, making it more energetically costly for foraging marine mammals to obtain necessary prey. Overall reduction in prey biomass may be caused by removal of prey or disturbance of prey habitat. The timing and location of fisheries relative to foraging patterns of marine mammals and the abundance of prey species may be a more relevant management concern than total prey removals. The GOA non-pollock trawl fisheries 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 varied diets may be less likely to be impacted than those with more restricted diets. Table 3-19 shows the GOA marine mammal

species and their prey species that may be impacted by the GOA non-pollock trawl fisheries. Non-pollock groundfish targets and salmon prey are in **bold**.

Table 3-19 Prey species used by GOA marine mammals that may be impacted by the GOA non-pollock trawl fisheries.

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

Chinook salmon PSC in the non-pollock trawl fisheries may remove salmon that would otherwise have been available as prey for marine mammals. CWT recoveries from Chinook salmon PSC in the GOA provide information on occurrence of specific salmon stocks in the GOA. Although CWT recoveries provide reliable documentation of the presence of a stock in the PSC, the recoveries to date can't be used to establish the relative abundance of stocks in the PSC, nor to estimate the number harvested from any one stock due to sampling issues. CWTs do not represent the true composition of all stocks of Chinook salmon in the PSC in the GOA groundfish fisheries (see Section 3.3.3.1). Between 1995 and 2010, 34% of the observed CWTs of Chinook salmon in the GOA fishery have originated from British Columbia, followed by Alaska (31%), Oregon (21%), Washington (13%), and Idaho (<1%). MARK expansions of the CWT recoveries estimate Chinook salmon to have originated in British Columbia (52%), Alaska (33%), Oregon (8%), Washington (7%), and Idaho (<1%). It is important to note that in 6 out of the 16 years that CWT recovery data were collected, the majority of tagged fish were from Alaska. MARK expansions should be considered a minimum estimate of the actual PSC of specific Chinook salmon stocks. Genetic analysis of stock composition, and AEQ analysis on Chinook salmon PSC in the GOA is not yet available. NMFS recently initiated improvements to the sampling process for Chinook salmon in the GOA pollock trawl fishery.

Several marine mammals in the GOA may be affected indirectly by impacts of non-pelagic trawl gear on benthic habitat. Table 3-20 lists marine mammals that may depend on benthic prey and known depths of diving. Sperm whales are not likely to be affected by any potential impacts on benthic habitat from non-pelagic trawling because they generally occur in deeper waters than where trawling occurs (Table 3-20). Benthic habitat for harbor seals and sea otters is also not likely to be affected by non-pelagic trawling because they occur primarily along the coast where trawling is not conducted. Cook Inlet beluga whales are not likely to be affected by non-pelagic trawling benthic impacts because they do not range outside of Cook Inlet and do not overlap spatially with the trawl fisheries.

Table 3-20 Benthic dependent GOA marine mammals, foraging locations, and diving depths.

Species	Depth of diving and location
Ribbon seal	Mostly dive < 150 m on shelf, deeper off shore. Primarily in shelf and slope areas.
Harbor seal	Up to 183 m. Generally coastal.
Sperm whale	Up to 1,000 m, but generally in waters > 600 m.
Northern sea otter	Rocky nearshore < 75 m
Gray whale	Benthic invertebrates

Sources: Allen and Angliss 2012; Burns et al. 1981; http://www.adfg.state.ak.us/pubs/notebook/marine/rib-seal.php; http://www.afsc.noaa.gov/nmml/species/species_ribbon.php; http://www.adfg.state.ak.us/pubs/notebook/marine/harseal.php; http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm

Prey Availability Effects under Status Quo: Alternative 1

The GOA Halibut PSC EA/RIR/IRFA concluded that competition for key prey species with the non-pollock trawl fisheries is not likely to constrain the foraging success of marine mammals in the GOA or cause population declines (NPFMC 2012). The introduction to this section reviewed the marine mammal species that depend on groundfish or salmon, and the potential impacts of the non-pollock trawl fisheries on benthic habitat that supports marine mammal prey. Below is additional information regarding potential effects of the GOA non-pollock trawl fisheries on prey availability for Steller sea lions, Cook Inlet belugas, and SRKW.

Steller sea lions

The following information on Steller sea lion diet is summarized from the 2010 Biological Opinion (NMFS 2010a) and is incorporated by reference. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods. Prey species can be grouped into those that tend to be consumed seasonally, when they become locally abundant or aggregated when spawning (e.g., herring, Pacific cod, eulachon, capelin, salmon and Irish lords), and those that are consumed and available to Steller sea lions more or less year-round (e.g., pollock, cephalopods, Atka mackerel, arrowtooth flounder, rock sole and sand lance.

Stomach content analysis from animals in Kodiak in the 1970s showed that walleye pollock was the most important prey in fall, winter, and spring, while in summer the most frequently eaten prey were small forage fishes (capelin, herring, and sand lance) (Merrick and Calkins 1996). Prey occurrence of pollock, Pacific cod, and herring were higher in the 1980s than in the 1950s through 1970s in stomach content samples for both eastern and Western Steller sea lion populations. In a recent study in the Kodiak Archipelago, the most frequent Steller sea lion prey were found to be Pacific sand lance, walleye pollock, arrowtooth flounder, Pacific cod, salmon, and Pacific herring (McKenzie and Wynne 2008). Other studies since 1990 have shown that pollock continue to be a dominant prey species in the GOA. Pacific cod is also an important prey species in winter in the GOA. Salmon was eaten most frequently during the summer months in the GOA.

The effects of the status quo GOA Pacific cod fishery and state-managed salmon fisheries on prey availability for Steller sea lions were evaluated in the recent Biological Opinion (NMFS 2010a), and were not found to cause adverse population-levels effects on Steller sea lions. Steller sea lion protection measures in the GOA are sufficient to ensure that the groundfish fisheries are not likely to jeopardize the continued existence of Steller sea lions or adversely modify its designated critical habitat (NMFS 2010a).

Killer Whales

Northern resident killer whales consume salmon that are migrating to spawning streams in nearshore waters in Alaska (NMFS 2004a). Recent studies have shown that SRKWs forage selectively for Chinook salmon which are relatively large compared with other salmon species, have high lipid content, and are available year-round (Ford and Ellis 2006). In inland waters of Washington and British Columbia, the diet

of SRKWs consists of 82% Chinook salmon during May through September (Hanson et al. 2010). Stock of origin investigations have found that SRKWs forage on Chinook salmon from the Fraser River, Puget Sound runs, and other Washington and Oregon runs.

The non-pollock trawl fisheries may intercept salmon that would otherwise have been available as prey for Northern and Southern Resident killer whales. Any competition with the fisheries for Chinook salmon would depend on the extent to which the fishery intercepts salmon that would have otherwise been available to killer whales as prey. Data are not available to quantitatively evaluate the extent of this effect.

Cook Inlet Beluga Whales

The following information on Cook Inlet beluga diet is from the 2008 Recovery Plan (NMFS 2008b) and is incorporated by reference. Cook Inlet belugas feed on a wide variety of species, focusing on specific species when they are seasonally abundant. The groundfish fisheries directly harvest and incidentally catch several species that are important prey species for belugas, including pollock, Pacific cod, yellowfin sole, starry flounder, and staghorn sculpin. Because pollock is not likely to occur in large amounts in Cook Inlet, and appears to be eaten only in spring and fall, it is not likely an important prey species for Cook Inlet beluga whales. The groundfish fisheries also catch eulachon and salmon, which are energetically rich food sources and important prey species in spring and summer, respectively.

Cook Inlet beluga whales are not likely to compete with the GOA non-pollock trawl fisheries because their occurrence does not overlap spatially with the fisheries. Any competition with the fisheries for Chinook salmon would depend on the extent to which the fishery intercepts salmon that would have otherwise been available to Cook Inlet belugas as prey. Data are not available to quantitatively evaluate the extent of this effect. Even though the GOA fisheries take Cook Inlet salmon as PSC, it is not likely that the number of salmon taken under status quo would have a measurable effect on Cook Inlet beluga whales. Of the Alaska Chinook salmon CWT recoveries, 9% are estimated to be Cook Inlet fish. Returns of Chinook salmon are in the thousands of fish based on the number of river systems in the inlet with Chinook salmon runs, and the effects of GOA PSC on the volume of Cook Inlet spawning runs is likely not substantial. NMFS completed an informal ESA Section 7 consultation on the effects of the groundfish fisheries on Cook Inlet beluga whales and determined that the incidental harvest of Chinook salmon in the groundfish fisheries was not likely to adversely affect Cook Inlet beluga whales (Salveson 2009 and Brix 2010).

Other Marine Mammals

Ribbon seals, northern fur seals, and minke, fin, and humpback whales potentially compete with the GOA non-pollock trawl fisheries because of the overlap of their occurrence with the location of this fishery. Ribbon seals, fin whales, and humpback whales have a more diverse diet than minke whales and northern fur seals, and may therefore have less potential to be affected by any competition with the fisheries. There is no evidence that the harvest of groundfish in the GOA is likely to cause population level effects on these marine mammals.

Based on a review of marine mammal diets, and an evaluation of the status quo harvests of potential prey species in the GOA non-pollock trawl fishery, the effects of Alternative 1 on prey availability for marine mammals are not likely to cause population level effects and are therefore insignificant.

Prey Availability Effects under Alternative 2

A hard cap on the number of Chinook salmon taken in the non-pollock trawl fisheries could benefit those species that depend on salmon (e.g., Steller sea lions, Northern and Southern Resident killer whales, beluga whales, harbor seals, ribbon seals, and northern fur seals) by limiting salmon PSC. If the hard cap

results in the fisheries closing before the TACs are reached, it could also increase the availability of groundfish to marine mammals. If the hard cap results in additional fishing effort in less productive groundfish areas with less salmon PSC, the shift in fishing location may result in additional groundfish being available in those areas where salmon is concentrated, and would provide a benefit if these areas are also used by groundfish- and salmon-dependent marine mammals for foraging. A higher hard cap would be less constraining on the fishery and would likely result in effects on prey availability similar to the status quo. A lower hard cap would be more constraining on the fishery, making more salmon available for prey; and may also increase availability of groundfish if the fishery is closed before the groundfish TACs is reached.

Consequently, Alternative 2 may reduce the potential effects of the GOA non-pollock trawl fisheries on the availability of prey for marine mammals, especially in years when the salmon cap is reached and fishing may be constrained. It is not likely that the potential effects would be substantially different from status quo, and therefore the effects of Alternative 2 are likely insignificant.

3.4.2.4 Disturbance

Disturbance Effects under Status Quo: Alternative 1

The GOA Halibut PSC EA/RIR/IRFA contains a detailed description of the disturbance of marine mammals by the non-pollock trawl fisheries (NPFMC 2012). The EA concluded that the status quo fishery does not cause significantly adverse impacts to marine mammals. Fishery closures limit the potential interaction between fishing vessels and marine mammals (e.g., 3-nm no groundfish fishing areas around Steller sea lion rookeries). Because disturbances to marine mammals under the status quo fishery are not likely to cause population level effects, the impacts of Alternative 1 are likely insignificant.

Disturbance Effects under Alternative 2: Hard Caps

The effects of the proposed hard caps on disturbance would be similar to the effects on incidental takes. If the groundfish fishery closes early because the hard cap is reached, then less potential exists for disturbance of marine mammals. If the non-pollock trawl fisheries increase the duration of fishing in areas with lower concentrations of groundfish to avoid areas of high salmon PSC, there may be more potential for disturbance if this increased fishing activity overlaps with areas used by marine mammals. Fishing under the higher hard cap is likely similar to status quo because it is less constraining than fishing under the lower caps and less likely to cause a change in fishing activities.

None of the disturbance effects on other marine mammals under Alternative 2 are expected to result in population level effects on marine mammals. Disturbance effects are likely to be localized and limited to a small portion of any particular marine mammal population. Because disturbances to marine mammals under Alternative 2 is not likely to be substantially different from status quo, the impacts of Alternative 2 are likely insignificant.

3.5 Seabirds

3.5.1 Seabird Species and Status

Thirty-eight species of seabirds breed in Alaska (Table 3-21). Breeding populations are estimated to contain 36 million individual birds in Alaska, and total population size (including subadults and nonbreeders) is estimated to be approximately 30% higher. Five additional species that breed elsewhere but occur in Alaskan waters during the summer months contribute another 30 million birds (Table 3-21).

More information on seabirds in Alaska's EEZ may be found in several NMFS, Council, and USFWS documents:

- The URL for the USFWS Migratory Bird Management program is at: http://alaska.fws.gov/mbsp/mbm/index.htm
- Section 3.7 of the PSEIS (NMFS 2004a) provides background on seabirds in the action area and their interactions with the fisheries. This may be accessed at http://www.alaskafisheries.noaa.gov/sustainablefisheries/seis/final062004/Chaps/chpt_3/chpt_3_7.pdf
- The annual Ecosystems Considerations chapter of the SAFE reports has a chapter on seabirds. Back issues of the Ecosystem SAFE reports may be accessed at http://www.afsc.noaa.gov/REFM/REEM/Assess/Default.htm.
- The Seabird Fishery Interaction Research webpage of the Alaska Fisheries Science Center: http://www.afsc.noaa.gov/refm/reem/Seabirds/Default.htm
- The NMFS Alaska Region's Seabird Incidental Take Reduction webpage: http://www.alaskafisheries.noaa.gov/protectedresources/seabirds.html
- The BSAI and GOA groundfish FMPs each contain an "Appendix I" dealing with marine mammal and seabird populations that interact with the fisheries. The FMPs may be accessed from the Council's home page at http://www.alaskafisheries.noaa.gov/npfmc/default.htm
- Washington Sea Grant has several publications on seabird takes, and technologies and practices for reducing them: http://www.wsg.washington.edu/publications/online/index.html
- The seabird component of the environment affected by the groundfish FMPs is described in detail in Section 3.7 of the PSEIS (NMFS 2004a).
- Seabirds and fishery impacts are also described in Chapter 9 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a).

Table 3-21 Seabird species in Alaska

Type	Common name	Status
Albatrosses	Black-footed	
	Short-tailed	Endangered
	Laysan	
Fulmars	Northern fulmar	
Shearwaters	Short-tailed	
	Sooty	
Storm petrels	Leach's	
	Fork-tailed	
Cormorants	Pelagic	
	Red-faced	
	Double-crested	
Gulls	Glaucous-winged	
	Glaucous	
	Herring	
	Mew	
	Bonaparte's	
	Sabine	
	Ivory	
	Ross's	
Murres	Common	
	Thick-billed	
Jaegers	Long-tailed	
	Parasitic	
	Pomarine	

Type	Common name	Status
Guillemots	Black	
	Pigeon	
Eiders	Common	
	King	
	Spectacled	Threatened
	Steller's	Threatened
Murrelets	Marbled	
	Kittlitz's	Candidate
	Ancient	
Kittiwakes	Black-legged	
	Red-legged	
Auklets	Cassin's	
	Parakeet	
	Least	
	Whiskered	
	Crested	
	Rhinoceros	
Terns	Arctic	
	Aleutian	
Puffins	Horned	
	Tufted	

3.5.1.1 ESA-Listed Seabirds in the GOA

Several species of conservation concern occur in the GOA (Table 3-22). Short-tailed albatross is listed as endangered under the ESA, and Steller's eider is listed as threatened. Kittlitz's murrelet is a candidate species for listing under the ESA, and the USFWS is currently working on a 12-month finding for black-footed albatross.

Table 3-22 ESA-listed and candidate seabird species that occur in the GOA.

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

Short-tailed Albatross

Short-tailed albatross (*Phoebaotria albatrus*) is listed as endangered under the ESA. Short-tailed albatross populations were decimated by feather hunters and volcanic activity at nesting sites in the early 1900s, and the species was reported to be extinct in 1949. In recent years, the population has recovered at a 7% to 8% annual rate. The world population of short-tailed albatross in 2009 was estimated at 3,000 birds. The majority of nesting occurs on Torishima Island in Japan, where an active volcano threatens the colony. No critical habitat has been designated for the short-tailed albatross in the United States, because the population growth rate does not appear to be limited by marine habitat loss (NMFS 2004b). Short-tailed albatross feeding grounds are continental shelf breaks and areas of upwelling and high productivity. Short-tailed albatross are surface feeders, foraging on squid and forage fish.

As part of a 5-year project, chicks have been translocated from Torishima Island to a new breeding colony on Mukojima in the Ogasawara Islands, which is not threatened by volcanic activity. In February 2011, researchers noted the first return of a short-tailed albatross chick to its hand-reared home on Mukojima, a promising sign that the chicks may return to Mukojima to breed.

Steller's Eider

Steller's eider (*Polysticta stelleri)* is listed as threatened under the ESA. While designated critical habitat for Steller's eiders does overlap with fishing grounds in the Bering Sea, there has never been an observed take of this species off Alaska (USFWS 2003a, 2003b; NMFS 2008a), and no take estimates are produced by AFSC. Therefore, impacts to Steller's eider are not analyzed in this document.

Kittlitz's Murrelet

Kittlitz's murrelet (*Brachyramphus brevirostris*) is a small diving seabird that forages in shallow waters for capelin, Pacific sandlance, zooplankton, and other invertebrates. It feeds near glaciers, icebergs, and outflows of glacial streams, sometimes nesting up to 45 miles inland on rugged mountains near glaciers. Most recent population estimates indicate that it has the smallest population of any seabird considered a regular breeder in Alaska (9,000 to 25,000 birds). This species appears to have undergone significant population declines in several of its core population centers. USFWS believes that glacial retreat and oceanic regime shifts are the factors that are most likely causing population-level declines in this species. Kittlitz's murrelet is currently a candidate species for listing under the ESA. No Kittlitz's murrelets were reported taken in the observed groundfish fisheries between 2007 and 2010 (NMFS 2011b).

3.5.1.2 Status of ESA Consultations on Seabirds

The USFWS has primary responsibility for managing seabirds, and has evaluated effects of the BSAI and GOA FMPs and the harvest specifications process on currently listed species in two Biological Opinions (USFWS 2003a and 2003b). Both Biological Opinions concluded that the groundfish fisheries off Alaska are unlikely to jeopardize populations of listed species or adversely modify or destroy critical habitat for listed species. The current population status, life history, population biology, and foraging ecology of these species, as well as a history of ESA Section 7 consultations and NMFS actions carried out as a result of those consultations are described in detail in Section 3.5.2 of the GOA Halibut PSC EA/RIR/IRFA (NPFMC 2012).

3.5.1.3 Seabird Distribution in the Gulf of Alaska

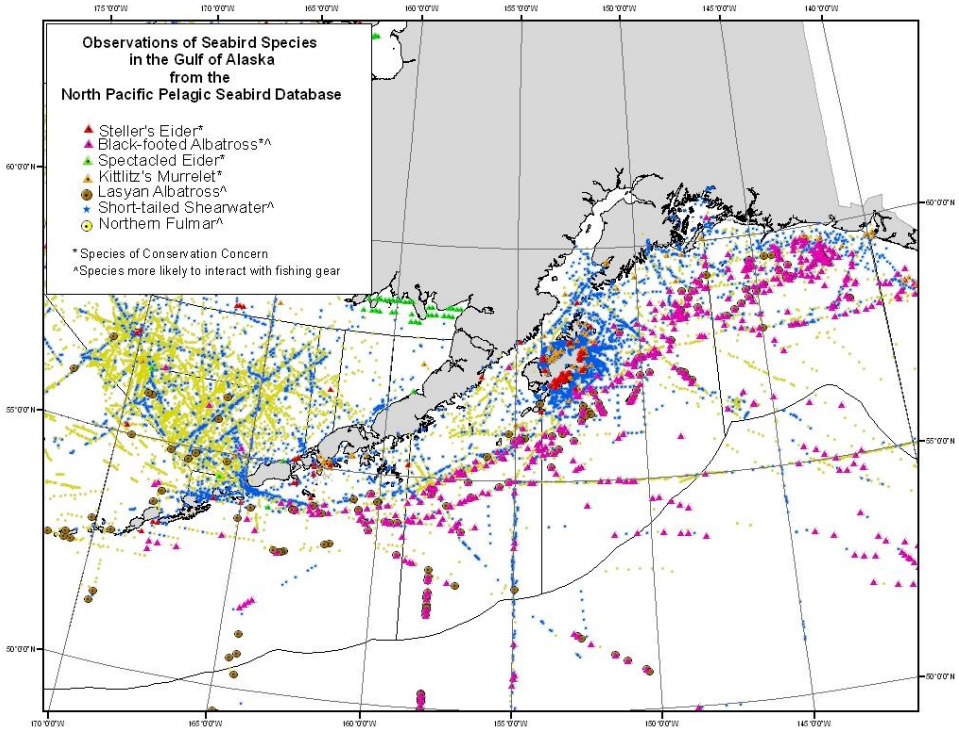
Figure 3-12 shows observations of several seabird species that may interact with fishing gear in the GOA. Figure 3-13 shows locations of short-tailed albatross seen on surveys from 2002 through 2004 (Melvin et al. 2006). Melvin et al. (2006) provides the most current and comprehensive data on seabird distribution patterns off Alaska.

Satellite Tracking of Short-tailed Albatross

USFWS and Oregon State University placed 52 satellite tags on Laysan, black-footed, and short-tailed albatrosses in the Central Aleutian Islands to study movement patterns of the birds in relation to commercial fishing activity and other environmental variables. From 2002 to 2006, 21 individual short-tailed albatrosses (representing about 1% of the entire population) were tagged, including adults, sub-adults, and hatch-year birds. During the non-breeding season, short-tailed albatross ranged along the Pacific Rim from southern Japan through Alaska and Russia to northern California, primarily along continental shelf margins (Suryan et al. 2006).

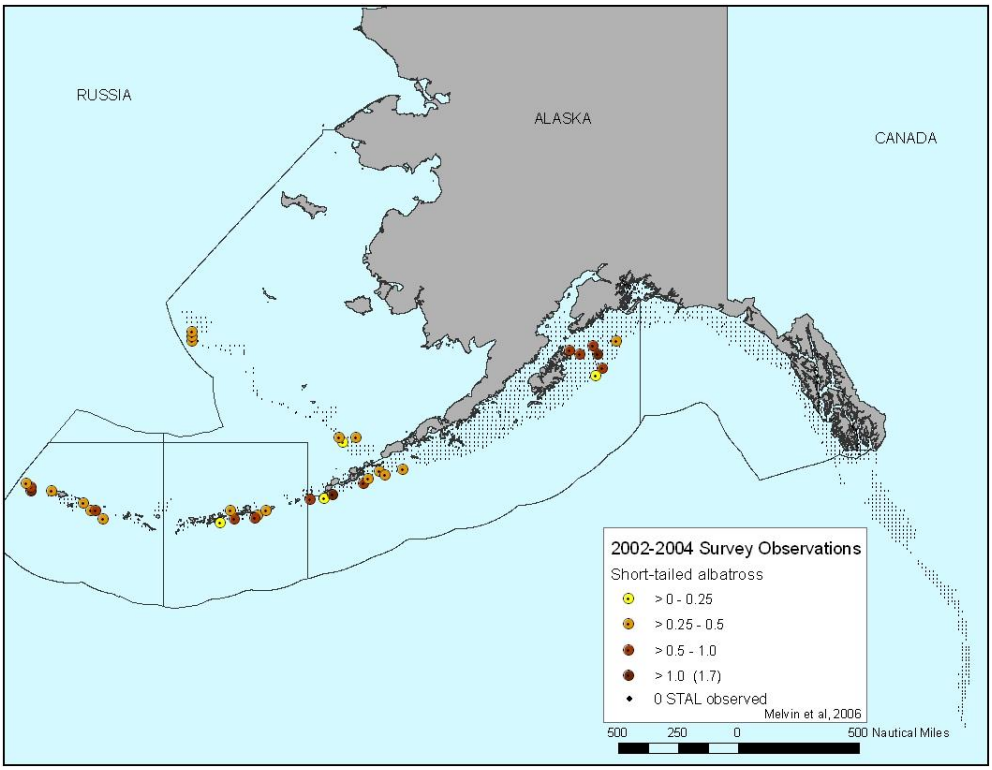
Sufficient data existed for 11 of the 14 to analyze movements within Alaska. Within Alaska, albatrosses spent varying amounts of time among NMFS reporting areas, with six of the areas (521, 524, 541, 542, 543, 610) being the most frequently used (Suryan et al. 2006). Non-breeding albatross concentrate foraging in oceanic areas characterized by gradients in topography and water column productivity. The primary hot spots for short-tailed albatrosses in the Northwest Pacific Ocean and Bering Sea occur where a variety of underlying physical processes enhance biological productivity or prey aggregations. The Aleutian Islands, in particular, were a primary foraging destination for short-tailed albatrosses.

Figure 3-12 Observations of seabird species with conservation status and/or likely to interact with fishing gear in the Gulf of Alaska.



Source: NPPSD 2004

Figure 3-13 Observations of short-tailed albatrosses



Source: Melvin et al. 2006

Short-tailed Albatross Takes in Alaska Fisheries

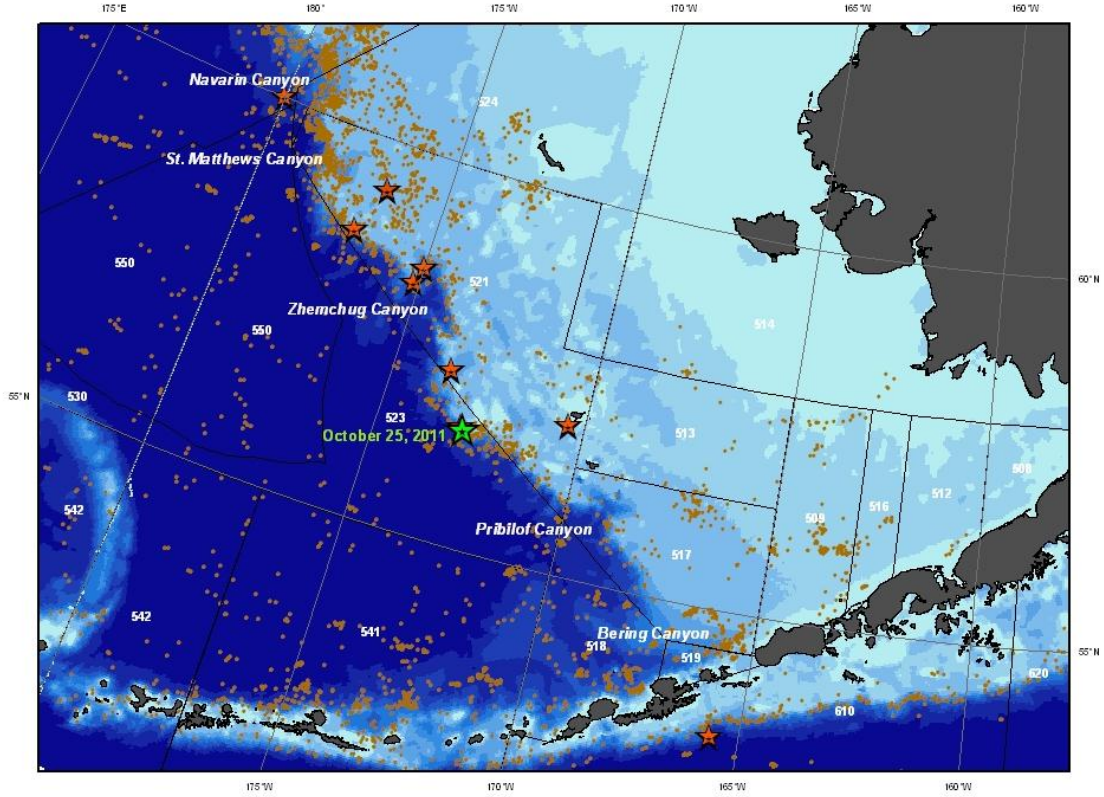
Table 3-23 lists the short-tailed albatrosses reported taken in Alaska fisheries since 1983. With the exception of one take in the Western GOA, all takes occurred along the shelf break in the Bering Sea. The Western GOA take was in the hook-and-line halibut fishery. No takes were reported from 1999 through 2009. No takes with trawl gear have been reported. While the incidental take statement take limits for short-tailed albatross have never been met or exceeded, three short-tailed albatrosses were taken in the BSAI hook-and-line Pacific cod fishery in 2010 (Table 3-23 and Figure 3-14). NMFS is working closely with industry and the observer program to understand the specific circumstances of these incidents.

Table 3-23 Reported takes of short-tailed albatross in Alaska fisheries.

Date of take	Location	Fishery	Age when taken
July 1983	BS	brown crab	juvenile (4 mos)
1 Oct 87	GOA	halibut	juvenile (6 mos)
28 Aug 95*	EAI	hook-and-line	sub-adult (16 mos)
8 Oct 95	BS	hook-and-line	sub-adult
27 Sept 96	BS	hook-and-line	sub-adult (5 yrs)
21 Sept 98	BS	Pacific cod hook-and-line	adult (8 yrs)
28 Sept 98	BS	Pacific cod hook-and-line	sub-adult
27 Aug 2010	BS	Pacific cod hook-and-line	Sub-adult (7 yrs 10 mos)
14 Sept 2010	BS	Pacific cod hook-and-line	Sub-adult (3 yrs 10 mos)
25 Oct 2010	BS	Pacific cod hook-and-line	Sub-adult (less than 2 years)

Source: AFSC.

Figure 3-14 Locations (brown dots) of all Short-tailed albatross locations during September to November 2001-2010, and locations of all STAL takes in Alaska fisheries (red stars) from 1983 to 2010, and location of the most recent STAL take (green star).



Credits: Yamashita Institute for Ornithology, Oregon State University, U.S. Fish and Wildlife Service, and Ministry of Environment, Japan. Reprinted from http://alaskafisheries.noaa.gov/index/infobulletins/bulletin.asp?BulletinID=7771.

3.5.2 Effects on Seabirds

The PSEIS identifies how the GOA groundfish fisheries activities may directly or indirectly affect seabird populations (NMFS 2004a). Direct effects may include incidental take in fishing gear and vessel strikes. Indirect effects may include reductions in prey (forage fish) abundance and availability, disturbance to benthic habitat, discharge of processing waste and offal, contamination by oil spills, presence of nest predators in islands, and disposal of plastics, which may be ingested by seabirds.

3.5.2.1 Significance Criteria for Seabirds

Criteria for analyzing the potential impacts of these alternatives on seabirds are identified in Table 3-24. These criteria are adopted from the 2006-2007 groundfish harvest specifications EA/FRFA. The GOA Halibut PSC EA (NPFMC 2012) analyzed the GOA non-pollock trawl fisheries as currently prosecuted, and concluded that the fisheries are not likely to result in significantly adverse impacts to seabirds. Alternative 1 is Status Quo, and under that alternative no changes are expected, and no significantly adverse impacts are expected for any seabirds. As with marine mammals, potential impacts from other alternatives are addressed as changes from status quo.

Table 3-24 Criteria used to determine significance of impacts on seabirds.

	Incidental take	Prey availability	Benthic habitat
Insignificant	No substantive change in takes of seabirds during the operation of fishing gear.	No substantive change in forage available to seabird populations.	No substantive change in gear impact on benthic habitat used by seabirds for foraging.
Adverse impact	Non-zero take of seabirds by fishing gear.	Reduction in forage fish populations, or the availability of forage fish, to seabird populations.	Gear contact with benthic habitat used by benthic feeding seabirds reduces amount or availability of prey.
Beneficial impact	No beneficial impact can be identified.	Availability of offal from fishing operations or plants may provide additional, readily accessible, sources of food.	No beneficial impact can be identified.
Significantly adverse impact	Take levels increase substantially from the baseline level, or level of take is likely to have population level impact on seabirds.	Food availability decreased substantially from baseline such that seabird population level survival or reproduction success is likely to decrease.	Impact to benthic habitat decreases seabird prey base substantially from baseline such that seabird population level survival or reproductive success is likely to decrease. (ESA-listed eider impacts may be evaluated at the population level).
Significantly beneficial impact	No threshold can be identified.	Food availability increased substantially from baseline such that seabird population level survival or reproduction success is likely to increase.	No threshold can be identified.
Unknown impacts	Insufficient information available on take rates or population levels.	Insufficient information available on abundance of key prey species or the scope of fishery impacts on prey.	Insufficient information available on the scope or mechanism of benthic habitat impacts on food web.

3.5.2.2 Incidental Take of Seabirds in Trawl Fisheries

The impacts of the Alaska groundfish fisheries on seabirds were analyzed in the Alaska Harvest Specifications EIS (NMFS 2007a), and the GOA halibut PSC EA evaluated these fisheries for their potential impacts to seabirds. Those documents are incorporated here by reference.

Seabirds interact with trawl fishing vessels in several ways. Birds foraging at the water surface or in the water column are sometimes caught in the trawl net as it is brought back on board. These incidental takes are recorded by fisheries observers as discussed below. In addition to getting caught in the fishing nets of trawl vessels, some species strike cables attached to the infrastructure of vessels or collide with the infrastructure itself. Large winged birds such as albatrosses are most susceptible to mortalities from trawl-cable strikes (CCAMLR 2006). Third wire cables have been prohibited in some southern hemisphere fisheries since the early 1990s due to substantial albatross mortality from cable strikes. No short-tailed albatross or black-footed albatross have been observed taken with trawl gear in Alaska fisheries, but mortalities to Laysan albatrosses have been observed.

From 2007 – 2010, the estimated seabird bycatch for the Alaskan groundfish GOA fisheries, pelagic and non-pelagic gear combined, ranged from 0 in 2009 to 122 in 2010 (NMFS 2011b). Northern fulmars were the only species of seabird reported in GOA trawl nets during those years.

Seabird takes in the GOA trawl fisheries are relatively low, based on standard observer sampling and NMFS estimation. However, standard species composition sampling of the catch does not account for

additional mortality due to gear interactions. Special data collections of seabird gear interactions have been conducted, and preliminary information indicates that mortalities can be greater than the birds accounted for in the standard species composition sampling (Melvin 2011; Fitzgerald in prep). To date, strikes of trawl vessels or gear by the short-tailed albatross have not been reported by observers. The probability of short-tailed albatross collisions with third wires or other trawl vessel gear in Alaskan waters cannot be assessed; however, given the available observer data and the observed at-sea locations of short-tailed albatrosses relative to trawling effort, the likelihood of short-tailed albatross collisions are very rare, but the possibility of such collisions cannot be completely discounted. USFWS' biological opinion included an Incidental Take Statement (ITS) of two short-tailed albatross for the trawl groundfish fisheries off Alaska (USFWS 2003b).

3.5.2.3 Prey Availability Disturbance of Benthic Habitat

As noted in Table 3-25, seabird prey species in the GOA are not usually fish that are targeted by non-pelagic commercial fishing gear. However, seabird species may be impacted indirectly by effects of the non-pelagic trawl gear on the benthic habitat of seabird prey, bottom fish, mollusks, and crustaceans. The essential fish habitat final environmental impact statement provides a description of the effects of trawling on bottom habitat in the appendix (NMFS 2005b), including the effects of the commercial fisheries on the GOA slope and shelf.

It is not known how much seabird species use benthic habitat directly, although research funded by the North Pacific Research Board has been conducted on foraging behavior of seabirds in the Bering Sea in recent years. Thick-billed murres easily dive to 100 m, and have been documented diving to 200 m; common murres also dive to over 100 m. Since cephalopods and benthic fish compose some of their diet, murres could be foraging on or near the bottom (K. Kuletz, USFWS, personal communication, October 2008).

A description of the effects of prey abundance and availability on seabirds is found in the PSEIS (NMFS 2004a) and the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a). Detailed conclusions or predictions cannot be made regarding the effects of forage fish bycatch on seabird populations or colonies. NMFS (2007a) found that the potential impact of the entire groundfish fisheries on seabird prey availability was limited due to little or no overlap between the fisheries and foraging seabirds based on either prey size, dispersed foraging locations, or different prey (NMFS 2007a). The majority of bird groups feed in vast areas of the oceans, are either plankton feeders or surface or mid-water fish feeders, and are not likely to have their prey availability impacted by the nonpelagic trawl fisheries. There is no directed commercial fishery for those species that compose the forage fish management group, and seabirds typically target juvenile stages rather than adults for commercial target species. Most of the forage fish bycatch is smelt taken in the pollock fishery, which is not included in this action.

Table 3-25 Seabirds in the Gulf of Alaska: foraging habitats and common prey species.

Species	Foraging habitats	Prey
Short-tailed albatross	Surface seize and scavenge	Squid, shrimp, fish, fish eggs
Black-footed albatross	Surface dip, scavenge	Fish eggs, fish, squid, crustaceans, fish waste
Laysan albatross	Surface dip	Fish, squid, fish eggs and waste
Spectacled eider	Diving	Mollusks and crustaceans
Steller's eider	Diving	Mollusks and crustaceans
Black-legged kittiwake	Dip, surface seize, plunge dive	Fish, marine invertebrates
Murrelet (Kittlitz's and marbled)	Surface dives	Fish, invertebrates, macroplankton
Shearwater spp.	Surface dives	Crustaceans, fish, squid
Northern fulmar	Surface fish feeder	Fish, squid, crustaceans
Murres spp.	Diving fish-feeders offshore	Fish, crustaceans, invertebrates
Cormorants spp.	Diving fish-feeders nearshore	Bottom fish, crab, shrimp
Gull spp.	Surface fish feeder	Fish, marine invertebrates, birds
Auklet spp.	Surface dives	Crustaceans, fish, jellyfish
Tern spp.	Plunge, dive	Fish, invertebrates, insects
Petrel spp.	Hover, surface dip	Zooplankton, crustaceans, fish
Jaeger spp.	Hover and pounce	Birds, eggs, fish
Puffin spp.	Surface dives	Fish, squid, other invertebrates

Source: USFWS 2006, Dragoo et al. 2010.

Seabirds that feed on benthic habitat, including Steller's eiders, scoters, cormorants, and guillemots, may feed in areas that could be directly impacted by nonpelagic trawl gear (NMFS 2004b). A 3-year otter trawling study in sandy bottom of the Grand Banks showed either no effect or increased abundance in mollusk species after trawling (Kenchington et al. 2001), but clam abundance in these studies was depressed for the first 3 years after trawling occurred. McConnaughey et al. (2000) studied trawling effects using the Bristol Bay area Crab and Halibut Protection Zone. They found more abundant infaunal bivalves (not including *Nuculana radiata*) in the highly fished area compared to the unfished area. In addition to abundance, clam size is important to these birds. Handling time is very important to birds foraging in the benthos, and their caloric needs could change if a stable large clam population is converted to a very dense population of small first year clams. Additional impacts from nonpelagic trawling may occur if sand lance habitat is adversely impacted. This would affect a wider array of piscivorous seabirds that feed on sand lance, particularly during the breeding season, when this forage fish is also used for feeding chicks.

Recovery of fauna after the use of nonpelagic trawl gear may also depend on the type of sediment. A study in the North Sea found biomass and production in sand and gravel sediments recovering faster (2 years) than in muddy sediments (4 years) (Hiddink et al. 2006). The recovery rate may be affected by the animal's ability to rebury itself after disturbance. Clams species may vary in their ability to rebury themselves based on grain size and whether they are substrate generalist, substrate specialist, or substrate sensitive species (Alexander et al.1993).

3.5.2.4 Alternative 1 Status Quo

Incidental Take

The effects of the status quo fisheries on incidental take of seabirds are described in seabirds is described in the GOA halibut PSC EA (NPFMC 2012), which concluded that these fisheries are not likely to result in significantly adverse impacts to seabirds. It is reasonable to conclude that incidental take of seabirds would not change under the Status Quo alternative.

Prey Availability and Benthic Habitat

The status quo groundfish fisheries do not harvest seabird prey species in an amount that would decrease food availability enough to impact survival rates or reproductive success, nor do they impact benthic habitat enough to decrease seabird prey base to a degree that would impact survival rates or reproductive success. Under the Status Quo alternative no substantive changes are expected, and impacts are expected to be negligible.

3.5.2.5 Alternative 2

Incidental Take

The range of hard caps under Alternative 2 could potentially decrease the number of incidental takes of seabirds in the GOA trawl fisheries. A lower hard cap may preclude trawl fishing in the non-pollock GOA fisheries at some point in the fishing season, which would reduce the potential for incidental takes in fishing areas that overlap with seabird distributions. If the fleet is able to identify hotspots with high Chinook salmon catch rates, and avoid fishing in these areas, the distribution of effort in the fishery may change to some extent, although likely within the existing footprint of the fishery. To the extent that the redistribution of effort results in more vessel-days of effort, there could potentially be an increase in the likelihood of incidental takes of seabirds, compared to the status quo. However, the likely closures are relatively small compared to the capacity of the GOA groundfish trawl fleet, and seasons are likely to remain short. Overall effects on seabird takes are not likely to change substantially, and impacts are expected to be negligible. A higher hard cap would allow for more fishing and potentially more incidental takes of seabirds than a lower cap.

Prey Availability and Benthic Habitat

Under a hard cap, the fishing season has the potential to be shorter than the status quo fishery in high Chinook salmon PSC years. Decreased fishing effort could further reduce removals of seabird prey species and further mitigate any effects on benthic habitat at an insignificant level. Again, changes are not expected to be substantial, and any impacts are expected to be negligible.

3.5.2.6 Summary of Effects

Many seabird species utilize the marine habitat of the GOA. Several species of conservation concern and many other species could potentially interact with trawl cables. The AFSC estimates of incidental takes are small relative to total estimates of seabird populations. However, those estimates do not include cable-related trawl mortalities. Recent modeling suggests that even if there were to be a large increase in trawl cable incidental takes of short-tailed albatross (the only seabird listed as endangered under the ESA), it would have negligible effects on the recovery of the species. Table 3-26 summarizes the action alternatives' impacts to seabird populations.

Table 3-26 Summary of impacts to seabirds from alternatives in this analysis.

Alternative	Impact on incidental take of seabirds in Alaska waters	Impact on prey density and benthic habitat
Alternative 1	Seabird takes and disruptions to benthic habitat and prey availability are at low levels and are mitigated (to some degree) by current spatial restrictions on the fisheries in the Gulf of Alaska. Insignificant effects.	Seabird takes and disruptions to benthic habitat and prey availability are at low levels and are mitigated (to some degree) by current spatial restrictions on the fisheries in the Gulf of Alaska. Insignificant effects.
Alternative 2	Seabirds are taken by fisheries in minor amounts compared to population levels. Insignificant effects. Increased observer coverage would improve monitoring of incidental takes.	Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects. Insignificant effects.

3.6 Habitat

Fishing operations may change the abundance or availability of certain habitat features used by managed fish species to spawn, breed, feed, and grow to maturity. These changes may reduce or alter the abundance, distribution, or productivity of species. The effects of fishing on habitat depend on the intensity of fishing, the distribution of fishing with different gears across habitats, and the sensitivity and recovery rates of specific habitat features. In 2005, NMFS and the Council completed the EIS for EFH Identification and Conservation in Alaska (NMFS 2005b). The EFH EIS evaluates the long term effects of fishing on benthic habitat features, as well as the likely consequences of those habitat changes for each managed stock based on the best available scientific information. Maps and descriptions of EFH for the GOA groundfish species are available in the EFH EIS (NMFS 2005b). This document also describes the importance of benthic habitat to different groundfish species and the impacts of different types of fishing gear on benthic habitat. In the trawl fishery, doors, sweeps, and bobbins on the net may contact the seafloor.

3.6.1 Effects of the Alternatives

The effects of the GOA non-pollock trawl fisheries on benthic habitat and EFH were analyzed in the EFH EIS (NMFS 2005b), and that evaluation is incorporated by reference. Table 3-27 describes the criteria used to determine whether the impacts on EFH are likely to be significant. The GOA non-pollock trawl fisheries are prosecuted primarily with non-pelagic trawl gear, although pelagic gear is sometimes used in the rockfish target fishery. Year-round area closures protect sensitive benthic habitat. Appendix B to the EFH EIS describes how non-pelagic and pelagic trawl gear impacts habitat. The long-term effects index (LEI) estimates the proportion of habitat attributes that would be lost if recent fishing patterns continued. In the GOA, estimated reductions of epifaunal and infaunal prey due to fishing are less than 1% for all substrate types. For living structure, LEI impacts ranged between 3% and 9% depending on the substrate. Local areas with LEI values in excess of 50% occur to the east of Kodiak Island in Barnabus, Chiniak, and Marmot Gullies (NMFS 2005b).

In addition to impacting benthic habitat, the non-pollock trawl fisheries catch salmon prey species incidentally, for example, pollock. The catches of these prey species are very small relative to the overall populations of these species. Thus, fishing activities are considered to have minimal and temporary effects on prey availability for salmon.

Table 3-27 Criteria used to estimate the significance of impacts on essential fish habitat.

No impact	Fishing activity has no impact on EFH.
Adverse impact	Fishing activity causes disruption or damage of EFH.
Beneficial impact	Beneficial impacts of this action cannot be identified.
Significantly adverse impact	Fishery induced disruption or damage of EFH that is more than minimal and not temporary.
Significantly beneficial impact	No threshold can be identified.
Unknown impact	No information is available regarding gear impact on EFH.

The analysis in the EFH EIS concludes that current fishing practices in the GOA non-pollock trawl fisheries have minimal or temporary effects on benthic habitat and essential fish habitat. These effects are likely to continue under Alternative 1, and are not considered to be significant.

Alternative 2 would establish a hard cap that limits PSC of Chinook salmon in the GOA non-pollock trawl fisheries. A lower hard cap may result in the non-pollock trawl fisheries closing before the TACs are reached, which may reduce impacts of this fishery on benthic habitat. If the fleet is able to identify hotspots with high Chinook salmon catch rates, and avoid fishing in these areas, the distribution of effort in the fishery may change to some extent, although it is likely to remain within the overall footprint of the non-pollock trawl fisheries. A higher hard cap would allow for more groundfish fishing, and impacts to benthic habitat may be similar to the status quo fishery.

Alternative 2 may reduce the potential adverse effects of fishing on benthic habitat compared to the status quo, if the fishery closes early. To the extent that the redistribution of effort results in more vessel-days of effort, there could potentially be an increase in the habitat impacts compared to the status quo. However, regulatory constraints (e.g., seasonal allocations of TAC and halibut PSC) will continue to shape the temporal pattern of fishing, and the overall footprint of the fishery is unlikely to change. The potential effects on an area would be constrained by the amount of the groundfish TACs and by the existing habitat conservation and protection measures. To the extent that Alternative 2 reduces effort in the GOA non-pollock trawl fisheries, this alternative would reduce impacts on habitat relative to the status quo. Because Alternative 2 is not likely to result in significantly adverse effects to habitat, the impacts of Alternative 2 are likely insignificant.

Mitigation

Currently, non-pelagic and pelagic trawl gear is subject to a number of area closures in the GOA to protect habitat and marine species. If new information emerges to indicate that the GOA non-pollock trawl fisheries are having more than a minimal impact on EFH, the Council may consider additional habitat conservation measures. The Council conducts a review of EFH for all managed species every five years.

3.7 Ecosystem

Ecosystems consist of communities of organisms interacting with their physical environment. Within marine ecosystems, competition, predation, and environmental disturbance cause natural variation in recruitment, survivorship, and growth of fish stocks. Human activities, including commercial fishing, can also influence the structure and function of marine ecosystems. Fishing may change predator-prey relationships and community structure, introduce foreign species, affect trophic diversity, alter genetic diversity, alter habitat, and damage benthic habitats.

The GOA non-pollock trawl fisheries potentially impact the GOA ecosystem by relieving predation pressure on shared prey species (i.e., species which are prey for both groundfish and other species),

reducing prey availability for predators of target groundfish, altering habitat, imposing PSC and bycatch mortality, or by ghost fishing caused by lost fishing gear. Ecosystem considerations for the GOA groundfish fisheries are summarized annually in the GOA Stock Assessment and Fishery Evaluation report (Zador 2012). These considerations are summarized according to the ecosystem effects on the groundfish fisheries, as well as the potential fishery effects on the ecosystem.

Effects of the Alternatives

An evaluation of the effects of the GOA groundfish fisheries on the ecosystem is discussed annually in the Ecosystem Considerations sections of each chapter of the SAFE report (NPFMC 2011), and was evaluated in the Harvest Specifications EIS (NMFS 2007a). The significance criteria used in that analysis are incorporated here by reference. The analysis concluded that the current GOA non-pollock trawl fisheries do not produce population-level impacts to marine species or change ecosystem-level attributes beyond the range of natural variation. Consequently, Alternative 1 is not expected to have a significant impact on the ecosystem.

Alternative 2 will either maintain or reduce the overall level of groundfish harvest from the status quo. The level of fishing effort by non-pollock trawl vessels is not expected to change, except in years where the fisheries are closed early due to the attainment of the Chinook salmon PSC cap. While the location and timing of fishing activities may show some localized changes, overall the fleets are constrained by regulatory measures (e.g., seasonal allocations of TAC and halibut PSC) in the location and timing of the fisheries. As a result, Alternative 2 is not likely to have a significant impact on the ecosystem.

3.8 Cumulative Effects

This section analyzes the cumulative effects of the actions considered in this environmental assessment. A cumulative effects analysis includes the effects of past, present, and reasonably foreseeable future action (RFFA). The past and present actions are described in several documents and are incorporated by reference. These include the PSEIS (NMFS 2004), the EFH EIS (NMFS 2005b), the harvest specifications EIS (NMFS 2007a), the Central Gulf of Alaska Rockfish Program EA (NPFMC 2011b), and the EA/RIR/IRFA to Revise GOA Halibut PSC Limits (NPFMC 2012). This analysis provides a brief review of the RFFAs that may affect environmental quality and result in cumulative effects. Future effects include harvest of federally managed fish species and current habitat protection from federal fishery management measures, harvests from state managed fisheries and their associated protection measures, efforts to protect endangered species by other federal agencies, and other non-fishing activities and natural events.

The most recent comprehensive analysis of RFFAs for the groundfish fisheries is in the Harvest Specifications EIS (NMFS 2007a). No additional RFFAs have been identified for this proposed action. The RFFAs are described in the Harvest Specifications EIS Section 3.3 (NMFS 2007a), are applicable for this analysis, and are incorporated by reference. A summary table of these RFFAs is provided below (Table 3-28). The table summarizes the RFFAs identified applicable to this analysis that are likely to have an impact on a resource component within the action area and timeframe. Actions are understood to be human actions (e.g., a proposed rule to designate northern right whale critical habitat in the Pacific Ocean), as distinguished from natural events (e.g., an ecological regime shift). CEQ regulations require a consideration of actions, whether taken by a government or by private persons, which are reasonably foreseeable. This is interpreted as indicating actions that are more than merely possible or speculative. Actions have been considered reasonably foreseeable if some concrete step has been taken toward implementation, such as a Council recommendation or the publication of a proposed rule. Actions simply "under consideration" have not generally been included because they may change substantially or may not be adopted, and so cannot be reasonably described, predicted, or foreseen. Identification of actions

likely to impact a resource component within this action's area and time frame will allow the public and Council to make a reasoned choice among alternatives.

Table 3-28 Reasonably Foreseeable Future Actions.

Ecosystem-sensitive management	• Increasing understanding of the interactions between ecosystem components, and ongoing efforts to bring these understandings to bear in stock assessments, • Increasing protection of ESA-listed and other non-target species components of the ecosystem, • Increasing integration of ecosystems considerations into fisheries decision-making
Fishery rationalization	• Continuing rationalization of federal fisheries off Alaska, • Fewer, more profitable, fishing operations, • Better harvest, PSC, and bycatch control, • Rationalization of groundfish in waters in and off Alaska, • Expansion of community participation in rationalization programs
Traditional management tools	• Authorization of groundfish fisheries in future years, • Increasing enforcement responsibilities, • Technical and program changes that will improve enforcement and management
Other federal, state, and international agencies	• Future exploration and development of offshore mineral resources • Reductions in United States Coast Guard fisheries enforcement activities • Continuing oversight of seabirds and some marine mammal species by the USFWS • Expansion and construction of boat harbors • Expansion of state groundfish fisheries • Other state actions • Ongoing EPA monitoring of seafood processor effluent discharges
Private actions	• Commercial fishing • Increasing levels of economic activity in coastal zone off Alaska • Expansion of aquaculture

Reasonably foreseeable future actions that may affect target and prohibited species are shown in Table 3-28. These actions include but are not limited to the implementation of Amendment 89 Area closures for *Chinoecetes Bairdi* Crab Protection in the Gulf of Alaska Groundfish Fisheries (NPFMC 2010b), and Amendment 95 Revision GOA Halibut PSC Limits. The Council is also in the very early stages of considering an action to institute a catch share system for the Central GOA trawl fisheries, in order to provide necessary tools for PSC management (Section 1.6), but this action is not yet sufficiently advanced to be considered reasonably foreseeable. Ecosystem management, rationalization, and traditional management tools are likely to improve the protection and management of target and prohibited species, including targets of the non-pollock trawl fleet and Chinook salmon, and are not likely to result in significant effects when combined with the direct and indirect effects of Alternative 2. Ongoing research efforts are likely to improve our understanding of the interactions between the harvest of groundfish and salmon. NMFS is conducting or participating in several research projects to improve understanding of the ecosystems, fisheries interactions, and gear modifications to reduce salmon PSC. The State of Alaska manages the commercial salmon fisheries off Alaska. 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. Other government actions and private actions may increase pressure on the sustainability of target and prohibited fish stocks either through extraction or changes in the habitat or may decrease the market through aquaculture competition, but it is not clear that these would result in significant

cumulative effects. Any increase in extraction of target species would likely be offset by federal management. These are further discussed in Sections 4.1.3 and 7.3 of the Harvest Specifications EIS (NMFS 2007a).

Reasonably foreseeable future actions for non-specified and forage species include ecosystem-sensitive management, traditional management tools, and private actions. Impacts of ecosystem-sensitive management and traditional management tools are likely to be beneficial as more attention is brought to the taking of non-specified species in the fisheries and accounting for such takes.

Reasonably foreseeable future actions for marine mammals and seabirds include ecosystem-sensitive management; rationalization; traditional management tools; actions by other federal, state, and international agencies; and private actions, as described in Sections 8.4 and 9.3 of the Harvest Specifications EIS (NMFS 2007a). Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to marine mammals and seabirds by considering these species more in management decisions, and by improving the management of the non-pollock trawl fisheries through the restructured Observer Program, catch accounting, seabird avoidance measures, and vessel monitoring systems (VMS). Research into marine mammal and seabird interactions with the non-pollock trawl fisheries are likely to lead to an improved understanding leading to trawling methods that reduce adverse impacts of the fisheries. 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. Any change in protection measures for marine mammals likely would have insignificant effects because any changes would be unlikely to result in the PBR being exceeded and would not be likely to jeopardize the continued existence or adversely modify or destroy designated critical habitat. Additionally, since future TACs will be set with existing or enhanced protection measures, we expect that the effects of the fishery on the harvest of prey species and disturbance will not increase in future years.

Any action by other entities that may impact marine mammals and seabirds will likely be offset by additional protective measures for the federal fisheries to ensure ESA-listed mammals and seabirds are not likely to experience jeopardy or adverse modification of critical habitat. Direct mortality by subsistence harvest is likely to continue, but these harvests are tracked and considered in the assessment of marine mammals and seabirds. The cumulative effect of these impacts in combination with measures proposed under Alternative 2 is not likely to be significant.

Reasonably foreseeable future actions for habitat and the ecosystem include ecosystem-sensitive management; rationalization; traditional management tools; actions by other federal, state, and international agencies; and private actions, as detailed in Sections 10.3 and 11.3 of the Harvest Specifications EIS (NMFS 2007a). These actions include but are not limited to the implementation of Amendment 89 Area closures for *Chinoecetes Bairdi* Crab Protection in the Gulf of Alaska Groundfish Fisheries (NPFMC 2010b), and Amendment 95 Revise GOA Halibut PSC Limits. Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to ecosystems and habitat by considering ecosystems and habitat more in management decisions and by improving the management of the fisheries through the Observer Program, catch accounting, seabird and marine mammal protection, gear restrictions, and VMS. Continued fishing under the harvest specifications is likely the most important cumulative effect on EFH but the EFH EIS (NMFS 2005b) has determined that this effect is minimal. The Council is also considering improving the management of non-specified species incidental takes in the fisheries to provide more protection to this component of the ecosystem. Any shift of fishing activities from federal waters into state waters would likely result in a reduction in potential impacts to EFH because state regulations prohibit the use of trawl gear in much of state waters. Nearshore impacts of coastal development and the management of the Alaska Water Quality Standards may have an impact on EFH, depending on the nature of the action and the level of protection

the standards may afford. Development in the coastal zone is likely to continue, but Alaska overall is lightly developed compared to coastal areas elsewhere and therefore overall impact to EFH are not likely to be great. Many of the GOA non-pollock trawl fisheries have been independently certified to the Marine Stewardship Council environmental standard for sustainable fishing. Overall, the cumulative effects on habitat and ecosystems under Alternative 2 are not likely to be significant.

There is no new information available that suggests the effects of climate change combined with the effects of this action will have effects beyond those already discussed in the Alaska Groundfish Final Programmatic Supplemental EIS (NMFS 2004), the Harvest Specifications EIS (NMFS 2007a), and the Bering Sea Chinook salmon bycatch EIS (NMFS 2009b). Commercial fishing has not been largely implicated in the GOA ecosystem changes; however, studies of other ecosystems with much larger fishing pressures indicate that fishing, in combination with climate change, can alter ecosystem species composition and productivity (NMFS 2004). 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 groundfish stocks as a result of changing oceanographic conditions. 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). A study linking temperature and salmon bycatch rates in the pollock fishery was conducted in the Bering Sea 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 over the long-term, 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. It is not expected that the effects of this action will have effects beyond those already discussed in the Alaska Groundfish Final Programmatic Supplemental EIS (NMFS 2004), the Harvest Specifications EIS (NMFS 2007a), and the Bering Sea Chinook salmon bycatch EIS (NMFS 2009b).

Considering the direct and indirect impacts of the proposed action when added to the impacts of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of the reasonably foreseeable future actions listed above, the cumulative impacts of the proposed action are determined to be not significant.

4 Regulatory Impact Review

This Regulatory Impact Review (RIR) examines the costs and benefits of a proposed regulatory amendment to implement Chinook salmon prohibited species catch limits in the trawl fisheries of the Central (regulatory areas 620 and 630) and Western GOA (regulatory area 610) Alaska groundfish fisheries. This chapter includes a description of the current Gulf of Alaska groundfish trawl fisheries, an

analysis of the potential effects of the proposed action on the groundfish fisheries operating under Chinook salmon PSC limitations, and identification of the individuals or groups that may be affected by the action. This section addresses the requirements of Presidential Executive Order 12866 (E.O. 12866), which requires a cost and benefit analysis of Federal regulatory actions.

The requirements of E.O. 12866 (58 51735; October 4, 1993) are summarized in the following statement from the order:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternatives regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health, and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

E.O. 12866 further requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant." A "significant regulatory action" is one that is likely to:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

This RIR examines the costs and benefits of proposed alternatives which include the establishment of a Chinook salmon PSC limit in the Central and Western Gulf of Alaska groundfish trawl fisheries and the apportionment of PSC by regulatory area, harvest type (catcher vessel and catcher/processor), or both.

4.1 Statutory Authority

Under the Magnuson-Stevens Act (16 USC 1801, et seq.), the United States has exclusive fishery management authority over all marine fishery resources found within the EEZ. The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the regional fishery management councils. In the Alaska Region, the Council has the responsibility for preparing FMPs and FMP amendments for the marine fisheries that require conservation and management, and for submitting its recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the federal mandates of the Department of Commerce with regard to marine and anadromous fish. Gulf of Alaska groundfish fisheries in the EEZ off Alaska are managed under the FMP for Groundfish of the Gulf of Alaska. The Chinook salmon prohibited species catch management measures under consideration would amend this FMP and federal regulations at 50 CFR 679. Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of federal law and regulations.

4.2 Problem Statement

The Council adopted the following problem statement in February 2012.

Magnuson-Stevens Act National Standards require balancing achieving optimum yield with minimizing bycatch, while minimizing adverse impacts on fishing dependent communities. Chinook salmon prohibited species catch (PSC) taken incidentally in GOA trawl fisheries is a concern, and incidental take is limited in the Biological Opinion for ESA-listed Chinook salmon stocks. The Council recently adopted a PSC limit of 25,000 Chinook salmon for the Western and Central GOA pollock trawl fisheries, while also indicating an intent to evaluate Chinook salmon bycatch in the non-pollock GOA trawl fisheries, which currently do not have a Chinook salmon bycatch control measure.

4.3 Description of the Alternatives

The alternatives that are analyzed in this amendment package were approved by the Council in February 2012; they are listed below and detailed in the sections that follow. These alternatives propose management measures that would apply exclusively to the directed non-pollock trawl fisheries in the Western and Central Gulf of Alaska. A more detailed description of alternatives is included in Sections 2.1, 2.2, and 2.2.1.

Alternative 1: Status quo.
Alternative 2: 5,000, 7,500, 10,000, or 12,500 Chinook salmon PSC limit (hard cap).
Option 1: Apportion limit between Central and Western GOA.
Option 2: Apportion limit by operational type (CV vs. CP).
Applies to both options: Apportion proportional to historic average bycatch of Chinook salmon (5 or 10-year average).
Alternative 3: Full retention of salmon.
Vessels will retain all salmon bycatch until the number of salmon has been determined by the vessel or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed.

4.4 Description of Gulf of Alaska Trawl Fisheries

The groundfish trawl fisheries in the Central and Western regulatory areas of the Gulf of Alaska are comprised of directed fisheries for pollock, Pacific cod, flatfish, and rockfish species. GOA trawl fisheries open on January 20 and close on December 31, unless NMFS intercedes with a closure to prevent the exceeding of annual TAC or established PSC limits for Pacific halibut (or Chinook salmon in the GOA pollock trawl fishery). Regulations prescribe seasons for pollock, Pacific cod and rockfish within the fishing year (50 C.F.R. 679.23). In the absence of management closures, directed pollock fishing is permitted in A- and B-seasons from January 20 to May 31 and in C and D seasons from August 25 to November 1. Likewise, directed Pacific cod fishing is permitted in the A season from January 20 to June 10 and the B season from September 1 to November 1. In the Central GOA, directed rockfish fishing is permitted from May 1 to December 31. In the Western GOA, directed rockfish fishing is permitted beginning on July 1. Directed flatfish fishing is permitted in either regulatory area from January 20 to December 31.

While these regulatory fishing seasons define beginning- and end-points for GOA trawl activity, the pattern of fishing behavior in a given year is complex and largely driven by participants' ability to be active in multiple fisheries. Beyond regulatory-established season dates, the factors that influence intra-annual behavior include relative value of various target species, interacting directed fishing closures due to species TAC limits or PSC limits, and seasonal fish stock abundance. Section 4.4.2 outlines the extent to which registered license holders participate in multiple GOA fisheries, and Section 4.4.8 details recent historical fishing patterns in GOA non-pollock trawl fisheries. Though this analysis focuses on GOA non-pollock trawl fisheries, it is important to note that many participants also trawl for GOA pollock (see

Section 4.4.3 for a breakdown of unique GOA groundfish vessels that landed pollock and non-pollock). Historical Chinook salmon PSC for trips targeting pollock are not directly considered in the analysis of proposed non-pollock Chinook salmon PSC apportionment, but understanding fishermen's total GOA groundfish participation is nonetheless critical to discussing potential regulatory impacts.

A variety of factors influence the potential return that may be realized from fisheries and PSC usage. Local processing markets vary across species. The timing of fish aggregations (particularly in the Pacific cod fishery) may affect choices of when to prosecute those fisheries, as increased aggregation often results in cost savings from increased catch per unit of effort and decreased PSC. Roe conditions also influence the timing of fishing activity (especially in the pollock fishery). Understanding both these choices and their interaction with management is critical when considering the potential effects of implementing Chinook salmon PSC limits in the GOA non-pollock trawl fisheries. Historical time trends in the prosecution of GOA target fisheries reflect these choices in aggregate, and provide a guideline in developing this analysis.

Several existing management actions interact in the GOA and are relevant to the present Council action under review. GOA trawl fisheries are currently subject to PSC limits on Pacific halibut (GOA Groundfish FMP Amendment 18, modified by Amendment 95) and Chinook salmon in the pollock fishery (Amendment 93). The Chinook salmon PSC limit in the pollock fishery only went into effect during the C-season of the 2012 fishing year, so its effect is not yet reflected in the historical catch records reported in this analysis. Halibut PSC limits are apportioned by gear sector, while Chinook salmon PSC in the pollock trawl fishery is apportioned by regulatory area. Moreover, a portion of the GOA trawl fleet participates in cooperative programs such as the Central GOA Rockfish Program, the Bering Sea pollock cooperative program (or American Fisheries Act), the Bering Sea and Aleutian Islands crab program, and the Amendment 80 (Bering Sea and Aleutian Islands non-pollock trawl catcher/processor) fisheries. Direct apportionment of PSC to cooperatives, such as the halibut PSC that was allocated to the Rockfish Program in Amendment 95, can reduce the negative effect of non-apportioned PSC on a cooperative's ability to mitigate a race to fish (and the associated harms and inefficiencies). Further discussion of cooperative management structures under a PSC hard cap is included in Section 4.7.3.

4.4.1 Data Caveats

Because the Council has asked for consideration of both 5- and 10-year PSC histories as the basis for potential PSC apportionment, this analysis utilizes some data that pre-dates the full implementation of NOAA's current Catch Accounting System (CAS). CAS, fully implemented during the 2003 fishing year, utilizes logbook data, while data from prior time periods come from a blend of fish ticket records and weekly production reports made by processors. The shift to CAS did not directly alter PSC estimation methods. Throughout the document, the analysts use CAS data from 2003 to 2011 in order to maintain data source consistency and because the pre-2003 blend data is less reliable in distinguishing between catch that occurred in federal waters and catch that occurred inside the three-mile management boundary.

The analysts will often refer to target species or target fisheries as a frame for describing the last decade of GOA non-pollock trawl fishing, and for characterizing the potential impacts of establishing Chinook salmon PSC limits.[8] A fishing trip may still be designated as having targeted a species for which directed fishing was closed, if the majority of a trip's landings were comprised of a closed species retained under

[8] Target species is the designation used by NOAA's CAS when reporting on fishing and related activity. When catch from a fishing trip is reported, the trip target is designated *ex post facto* according to an algorithm that relies on quantities of the various species harvested. The recorded trip target is often, but not always, the species that the skipper was directing on during fishing activity. It is important to note that target species is a classification for catch reporting, but it is not the management lever used by NMFS. The Agency may close directed fishing for a given species, pursuant to TAC usage or PSC allowances.

MRAs. Secondary species, for which directed fisheries do not exist, may also be recorded as a trip target. Trip target records represent the best available harvest data.

NOAA's CAS reports the timing of harvest records by week-ending date (WED). WED is the calendar date (month and day) on the end of the week during which catch was recorded. The reported WED for CVs is generally determined based on when catch is delivered to shoreside facilities. A fishing trip may span parts of multiple weeks; in some cases, the recorded WED may correspond to the week after fish were actually brought on board. CPs may account for harvest and record a WED while still at sea during an extended trip; as such, WED may be a slightly more precise measure of when catch occurred for CP vessels. This analysis often notes the timing of harvest and Chinook PSC throughout the year by WED. These data are as accurate as possible, but should be considered accurate to one-to-two weeks from the time that actual catch was made. When comparing WED across years, the analysts report the "AGENCY_WEEK," numbered 1 through 53. The agency week is not linked to a particular set of calendar days. Using agency weeks assists in making comparisons across years, but important regulatory opening and closure dates (such as the January 20 GOA groundfish opening, or the September 1 Pacific cod B-season opening) may occur during a slightly different agency weeks over a set of years.

4.4.2 Participation

The data used to describe fishery participation come from diversification tables provided by AKFIN. These data represent actual landings of each species group. whereas the data used to describe groundfish harvest and Chinook salmon PSC history are categorized by trip target species. For this reason, the revenue figures reported in Table 4-2 and Table 4-7 are *not* used for direct comparison to harvest (as dollars per metric ton) and PSC (as revenues generated per Chinook salmon PSC). Rather, revenue data in the following subsections reflect the GOA trawl fleets' level of dependency on various target species and GOA groundfish in general. Also note that these tables aggregate several flatfish species that are reported separately in trip target data. Here, "flatfish" includes shallow water flatfish, deep water flatfish, arrowtooth flounder, rex sole, and flathead sole.

Table 4-2 and Table 4-7 also describe the amount of latent effort in the GOA trawl fisheries. Many CV and CP vessels hold Central and Western GOA trawl licenses, but have not been active during the analyzed time period. The difference between the number of licensed vessels and active vessels reflects the potential amount of increased participation in a particular fishery. Moreover, fishers with licenses to trawl in both the Central and Western GOA may have an opportunity to move between areas and fish where Chinook PSC is available. If PSC is apportioned by regulatory area, fishers licensed in both the Central and Western GOA could relocate and continue fishing once the PSC limit has been attained in one area. As a result, dual licensed fishers may feel less incentive to avoid PSC in an area that is nearing its limit.

4.4.2.1 Annual patterns of trawl fleet activity

Individual GOA non-pollock trawl participants may not prosecute every available directed fishery throughout the entire calendar year. Those participants that focus on early season fisheries, such as A-season Pacific cod, or mid-season fisheries, such as rockfish, could experience a lesser incentive to reduce Chinook salmon PSC if the expected consequence is a late-year closure. Conversely, participants that derive a significant share of their revenue from late-season fisheries, such as flatfish, could be disproportionately disadvantaged by other participants' lack of incentive to avoid PSC.

Table 4-1 provides an active vessel count for each potential pattern of annual fishery participation. The calendar year is divided into four three-month quarters (January-March, April-June, July-September, October-December). A vessel that participates throughout the calendar year, recording his or her first

landing during a week ending in Quarter 1 and his or her final landing in a Quarter 4 week, would be counted in the top-right cell (1,4). A vessel that participates only in the first calendar quarter would be counted in the top-left cell (1,1). Calendar quarters are a rough measure of participation, but they capture the major time-distribution patterns of fishing behavior as dictated by participation in the principal non-pollock groundfish target fisheries. For example, vessels that do not begin fishing in Quarter 1 are likely not targeting Pacific cod; vessels that begin fishing in Quarter 2 or 3 are likely focused on rockfish; vessels that do not participate in Quarter 4 are not "topping off" on late-year flatfish trips. The number of vessels whose participation ends in Quarters 3 and 4 may provide a rough measure of the active participants who are most susceptible to Gulf-, area-, or sector-wide PSC closures that affect the targeting any non-pollock groundfish species.

Table 4-1 indicates that a significant proportion of the CP fleet completes their GOA participation during Quarter 3 (July-September). Moreover, many of these vessels do not participate in early season fisheries. Only a small portion of the CP fleet fished into Quarter 4, though this could have been an artifact of TAC or Pacific halibut PSC closures during the analyzed period.

By contrast the CV fleet consists of many vessels (~30% to 50%) that fish solely during Quarter 1. These fishers are likely targeting A-season Pacific cod. Excepting 2004 and 2005, a similar proportion of the CV fleet fished throughout all four quarters of the calendar year (2004 and 2005 records show this same proportion of the fleet fishing from Quarter 1 to 3, likely reflecting the effect of a regulatory closure to a key target fishery occurring prior to October). In summary, Table 4-1 indicates that premature Chinook salmon PSC closures would more greatly impact the typical time-distribution of fishing trips for the CV sector.

Table 4-1 Vessel entry and exit of GOA non-pollock trawl fisheries by calendar quarter (2004 to 2011)

Year: 2004

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	1		4		5
2			3		3
3			8		8
4					0
Total	1	0	15	0	16

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	16	3	39		58
2					0
3			6		6
4					0
Total	16	3	45	0	64

Year: 2005

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	1		6		7
2					0
3			9		9
4					0
Total	1	0	15	0	16

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	29	3	30	1	63
2		1			1
3			4		4
4					0
Total	29	4	34	1	68

Year: 2006

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1			1	2	3
2				2	2
3			10		10
4					0
Total	0	0	11	4	15

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	28	4	5	20	57
2				1	1
3			3		3
4					0
Total	28	4	8	21	61

Year: 2007

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1			4	2	6
2			3		3
3			6		6
4					0
Total	0	0	13	2	15

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	31	1	4	19	55
2		1	1	6	8
3					0
4					0
Total	31	2	5	25	63

Year: 2008

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	1		1	2	4
2			1	2	3
3			7		7
4					0
Total	1	0	9	4	14

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	29	3	1	22	55
2			2	4	6
3			1	3	4
4					0
Total	29	3	4	29	65

Year: 2009

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1				2	2
2			2	1	3
3			13		13
4					0
Total	0	0	15	3	18

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	27	2	2	25	56
2				1	1
3				2	2
4					0
Total	27	2	2	28	59

Year: 2010

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1			2	2	4
2			1	1	2
3			11		11
4					0
Total	0	0	14	3	17

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	19	1	6	25	51
2			1		1
3					0
4					0
Total	19	1	7	25	52

Year: 2011

Catcher/Processors

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	1		1	1	3
2		1	2	2	5
3			9		9
4					0
Total	1	1	12	3	17

Catcher Vessels

Beginning Quarter \ Ending Quarter	1	2	3	4	Total
1	16	1		29	46
2				1	1
3				3	3
4				3	3
Total	16	1	0	36	53

*(See footnote 9 for further guidance on interpreting Table 4-1). Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

[9] For Table 4-1, cells in the top row of each matrix indicate the number of vessels that reported their first catch of the year in the 1st Quarter (January to March) – and so on. Cells in the first column indicate the number of vessels that recorded their final landing of

4.4.2.2 Catcher Vessel Fleet

The active GOA catcher vessel (CV) trawl fleet included 100 unique vessels during the 2003 to 2011 period. The most CVs landing GOA groundfish in any given year was 71 (2003), and the fewest was 52 (2010). Table 4-2 summarizes the number of CVs that recorded groundfish landings of a given species or species complex, as well as the aggregate revenue generated. CV revenue represents the ex-vessel price received by harvesters when catch is delivered to shoreside processors or tender vessels.[10]

The table also reports the number of GOA CVs that landed groundfish from the Bering Sea/Aleutian Islands management area. 57 of the 100 GOA CVs landed groundfish from the BSAI management area in at least one year. On average, GOA CVs that landed BSAI groundfish did so in between four and five of the nine years, with a median value of three years landing BSAI groundfish. Participants in the GOA CV trawl fleet harvested BSAI groundfish in all years, though yearly revenues from these landings were never greater than those generated by fishing in the Gulf region. On aggregate, CVs that participated in both the GOA and BSAI groundfish fisheries generated 32% of their total 2003-to-2011 revenue in the BSAI. Counting only the records from years that each vessel actually landed BSAI groundfish, the 57 vessels generated 44% of their aggregate revenue in the BSAI when active in that region. Looking only at 2010 and 2011 – the years since recency measures went into effect – BSAI groundfish accounted for 28% of the 57 vessels' aggregate revenue, or 40% of their aggregate revenue in the years that they fished the region.

Table 4-2 Catcher Vessels landing GOA Groundfish, 2003 to 2011

	CV Vessels														Revenue (MM$)		
			Western GOA					Central GOA					Dual Licensed Vessels (CG&WG)	BSAI			
YEAR	Total Licensed Vessels	Active Vessels	WG Licensed Vessels	Active Vessels				CG Licensed Vessels	Active Vessels					All Groundfish	GOA Groundfish Revenue	BSAI Groundfish Revenue	Total Groundfish Revenue
				Flatfish	Pacific Cod	Rockfish	Pollock		Flatfish	Pacific Cod	Rockfish	Pollock					
2003	221	71	162	21	24	11	19	179	54	51	47	53	120	37	26.1	22.8	48.9
2004	221	63	162	21	21	10	20	179	52	52	46	52	120	33	27.7	16.8	44.6
2005	220	67	178	28	30	25	28	161	45	45	45	45	119	29	38.2	16.3	54.5
2006	218	61	160	28	28	26	28	176	41	41	41	41	118	19	41.0	11.6	52.6
2007	218	63	160	31	31	27	30	176	37	37	37	37	118	28	41.4	19.4	60.8
2008	217	65	160	22	24	15	23	176	42	42	39	42	118	26	56.2	22.2	78.3
2009	211	59	154	24	25	15	25	171	34	34	33	34	114	22	31.7	10.3	42.1
2010	124	52	78	16	16	12	16	97	40	40	37	40	51	23	41.2	12.5	53.7
2011	124	53	78	12	14	11	13	97	46	47	41	46	51	28	48.1	17.5	65.6

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT and AFSC Gross Earnings data compiled by AKFIN; RAM LLP file.

From 2003 to 2009, more than half of the Central and Western GOA CV trawl fleet held licenses for both regulatory areas; this proportion has been lower since 2010. Of the 100 groundfish CVs active during the total period, 29 participated exclusively in the Western GOA and 49 participated exclusively in the Central GOA.

Latent effort in the CV fleet ranged from 150 to 158 inactive license holders between 2003 and 2009. This number fell to 72 and 71 inactive licenses in 2010 and 2011, respectively, with implementation of the GOA trawl recency action in 2010 (GOA FMP Amendment 82). A greater number of licenses were held in the Central GOA, but the proportion of inactive licenses was typically greater in the Western GOA. Table 4-2 does not report on the 2012 fishing year, but it is worth noting that the total number of license holders remained the same as in 2011.

the year during the 1st Quarter. As an example, the number in the Row 2, Column 4 indicates the number of vessels that made their first landing in the 2nd Quarter (April to June) and their final landing in the 4th Quarter (October to December).

[10] The data in Table 4-2 reflect actual landings by species, as opposed to landings by designated trip target.

Vessel length in the CV fleet directly affects the level of observer coverage and, by extension, the degree to which PSC are based on extrapolation and estimation. Under the current North Pacific Groundfish Observer Program, vessels under 60' in length are exempt from observer coverage. A vessel greater than or equal to 60' but less than 125' must carry an observer during at least 30% of its fishing days in a calendar quarter, and the vessel owners and operators in this coverage category choose when to carry observers. Vessels greater than or equal to 125' are required to carry an observer on 100% of fishing days. The proposed rule to restructure the Observer Program places all CVs into the partial coverage category – removing the exemption for vessels under 60' – except when participating in fisheries requiring full observer coverage. The only such full coverage fishery involving GOA groundfish CVs is the Central GOA Rockfish Program fishery.

CVs that landed GOA groundfish during the 2003 to 2011 period ranged in length from 58' to 144'. The average vessel length in the fleet was 80', and the median was 81'. The most common vessel length was also the shortest, with 36 vessels of 58'. These 36 vessels comprised the entire portion of the fleet that was less than 60' in length. Only two GOA CVs measured more than 125' in length, and each of these vessels was active in only one year (2008).

4.4.2.3 Communities listed on LLP Licenses of catcher vessels

Tracking participation by the mailing address listed on a vessel owner's LLP (License Limitation Program) license can provide information about which communities are economically dependent on GOA groundfish fisheries. LLP license addresses do not necessarily reflect a vessel's homeport. It is likely that a significant portion of net revenue generated from fishing will enter the license holder's home community.

Table 4-3 provides a snapshot of participation and groundfish-related revenue for the 2011 fishing year. Here, groundfish includes rockfish, flatfish, Pacific cod and pollock. On aggregate, the 53 trawl CVs active in 2011 derived 68% of their total groundfish revenue from GOA fisheries. These figures, presented in millions of dollars, include pollock revenues. Pollock revenue accounted for 54% of Central GOA groundfish revenue (52% for Alaska LLPs, 54% for Washington LLPs, and 52% for Oregon LLPs), and 72% of Western GOA revenue (79% for Alaska LLPs, and 68% for Washington LLPs). Groundfish trawl license holders with Alaska and Oregon addresses derived around three-quarters of their groundfish revenue from GOA fisheries, while Washington-based license holders generated almost half of their 2011 revenue from the BSAI region.

Table 4-3 2011 vessel count and groundfish revenue for active GOA catcher vessels, by owner's LLP mailing address

LLP Address		# Catcher Vessels	Groundfish Revenue (MM$)			% Revenue from GOA
State	Locality		Central GOA	Western GOA	BSAI	
Alaska	Kodiak	13	11.22	0.00	4.04	74%
	Other	7	1.65	1.64	0.80	80%
Alaska Total		20	12.87	1.64	4.84	75%
Washington Total		18	6.58	2.96	8.45	53%
Oregon Total		15	14.00	0.00	4.23	77%
Grand Total		53	33.45	4.60	17.52	68%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT and AFSC Gross Earnings data compiled by AKFIN; RAM LLP file.

Table 4-4 provides the full list of communities that were listed on at least one 2011 CV LLP license. Three of the Alaska communities (together representing five active vessels), five of the Washington communities (together representing five active vessels), and two of the Oregon communities (together representing three active vessels) derived 100% of groundfish-related revenue from GOA fisheries.

Table 4-4 Communities listed as owner mailing address on 2011 GOA groundfish trawl LLP catcher vessel licenses

Alaska	Washington	Oregon
Girdwood	Bellingham	Brookings
Homer	Camas	Charleston
King Cove	East Wenatchee	Clackamas
Kodiak	Gig Harbor	Florence
Petersburg	Issaquah	Newport
	Mercer Island	Port Orford
	Renton	Siletz
	Seattle	Sisters
	South Bend	South Beach

Source: RAM LLP file

Tracking participation by vessel home port, rather than owner residence, may give a better indication of where the money spent to operate a vessel enters local economies. Table 4-5 indicates that 11 vessels whose owners live outside of Alaska are homeported in the state. This 2011 snapshot also shows that vessels homeported in Alaska derive a greater proportion of their groundfish revenue from the GOA groundfish fisheries. As above, the groundfish revenues in Table 4-5 include rockfish, flatfish, Pacific cod and pollock. Table 4-6 lists the communities where the CVs active in 2011 homeported.

Table 4-5 2011 vessel count and groundfish revenue for active GOA catcher vessels, by home port

Home Port		# Catcher Vessels	Groundfish Revenue (MM$)			% Revenue from GOA
State	Locality		Central GOA	Western GOA	BSAI	
Alaska	Kodiak	19	16.60	0.36	4.12	80%
	Other	12	1.57	3.07	3.84	55%
Alaska Total		31	18.17	3.43	7.96	73%
Washington Total		9	4.26	1.62	7.13	45%
Oregon Total		13	12.57	0.00	6.32	67%
Grand Total		53	34.99	5.05	21.40	65%

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT and AFSC Gross Earnings data compiled by AKFIN.

Table 4-6 Home port communities for catcher vessels active in the 2011 GOA groundfish trawl fishery

Alaska	Washington	Oregon
Anchorage	Blaine	Brookings
Girdwood	Seattle	Charleston
Juneau		Newport
King Cove		Portland
Kodiak		
Petersburg		
Sand Point		
Unalaska		

Source: ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT.

The Alaska Fisheries Science Center has compiled extensive community profiles for 195 fishing dependent communities in the state. Full community profiles are available at: http://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/CPU.php. It may also be useful to reference these profiles for the communities identified as home to key processing ports in Table 4-10 and Table 4-12.

4.4.2.4 Catcher/Processor Fleet

The active GOA catcher/processor (CP) trawl fleet included 22 unique vessels during the 2003 to 2011 period. The most CP vessels landing GOA groundfish in any given year was 21 (2003), and the fewest was 14 (2008). Table 4-7 summarizes the number of CP vessels that recorded groundfish landings of a given species or species complex, as well as the aggregate revenue generated. CP revenue is based upon first wholesale prices. As in the CV section, the summary table includes entries for pollock. While there is no directed pollock fishery for CPs in the GOA, the vessels can still harvest pollock up to the MRA limit. The table also reports the number of GOA CP vessels that landed groundfish in the BSAI management area. On aggregate, it is evident that active GOA CP vessels derive the greater part of their gross revenue from fishing outside of the Gulf. Only two CP vessels logged years in which they generated no revenue from BSAI groundfish. One vessel was inactive in the BSAI in eight of nine years, and the other was inactive in the BSAI in one year.

Table 4-7 Catcher/Processor vessels landing GOA groundfish, 2003 to 2011

	CP Vessels														Revenue (MM$)		
			Western GOA					Central GOA									
YEAR	Total Licensed Vessels	Active Vessels	WG Licensed Vessels	Active Vessels				CG Licensed Vessels	Active Vessels				Dual Licensed Vessels (CG&WG)	BSAI All Groundfish	GOA Groundfish Revenue	BSAI Groundfish Revenue	Total Groundfish Revenue
				Flatfish	Pacific Cod	Rockfish	Pollock		Flatfish	Pacific Cod	Rockfish	Pollock					
2003	38	21	31	15	9	14	15	29	15	12	13	10	19	20	41.5	124.2	165.7
2004	38	16	29	14	14	13	11	28	9	10	11	7	19	16	21.3	121.7	142.9
2005	38	16	29	12	13	11	10	28	9	11	12	9	19	15	36.1	148.8	184.9
2006	38	15	27	11	11	10	9	28	12	11	8	8	17	14	40.0	119.6	159.6
2007	37	15	26	13	13	11	12	27	9	9	8	8	16	14	44.9	131.2	176.1
2008	37	14	26	11	11	11	10	27	9	9	10	9	16	12	68.5	148.3	216.8
2009	37	18	26	14	14	14	13	27	12	11	11	11	16	17	38.1	196.5	234.6
2010	28	17	20	13	13	13	13	21	9	9	10	10	13	16	22.8	241.8	264.6
2011	28	17	20	14	14	14	14	21	9	9	9	9	13	16	79.9	284.1	364.1

Source: NMFS Alaska Region At-Sea Production Reports, data compiled by AKFIN in Comprehensive_WPR; RAM LLP file.

Roughly half of the Central and Western GOA CP trawl fleet held licenses for both regulatory areas. Of the 22 active groundfish CP vessels, four participated only in Western GOA fisheries, while three participated only in Central GOA fisheries (with one additional vessel that recorded Western GOA groundfish landings for one species in one year). Participation in the BSAI groundfish fishery was consistent across vessels. On average, GOA CP vessels landed BSAI groundfish in at least six of the nine years analyzed, with a median value of 7.5 years landing BSAI groundfish. Each of the vessels in this operational type sector landed BSAI groundfish in at least one year, and only four recorded BSAI landings in fewer than four years.

Latent effort in the CP fleet ranged from 17 to 23 inactive licenses from 2003 to 2009. Inactive permits fell to 11 in 2010 and 2011, following the GOA trawl recency action. The total number of licenses held was roughly similar in the two regulatory areas, though on the whole more vessels participated in Western GOA fisheries. License holdings in 2012 have remained at the same level as 2011.

Active CP vessels range in length from 99' to 295'. The median vessel length is 175.5'. Seven active CPs are less than 125', and thus do not currently fall in the 100% observer coverage category by length; however, each of those vessels are members of Amendment 80 or Central GOA Rockfish Program cooperatives, and thus are required to have 100% observer coverage in the GOA. The proposed rule for the restructured Observer Program would increase observer coverage requirements for all CP vessels to 100% of fishing days.

Table 4-8 provides a snapshot of 2011 CP participation and revenue in Alaskan groundfish fisheries. Here, groundfish includes rockfish, flatfish, Pacific cod and pollock. CP vessels derived the vast majority of their revenue outside of the GOA, particularly those vessels that were homeported in Alaska. Confidentiality limitations prevent reporting Alaska vessels by their home port community. 2011 active

vessels that homeported in Alaska did so in Kodiak and Dutch Harbor. The vessels that homeported in Kodiak did not participate in the Central GOA groundfish trawl fisheries.

Table 4-8 2011 vessel count and groundfish revenue for active GOA catcher/processors, by home port

Home Port State	# Catcher/Processors	Groundfish Revenue (MM$)			% Revenue from GOA
		Central GOA	Western GOA	BSAI	
Alaska	5	0.45	3.33	67.57	5%
Other	12	26.35	6.17	221.95	13%
Grand Total	17	26.80	9.50	289.53	11%

Source: NMFS Alaska Region At-Sea Production Reports, data compiled by AKFIN in Comprehensive_WPR

4.4.3 Processor Participation

Since 2003, GOA catcher vessels have delivered non-pollock groundfish to 10 Alaska communities. CV deliveries reached Alaskan processing interests in Akutan, Dutch Harbor, Homer, Kenai, King Cove, Kodiak, Ninilchik, Sand Point, Seward and Unalaska. Harvest has not been delivered to Homer or Kenai since 2003, and Ninilchik received deliveries in only one year (2006) since 2003. Processors in Seward only received non-pollock harvest in 2004 and 2011. The catcher/processor interests that harvest GOA non-pollock species are registered in four Washington cities, Dutch Harbor, Alaska, and Rockland, Maine. Washington interests are based in Bellingham, Renton, Seattle and South Bend.

Table 4-9 Location or Intent to Operate (ITO) registration for processors taking non-pollock groundfish deliveries, 2007 to 2011

		Shorebased Processor	Floating Processor	Catcher/ Processor
AK	Akutan	1		
	Dutch Harbor	2	1	6
	King Cove	1	1	
	Kodiak	14		
	Sand Point	1		
	Seward	3		
	Unalaska	1		
WA	Bellingham			2
	Renton			4
	Seattle		6	22
	South Bend			1
Other				2

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

The data used in this section to describe processor participation by port location are presented as cumulative totals from 2007 to 2011. Summed harvest weight or catch value illustrate each location's relative share of GOA non-pollock activity. Because wholesale revenue is the most appropriate measure for considering processor outcomes, catch value is presented as first wholesale gross revenue for both CPs and CVs. The 2007 to 2011 period was chosen for analysis in order to avoid summing together years before and after Rockfish Pilot Program implementation, which is likely to have altered temporal and spatial aspects of landings for a set of important GOA non-pollock groundfish species.

During the 2007 to 2011 period, 62% (212,006 mt) of all GOA non-pollock groundfish was processed in Kodiak. These landings generated $248.2 million dollars, or 59% of all GOA non-pollock groundfish trawl gross first wholesale revenue. Over the same period, slightly more than 30% of harvest was taken

by Washington-based CPs, accounting approximately 30% of total GOA non-pollock gross wholesale revenue. Sand Point and King Cove shoreplants and Dutch Harbor based catcher processors shared roughly equally in the majority of the remaining GOA harvest and revenue.

Port cities, regardless of size, tend to either receive landings from CVs or serve as home ports for CPs. Since 2007, only Dutch Harbor, AK received landings from CVs and served as a homeport for non-pollock CP vessels. Harvest processed by CPs comprised the overwhelming majority of groundfish passing through Dutch Harbor (97.6%). Table 4-10 and Table 4-11 break down recent harvest and gross revenue by operational type. It is important to note that Kodiak, AK, the highest volume port city, relies on deliveries from the CV fleet.

Table 4-10 GOA non-pollock sector CV harvest and revenue by processing port, 2007 to 2011

CITY	Harvest (mt)	% GOA share	Wholesale Gross Revenue ($1,000)	% GOA share
Kodiak	212,006	93%	248,210	90%
Other AK*	14,767	7%	26,440	10%
GOA TOTAL	**226,773**		**274,651**	

* Other AK includes Akutan, Dutch Harbor, King Cove, Sand Point, Seward and Unalaska

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Table 4-11 GOA non-pollock sector CP harvest and revenue by home port, 2007 to 2011

CITY	Harvest (mt)	% GOA share	Wholesale Gross Revenue ($1,000)	% GOA share
Dutch Harbor	7,248	6%	9,642	7%
Washington & other [#]	108,267	94%	136,840	93%
GOA TOTAL	**115,514**		**146,482**	

[#] "Washington includes Bellingham, Renton, Seattle and South Bend; "other" refers to CP vessels owned by interests outside of the North Pacific region

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Table 4-12 describes the regulatory area that was the source of harvest for processing localities, from 2007 to 2011. Harvest area, as reflected in the data supporting this table, is determined for each fishing trip and recorded in NOAA's CAS. Most Alaska port cities do generate a portion of wholesale revenue from harvest taken outside of the geographic regulatory area in which they are located. Akutan, for example, is located on the Aleutian Chain but receives 5.7% of its Gulf harvest weight (generating 8.6% of its Gulf wholesale gross revenue) from Central GOA trips. By contrast, Seward and Unalaska, which were also CV-only ports during this period, received only harvest taken in their respective regulatory areas. In Dutch Harbor, the entirety of the revenue-generating harvest weight received from outside of its regulatory area (from the Central GOA) comes from CP harvest registered to Dutch Harbor interests. Washington interests generate a significant proportion of their revenue from both the Central and Western GOA.

Table 4-12 Source of harvest (by regulatory area) for port cities receiving GOA non-pollock groundfish, 2007 to 2011

CITY	Harvest Area	Harvest (mt)	% Port City Total	Wholesale Gross Revenue ($1,000)	% Port City Total
Kodiak	CG	209,319	100.0%	244,804	100.0%
	WG	90	<0.1%	120	<0.1%
Other AK	CG	3,153	14.3%	4,685	13.0%
	WG	18,862	85.7%	31,398	87.0%
Washington & other [#]	CG	72,423	65.3%	92,670	66.1%
	WG	38,441	34.7%	47,457	33.9%
GOA TOTAL		**342,288**		**421,133**	

[#] "Washington includes Bellingham, Renton, Seattle and South Bend; "other" refers to CP vessels owned by interests outside of the North Pacific region
Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

The highest volume localities – Kodiak, AK and Washington – receive landings throughout the year. However, other important processing locations receive the bulk of their wholesale revenue generating inputs during a particular season. From 2007 to 2011, Dutch Harbor did not receive any landings after August, while King Cove and Sand Point had received nearly all of their respective GOA non-pollock groundfish landings by the end of March (Table 4-13). Processors in these locations do, however, take deliveries from non-groundfish fisheries in the GOA as well as Bering Sea fisheries.

Though the alternatives considered in this Council action do not propose Chinook salmon PSC apportionment by target species, it is worth noting that four of the nine processing localities relied entirely on Pacific cod harvest in order to generate revenue and maintain operations (Akutan, King Cove, Sand Point, and Unalaska). Processing operations in these cities are tied closely to A-season Pacific cod harvest. Dutch Harbor receives a diverse harvest including nine different target species (or species complexes); nevertheless, rockfish harvest during June and July accounted for a full 67% of the total harvest that Dutch Harbor received from 2007 to 2011 (59% in July alone).

Table 4-13 Monthly GOA non-pollock groundfish harvest received (mt), by port city, 2007 to 2011

CITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Akutan		*	*									
Dutch Harbor	*	*	*	*	*	*	4,418	*				
King Cove	*	*	*									
Kodiak	17,735	21,846	5,916	34,971	23,222	15,335	13,333	17,195	28,187	24,536	6,003	1,129
Sand Point	*	*	*							*		
Seward	*						*			*		
Unalaska		*										
Washington	2,404	2,122	3,145	16,068	2,345	2,229	55,218	9,585	5,309	8,618	2,119	345
Other					*		*	*				

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

4.4.4 Community Profiles

Any effects of this action will be most apparent in three communities: Kodiak, Sand Point, and King Cove. This section briefly profiles some of the most relevant characteristics of each of these communities. These profiles are generally summarized from previously published profiles that are available in their entirety at:
http://www.alaskafisheries.noaa.gov/npfmc/current_issues/crab/CommunityProfiles/AK%20Community%20Profiles%20Vol%201.pdf and

http://www.alaskafisheries.noaa.gov/npfmc/current_issues/crab/CommunityProfiles/AK%20Community%20Profiles%20Vol%202.pdf.

Kodiak is a first class city in the Kodiak Island Borough. Although Kodiak has a diversified economy, its identity is that of a fishing community. Its vessels and processing plants are diversified, participating in a variety of GOA and Bering Sea fisheries. Kodiak is the dominant port for vessels and landings from the Central Gulf trawl fisheries. The community is homeport for a substantial minority of the vessels in the fishery and a very large majority of the fishery's processing activity. From 2003 to 2011, between 30% and 40% of the CVs active in GOA groundfish fisheries homeported in Kodiak. The other CVs spend a substantial amount of time in in the community during the pollock fishery and other Central Gulf groundfish trawl fisheries. Approximately 6 or 7 Kodiak processors compete for and process the large majority of the landings from the Central Gulf trawl fisheries. These characteristics effectively mean that the Central Gulf trawl fisheries are Kodiak based. Kodiak is also home to the largest and most diverse fishery support sector in Alaska. These businesses serve all of the fleets homeported in Kodiak and that deliver to Kodiak processors.

Processors are among the largest employers in Kodiak and are known to support a year-round resident workforce. This workforce is supplemented in peak seasons with labor from outside the community. Although non-pollock groundfish are of secondary importance in value to species such as salmon and halibut and have less volume than pollock, they are important contributors to both the overall value and volume of processing and to filling gaps in processing in the community. Similarly, the trawl fleet has relatively few vessels when compared to the larger Kodiak fleets that participate in the halibut, salmon, and fixed gear cod fisheries. The non-pollock groundfish fisheries, however, are an important component of the annual operations of both the trawl fleet and processors.

King Cove is one of two bases of the Western Gulf non-pollock groundfish trawl fisheries. King Cove is a first class city within the organized Aleutians East Borough. The city has a single processor (Peter Pan Seafoods). Although the community initially engaged primarily in local commercial salmon fisheries, over time activities have diversified into GOA and Bering Sea groundfish fisheries and Bering Sea crab fisheries. The community has a long history of maintaining a local fleet that delivers to the local plant, with between 5 and 10 vessels participating in the Western Gulf Pacific cod fishery delivering to the plant each year from 2003 through 2011. During the 2003 to 2011 period, between 1 and 5 vessels that participate in the Western GOA non-pollock fisheries reported themselves as homeported in King Cove.[11] The vessels that make deliveries into the community bring additional tax revenues and economic activity to King Cove, and also spend substantial time in the community and employ local residents.

The King Cove processor is known as a diversified plant that supports operations in all available fisheries. As a consequence of its diversity, the plant's dependence on the different species varies with performance of the fisheries in general. Although specific data cannot be released for the plant, Western Gulf Pacific cod is one of the many fisheries from which the plant draws landings. In the Western Gulf Pacific cod fishery, the King Cove plant relies on tenders for deliveries from distant grounds. The use of tenders allows participants to make more deliveries and save on fuel costs that would be associated with steaming to and from fishing grounds. Employment at the plant is primarily transient workers who come to King Cove to work at the plant. A few of these workers have relocated their families to the community, but the large majority of plant employees are not King Cove residents.

The community has a variety of fisheries support services, some of which are connected with the processing plant to some degree. Almost all of the private businesses in the community are largely

[11] Anecdotal reports are that two vessels homeported in King Cove deliver to the King Cove plant, as well as several vessels homeported in Sand Point.

dependent on fisheries. Consequently, any changes in fisheries performance may be anticipated to be distributed throughout the community.

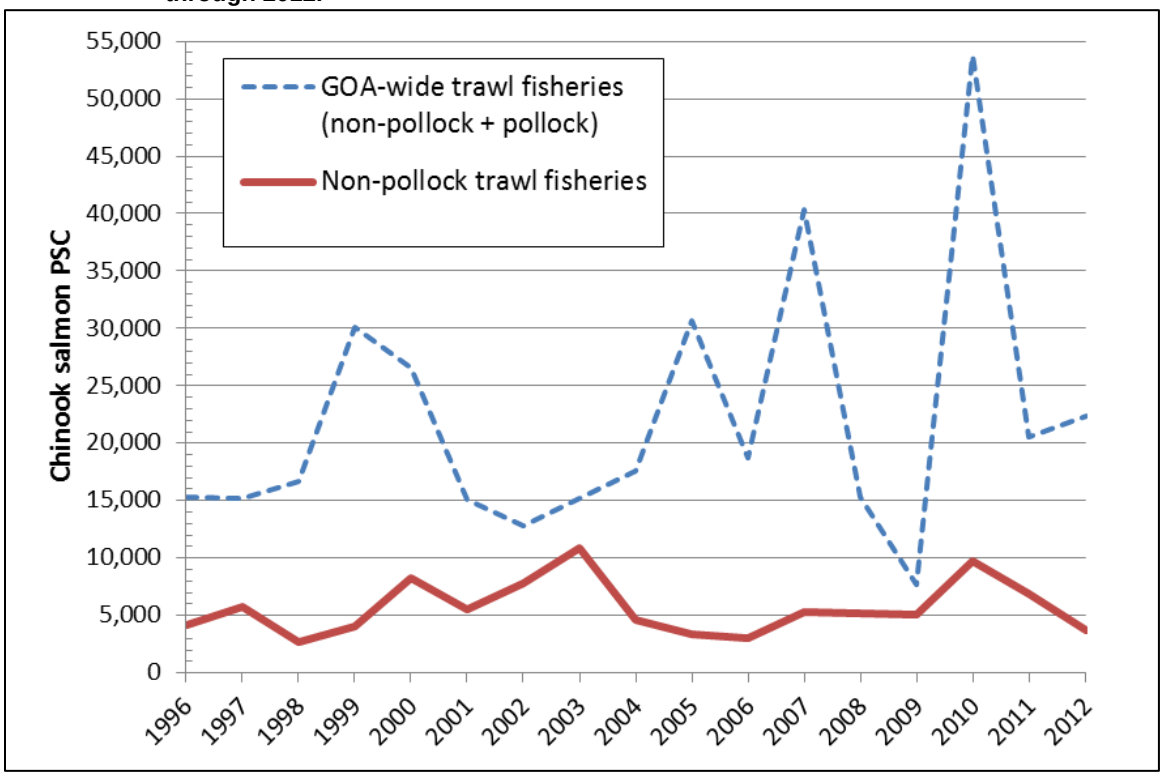
Sand Point is the other base of the Western Gulf pollock fishery. Sand Point is also a first class city located in Aleutians East Borough. Sand Point's economy is almost exclusively dependent on fisheries, as the community is home to a fleet that participates in local fisheries. Almost all local vessels are less than 60 feet in length to allow their participation in state fisheries that limit entry based on vessel length. Local vessels provide benefits to communities, not only through their owners' revenues, but also through deliveries to the local processing plant, employment of local crews, and the use of local support services.

Sand Point is homeport to a large portion of the Western Gulf trawl fleet, as approximately 10 vessels from Sand Point, on average, have participated in the fisheries between 2003 and 2010. While most of these vessels deliver to the Sand Point processor, some deliver to the processor in King Cove. Trawl caught groundfish have accounted for slightly less than half of the local fleet's catch in pounds, but make up a substantially smaller share of the local fleet's revenues. The local plant, operated by Trident Seafoods, processes primarily groundfish. The plant experiences peak production during the first few months of the year and again through the summer months. The plant uses a primarily transient labor force, employing few locals. The plant is the primary provider of fishery support services in the community and often provides fuel and basic support to vessels. Some local residents also provide some services.

4.4.5 Pollock

In 2012, the Council approved an annual gulf-wide trawl PSC limit of 25,000 Chinook salmon in the GOA pollock fishery. The bottom and midwater pollock fisheries (considered jointly in this discussion) comprise the majority of GOA trawl harvest. There is no directed pollock fishery in the GOA for CP trawl vessels. From 2003 to 2011, GOA pollock harvest accounted for 49% of groundfish trawl harvest by weight. Trips targeting pollock comprised a high of 60% of trawl harvested groundfish weight in 2005 (79,713 mt of total 132,147 mt) and a low of 37% in 2009 (37,811 mt of total 102,076 mt). GOA pollock has accounted for 75% of trawl Chinook salmon PSC over the analyzed period, peaking at 89% in 2005 (27,381 of 30,724 Chinook salmon) and lowest at 28% in 2003 (4,295 of 15,172 Chinook salmon; Figure 4-1). The average annual PSC rate for Chinook salmon in the GOA pollock trawl fishery (0.41 Chinook salmon per mt of pollock harvested) was second only to GOA rex sole (0.51), and higher than the average gulf-wide PSC rate of 0.20 Chinook salmon per mt of groundfish.

Figure 4-1 Prohibited species catch of Chinook salmon in Gulf of Alaska non-pollock trawl fisheries, 1996 through 2012.



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC. 2012 data reported through 11/4/2012.

Nearly all CP and CV vessels that landed non-pollock groundfish also landed pollock, including all active CPs from 2009 to 2011 and all active CVs in 2006, 2007, 2009 and 2010.

Table 4-14 Non-pollock groundfish vessels that also landed pollock

		2003	2004	2005	2006	2007	2008	2009	2010	2011
Catcher/ Processors	# Vessels Landing Pollock	18	13	14	12	14	13	18	17	17
	Total Vessels	21	16	16	15	15	14	18	17	17
Catcher Vessels	# Vessels Landing Pollock	65	61	63	61	63	64	59	52	51
	Total Vessels	71	63	67	61	63	65	59	52	53

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

The PSC limit for GOA pollock fisheries is subdivided between the Central and Western GOA regulatory areas. The Central GOA receives 73.3% of Chinook salmon PSC and the Western GOA receives 26.7%. In each year from 2003 to 2011, the Central GOA has harvested 39,459 mt of pollock on average while the Western GOA has harvested 21,394 mt. Pollock harvest comprised 43% of Central GOA groundfish harvest and 66% of Western GOA groundfish harvest during those years. Over the same period, pollock harvest accounted for 71% of Chinook salmon PSC in the Central GOA and 87% in the Western GOA. The average PSC rate for Chinook salmon was 0.31 in the Central GOA pollock trawl fishery and 0.29 in the Western GOA.

Trips targeting GOA pollock generated $513.4 million in wholesale gross revenue from 2003 to 2011 – more than twice the amount generated in the next highest value GOA fishery (rockfish). The average annual wholesale value of GOA pollock harvest during this period was $57.0 million, reaching a high of $71.7 million in 2011 and a low of $31.9 million in 2009. Here, because pollock is only a directed fishery for CVs, wholesale value is determined by applying an annual average wholesale price to the yearly total harvest of trips targeting pollock. The CV fleet generated an average ex-vessel value of approximately $22.8 million per year from harvesting pollock.

The GOA pollock fleet recorded 165,779 Chinook salmon PSC from 2003 to 2011. During this period, the pollock fleet generated $3,097 per Chinook salmon in wholesale value, or $1,239 per Chinook salmon in estimated ex-vessel value.

4.4.6 Non-pollock target species: harvest and value

The non-pollock directed trawl fisheries in the GOA – in descending order of total weight harvested from 2003 to 2011 – include rockfish, arrowtooth flounder, Pacific cod, shallow water flatfish, rex sole, flathead sole and deep water flatfish (Table 4-17). The primary species in the shallow water flatfish complex is rock sole; other shallow water flatfish species include Alaska plaice, starry flounder, yellowfin sole, sand sole, butter sole and English sole. Dover sole is the primary harvest species in the deep water flatfish complex, with deep-sea sole and Greenland turbot making up the remainder. Further information on GOA non-pollock groundfish species is included in Section 3.2.

In this section, harvest weights and revenues are reported by trip target, meaning that the reported values represent all species harvested in that target fishery (as determined by NOAA's Catch Accounting System).

4.4.6.1 Harvest

Non-pollock groundfish trawl harvest has ranged from 49,127 mt to 73,512 mt during the historical period analyzed in this report; the median harvest weight was 63,835 mt, recorded in 2007 (Table 4-15). Total GOA harvest displayed annual variability without a trend. Variability likely stems from a combination of year-specific factors including regulatory closures (TAC and halibut PSC), environmental factors, and relative product prices.

Table 4-15 Annual non-pollock groundfish trawl harvest in the Gulf of Alaska, 2003 to 2011

Year	Harvest (mt)
2003	60,631
2004	49,127
2005	52,434
2006	59,208
2007	63,835
2008	73,512
2009	64,265
2010	69,359
2011	69,564

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

From 2003 to 2011, the Central GOA accounted for 82% of the total non-pollock harvest weight in the action area (Table 4-16). Rockfish species made up the greatest proportion of total harvest in both the Central and Western regulatory areas (Table 4-17). Rockfish, arrowtooth flounder, Pacific cod and

shallow water flatfish comprised 92% of Central GOA total harvest weight. Rockfish, Pacific cod and arrowtooth flounder totaled 93% of Western GOA harvest weight.

During the same period, GOA non-pollock trawl catcher vessels harvested 65% of total weight in the action area. Pacific cod accounted for the greatest proportion of catch, followed by arrowtooth flounder, rockfish and shallow water flatfish. Rockfish species harvest made up 53% of total weight in the catcher/processor sector, with arrowtooth flounder and rex sole also accounting for a significant proportion of total harvest. Rockfish species were the only target species or complex for which catcher/processors harvested a larger share of gulf-wide trawl harvested weight than did catcher vessels.

Taken by operational type within each regulatory area, the Central GOA catcher vessel sector accounted for the greatest proportion of total harvest weight, at 60%. Central GOA catcher/processors harvested 22% of total weight; Western GOA catcher/processors harvested 13% of total weight; and Western GOA catcher vessels harvested 5% of total weight. Rockfish species accounted for 70% of Western GOA catcher/processor harvest weight, while Pacific cod accounted for 98% of Western GOA catcher vessel harvest weight. Central GOA operational type sectors reflected multiple important target species: rockfish, arrowtooth flounder and rex sole were the fisheries of greatest relative importance in the catcher/processor sector, while arrowtooth flounder, Pacific cod, rockfish and shallow water flatfish each made up similarly significant proportions of total harvest weight in the catcher vessel sector.

Table 4-16 Cumulative groundfish harvest (mt) in the Gulf of Alaska non-pollock trawl fisheries, by trip target, 2003 to 2011

	Harvest (mt)	% of GOA TOTAL
GOA TOTAL	561,935	100.0%
Central GOA	463,217	82.4%
Western GOA	98,718	17.6%
GOA Catcher Vessels	364,164	64.8%
GOA Catcher/Processors	197,772	35.2%
CGOA Catcher Vessels	337,300	60.0%
CGOA Catcher/Processors	125,917	22.4%
WGOA Catcher Vessels	26,863	4.8%
WGOA Catcher/Processors	71,855	12.8%

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 4-17 to Table 4-20 provide cumulative target harvest weight and proportions of total harvest for each of the predominant fisheries, from 2003 to 2011. These totals are subdivided and repeated to reflect each potential division of the GOA non-pollock trawl fisheries envisioned in Alternative 2 and the associated options for this Council action.

Table 4-17 Non-pollock groundfish harvest by trip target species (mt) and proportion of total Gulf of Alaska non-pollock trawl groundfish harvest, 2003 to 2011

Total GOA Trawl			
TARGET	**Harvest (mt)**	**% Total**	**Rank**
Rockfish	187,319	33%	1
Arrowtooth Flounder	148,061	26%	2
Pacific Cod	117,494	21%	3
Shallow Water Flatfish	66,502	12%	4
Rex Sole	25,858	5%	5
Flathead Sole	11,439	2%	6
Deep Water Flatfish	1,952	0%	7
Other Species	1,752	0%	8
Sablefish	1,345	0%	9
Atka Mackerel	214	0%	10
GOA TOTAL	**561,935**	**100%**	

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 4-18 Non-pollock groundfish harvest of trip target species by regulatory area (mt), and proportion of subarea and total Gulf of Alaska non-pollock trawl groundfish harvest, 2003 to 2011

Western GOA				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Rockfish	50,717	51%	9%	1
Pacific Cod	28,275	29%	5%	2
Arrowtooth Flounder	13,080	13%	2%	3
WG SUBTOTAL	**98,718**	**93%**		
GOA TOTAL	**561,935**		**16%**	

Central GOA				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Rockfish	136,602	29%	24%	1
Arrowtooth Flounder	134,981	29%	24%	2
Pacific Cod	89,219	19%	16%	3
Shallow Water Flatfish	66,070	14%	12%	4
CG SUBTOTAL	**463,217**	**92%**		
GOA TOTAL	**561,935**		**76%**	

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 4-19 Non-pollock groundfish harvest of trip target species by operational type (mt), and proportion of sector and total Gulf of Alaska non-pollock trawl groundfish harvest, 2003 to 2011

GOA Trawl Catcher Vessels				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Pacific Cod	113,495	31%	20%	1
Arrowtooth Flounder	95,138	26%	17%	2
Rockfish	82,416	23%	15%	3
Shallow Water Flatfish	63,631	17%	11%	4
CV SUBTOTAL	**364,164**	**97%**		
GOA TOTAL	**561,935**		**63%**	

GOA Trawl Catcher/Processors				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Rockfish	104,904	53%	19%	1
Arrowtooth Flounder	52,923	27%	9%	2
Rex Sole	24,710	12%	4%	3
CP SUBTOTAL	**197,772**	**92%**		
GOA TOTAL	**561,935**		**32%**	

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 4-20 Non-pollock groundfish harvest of trip target species by regulatory area and operational type (mt), and proportion of sector and total Gulf of Alaska non-pollock trawl groundfish harvest, 2003 to 2011

Western GOA Trawl Catcher Vessels				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Pacific Cod	26,359	98%	5%	1
WG CV SUBTOTAL	**26,863**	**98%**		
GOA TOTAL	**561,935**		**5%**	

Western GOA Trawl Catcher/Processors				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Rockfish	50,363	70%	9%	1
Arrowtooth Flounder	13,063	18%	2%	2
Flathead Sole	3,804	5%	1%	3
Rex Sole	2,279	3%	0%	4
Pacific Cod	1,916	3%	0%	5
WG CP SUBTOTAL	**71,855**	**99%**		
GOA TOTAL	**561,935**		**13%**	

Central GOA Trawl Catcher Vessels				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Arrowtooth Flounder	95,120	28%	17%	1
Pacific Cod	87,137	26%	16%	2
Rockfish	82,062	24%	15%	3
Shallow Water Flatfish	63,585	19%	11%	4
CG CV SUBTOTAL	**337,300**	**97%**		
GOA TOTAL	**561,935**		**58%**	

Central GOA Trawl Catcher/Processors				
TARGET	**Harvest (mt)**	**% Subtotal**	**% Total**	**Rank**
Rockfish	54,540	43%	10%	1
Arrowtooth Flounder	39,861	32%	7%	2
Rex Sole	22,432	18%	4%	3
CG CP SUBTOTAL	**125,917**	**93%**		
GOA TOTAL	**561,935**		**21%**	

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

4.4.6.2 Value

NOAA's CAS reports the first wholesale value (gross revenue) of harvest. This value is generated by applying annual average wholesale prices to yearly harvest. Wholesale value is an appropriate measure of value for CP vessels, but ex-vessel value is a more relevant measure for CVs. Within this section, unless otherwise noted, the analysts report all harvest values in terms of the wholesale market for ease of comparison. As with harvest weight, historical harvest values are presented in terms of the ex-post-determined trip target.

During the 2003 to 2011 period, the proportional distribution of wholesale value across regulatory areas or harvest sectors is quite similar to the observed distribution of harvested weight. Central GOA non-pollock harvest generates $538.8 million (81% of the GOA total), while CV harvest generates more wholesale harvest value than the CP sector ($429.0 million; 64%). Comparing Table 4-21 to Table 4-16 reveals that, pound-for-pound, the Western GOA generates slightly more wholesale value from its harvest than the Central GOA. This difference appears to derive from the Western GOA CV sector, for which the percentage-share of Gulf-wide wholesale value is 2% higher than the percentage-share of Gulf-wide harvest weight (6.8% vs. 4.8%). This effect, in turn, arises from the fact that the Western GOA CV sector almost exclusively harvests Pacific cod, which has had higher value than other non-pollock groundfish species.

Table 4-17 to Table 4-25 provide cumulative target first wholesale value and proportion of total fishery value for each of the predominant fisheries, from 2003 to 2011. These totals are subdivided and repeated to reflect each potential apportionment of the GOA non-pollock trawl fisheries envisioned in Alternative 2 and the associated options for this Council action. [12]

On a gulf-wide target species level, different species' wholesale values create a minor reordering in proportional share of total GOA value, as compared to shares of GOA harvest. Rockfish species, relatively high in value, generated 37% of GOA wholesale value while accounting for only 33% of total harvest. Conversely, arrowtooth flounder generated only 20% of total wholesale value in comparison to 26% of total harvest. Table 4-22 summarizes gulf-wide wholesale value by target species and provides direct comparison for Table 4-17.

Table 4-23 to Table 4-25 show the relative importance of key harvest species to the total GOA cumulative wholesale value from 2003 to 2011. As with the gulf-wide wholesale value data, the order of species importance is similar to the order of harvest data in Table 4-18 to Table 4-20. Key differences, again driven by different product prices for different target species, center around lower rankings for arrowtooth flounder and higher rankings for rockfish and Pacific cod. Notable differences between harvest rank and wholesale value rank include the following: gulf-wide CV arrowtooth flounder trips accounted for 26% of operational type harvest weight, but only 17% of CV wholesale value; Central GOA CV arrowtooth flounder trips accounted for 28% of sector harvest weight, but only 19% of Central GOA CV wholesale value. Conversely, gulf-wide CV Pacific cod and rockfish trips respectively accounted for 31% and 23% of operational type harvest weight, but generated 40% and 26% of wholesale value; Central GOA CV Pacific cod and rockfish accounted for 26% and 24% of sector harvest, but generated 33% and 29% of wholesale value.

[12] Average annual wholesale value (as opposed to aggregate over the 2003 to 2011 period) is summarized for each target species in Table 4-48, located in Section 4.7. That table also breaks out average annual wholesale value by regulatory area and operational type sector.

Table 4-21 Wholesale value of GOA non-pollock groundfish trawl fisheries by trip target, 2003 to 2011

	Wholesale Value ($1000)	% of GOA TOTAL
GOA TOTAL	668,807	100.0%
Central GOA	538,839	80.6%
Western GOA	129,968	19.4%
GOA Catcher Vessels	429,045	64.2%
GOA Catcher Processors	239,762	35.8%
CGOA Catcher Vessels	383,768	57.4%
CGOA Catcher/Processors	155,071	23.2%
WGOA Catcher Vessels	45,278	6.8%
WGOA Catcher/Processors	84,690	12.7%

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Table 4-22 Wholesale value by trip target species and proportion of total Gulf of Alaska non-pollock trawl groundfish value, 2003 to 2011 (ordered by total harvest weight)

Total GOA Non-Pollock Trawl			
TARGET	**Wholesale Value ($1000)**	**% Total**	**Rank**
Rockfish	247,715	37%	1
Arrowtooth Flounder	130,810	20%	3
Pacific Cod	177,651	27%	2
Shallow Water Flatfish	57,149	9%	4
Rex Sole	30,233	5%	5
Flathead Sole	12,150	2%	6
Deep Water Flatfish	1,856	0%	8
Other Species	1,378	0%	9
Sablefish	9,541	1%	7
Atka Mackerel	324	0%	10
GOA TOTAL	**668,807**	**100%**	

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Table 4-23 Wholesale value of trip target species by regulatory area, and proportion of subarea and total Gulf of Alaska non-pollock trawl groundfish value, 2003 to 2011 (ordered by total harvest weight)

Western GOA				
TARGET	**Wholesale Value ($1000)**	**% Subtotal**	**% Total**	**Rank**
Rockfish	61,588	47%	9%	1
Arrowtooth Flounder	12,910	10%	2%	3
Pacific Cod	47,556	37%	7%	2
Flathead Sole	4,680	4%	1%	4
WG SUBTOTAL	**129,968**	**98%**		
GOA TOTAL	**668,807**		**19%**	

Central GOA				
TARGET	**Wholesale Value ($1000)**	**% Subtotal**	**% Total**	**Rank**
Rockfish	186,126	35%	28%	1
Arrowtooth Flounder	117,900	22%	18%	3
Pacific Cod	130,094	24%	19%	2
Shallow Water Flatfish	56,685	11%	8%	4
Rex Sole	27,500	5%	4%	5
Flathead Sole	7,469	1%	1%	6
CG Subtotal	**538,839**	98%		
GOA TOTAL	**668,807**		79%	

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Table 4-24 Wholesale value of trip target species by operational type, and proportion of sector and total Gulf of Alaska non-pollock trawl groundfish value, 2003 to 2011 (ordered by total harvest weight)

GOA Trawl Catcher Vessels				
TARGET	Wholesale Value ($1000)	% Subtotal	% Total	Rank
Rockfish	112,794	26%	17%	2
Arrowtooth Flounder	73,443	17%	11%	3
Pacific Cod	172,556	40%	26%	1
Shallow Water Flatfish	53,808	13%	8%	4
CV SUBTOTAL	**429,045**	**96%**		
GOA TOTAL	**668,807**		**62%**	

GOA Trawl Catcher/Processors				
TARGET	Wholesale Value ($1000)	% Subtotal	% Total	Rank
Rockfish	134,921	56%	20%	1
Arrowtooth Flounder	57,367	24%	9%	2
Rex Sole	29,098	12%	4%	3
Flathead Sole	9,313	4%	1%	4
CP SUBTOTAL	**239,762**	**96%**		
GOA TOTAL	**668,807**		**34%**	

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Table 4-25 Wholesale value of trip target species by regulatory area and operational type, and proportion of sector and total Gulf of Alaska non-pollock trawl groundfish value, 2003 to 2011 (ordered by total harvest weight)

Western GOA Trawl Catcher Vessels				
TARGET	Wholesale Value ($1000)	% Subtotal	% Total	Rank
Pacific Cod	45,071	100%	7%	1
WG CV SUBTOTAL	**45,278**	**100%**		
GOA TOTAL	**668,807**		**7%**	

Western GOA Trawl Catcher/Processors				
TARGET	Wholesale Value ($1000)	% Subtotal	% Total	Rank
Rockfish	61,469	73%	9%	1
Arrowtooth Flounder	12,910	15%	2%	2
Pacific Cod	2,485	3%	0%	5
Rex Sole	2,733	3%	0%	4
Flathead Sole	4,627	5%	1%	3
WG CP SUBTOTAL	**84,690**	**99%**		
GOA TOTAL	**668,807**		**13%**	

Central GOA Trawl Catcher Vessels				
TARGET	Wholesale Value ($1000)	% Subtotal	% Total	Rank
Rockfish	112,674	29%	17%	2
Arrowtooth Flounder	73,443	19%	11%	3
Pacific Cod	127,484	33%	19%	1
Shallow Water Flatfish	53,775	14%	8%	4
CG CV SUBTOTAL	**383,768**	**96%**		
GOA TOTAL	**668,807**		**55%**	

Central GOA Trawl Catcher/Processors				
TARGET	Wholesale Value ($1000)	% Subtotal	% Total	Rank
Rockfish	73,452	47%	11%	1
Arrowtooth Flounder	44,457	29%	7%	2
Rex Sole	26,365	17%	4%	3
Flathead Sole	4,686	3%	1%	4
CG CP SUBTOTAL	**155,071**	**96%**		
GOA TOTAL	**668,807**		**22%**	

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

4.4.6.3 Relationship between harvest levels and gross wholesale revenue

Average annual harvest (mt) and average annual gross wholesale revenue ($) are positively correlated in the key GOA non-pollock directed groundfish fisheries. Based upon this observation, the analysts can presume that a reduction in harvest would likely decrease the fleet's revenue and, assuming no changes in cost structure, profit.

The correlation coefficients reported in Table 4-26 capture the strength of the linear relationship between groundfish harvest weight and the gross wholesale revenue generated. Values greater than zero indicate a positive relationship, where high (or low) harvest results in high (or low) gross revenue. The maximum value of 1.0 would indicate perfectly simultaneous percentage changes in the paired data. Noting that the coefficient for rockfish was low relative to other species, the analysts included measures of correlation for only the period of cooperative rockfish management (2007 to 2011). The even lower coefficient on rockfish (0.57) for these later years may signal a weaker connection between the amount harvested and the prices received under cooperative management fisheries, thus creating a possible exception to the earlier statement that decreased harvest reduces revenue by a similar margin.

Table 4-26 Measure of correlation between average annual groundfish harvest (mt) and average annual gross wholesale revenue ($), 2003 to 2011 & 2007 to 2011

TARGET	Correlation Coefficient (2003-2011)	Correlation Coefficient (2007-2011)
Arrowtooth Flounder	0.76	0.68
Pacific Cod	0.83	0.87
Rockfish	0.76	0.57
Shallow Water Flatfish	0.94	0.83
Rex Sole	0.96	0.99
Flathead Sole	0.93	0.96
Deep Water Flatfish	0.95	0.99

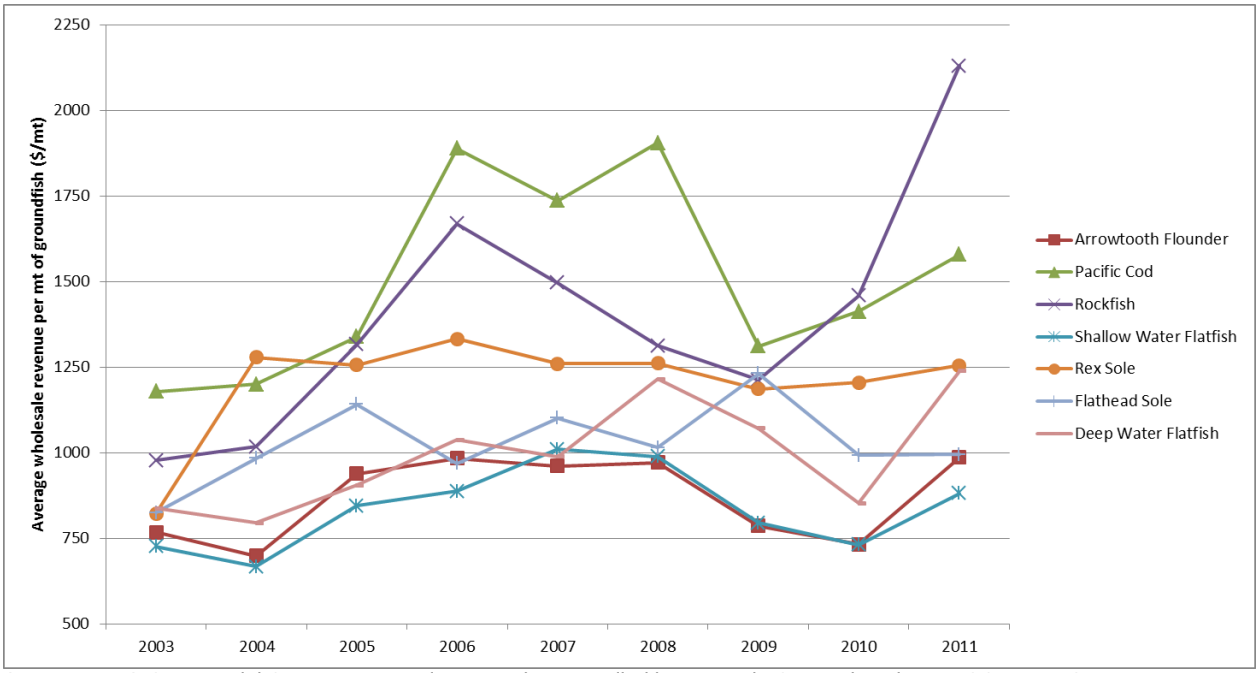
(Note: averages are derived from NOAA Catch Accounting System records at the fishing trip level)

One might expect a price effect where prices increase when harvest supply is low, thereby mitigating some of the revenue loss created by any groundfish harvest constraints under PSC limits. However, data from the 2003 to 2011 period reflect a strong positive correlation between harvest weight and gross wholesale revenue (Table 4-26). From this, the analysts can conclude that prices did not adjust to maintain fairly constant gross revenue in low harvest years. Rather, prices are at least partially shaped by external factors such as supplies of substitute products, domestic and foreign market prices, foreign exchange rates, seafood consumption, and consumer and producer price indices (Fissel et al., 2012).

Figure 4-2 through Figure 4-7 illustrate the relatively stable nature of non-pollock groundfish prices during the analyzed period, as reflected in first wholesale gross revenue. Given the strong correlation between harvest (mt) and wholesale revenue ($), the chosen metric is annual average wholesale revenue per metric ton of non-pollock groundfish. Deflating nominal values to a base year reveals that per unit harvest revenue has not substantially increased or decreased during the analyzed period (Figure 4-3, Figure 4-5, and Figure 4-7).[13] This observation holds for harvest revenues taken by specific operational type sector (Figure 4-5) and regulatory area (Figure 4-7).

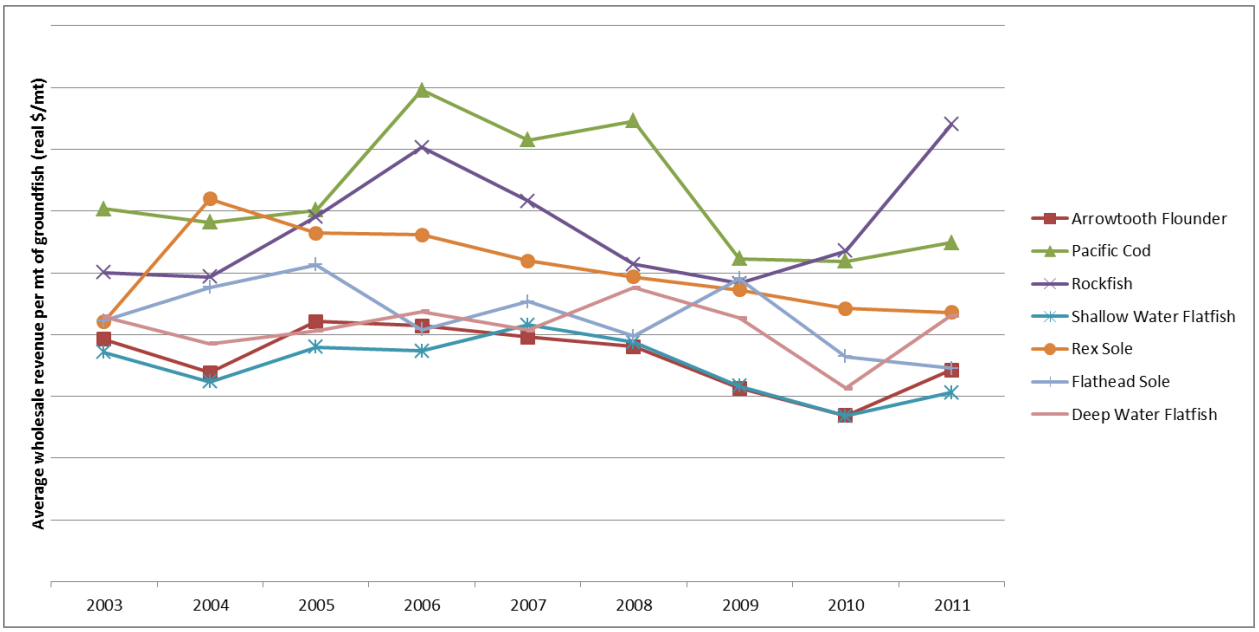
[13] Nominal to real dollar adjustments were made using the Bureau of Labor Statistics Producer Price Index for "unprocessed and packaged fish" (Series ID WPU0223 available at http://data.bls.gov/cgi-bin/srgate), which is the same index used in Economic SAFE Reports.

Figure 4-2 Annual average wholesale revenue per mt of GOA non-pollock groundfish harvest by trip target, nominal value from 2003 to 2011



Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Figure 4-3 Annual average wholesale revenue per mt of GOA non-pollock groundfish harvest by trip target, inflation-adjusted trend from 2003 to 2011



Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Figure 4-4 Annual average wholesale revenue per mt of GOA non-pollock groundfish harvest by operational type, nominal value from 2003 to 2011

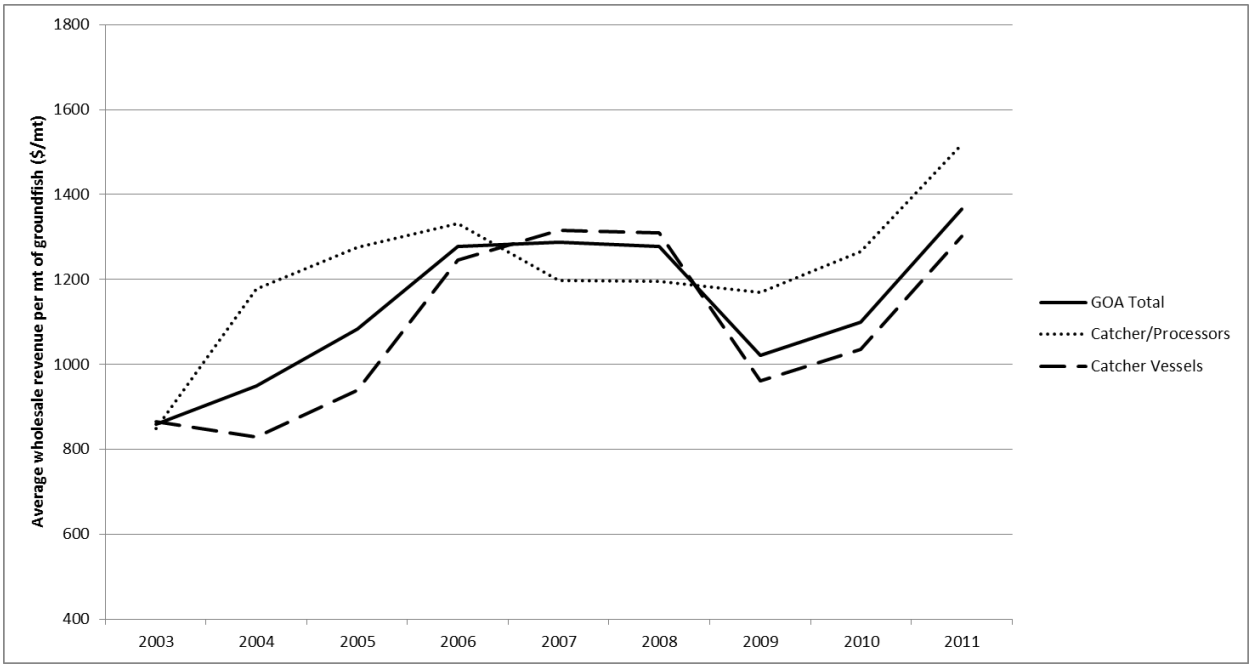


Figure 4-5 Annual average wholesale revenue per mt of GOA non-pollock groundfish harvest by operational type, inflation-adjusted trend from 2003 to 2011

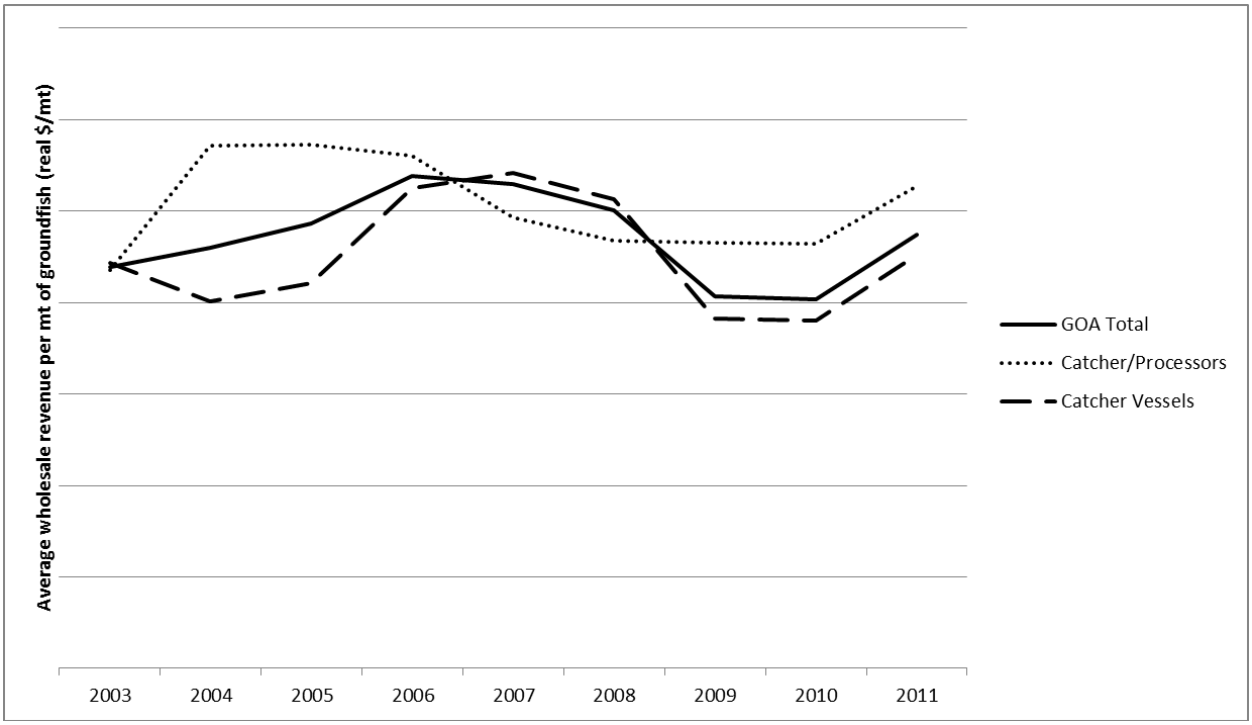


Figure 4-6 Annual average wholesale revenue per mt of GOA non-pollock groundfish harvest by regulatory area, nominal value from 2003 to 2011

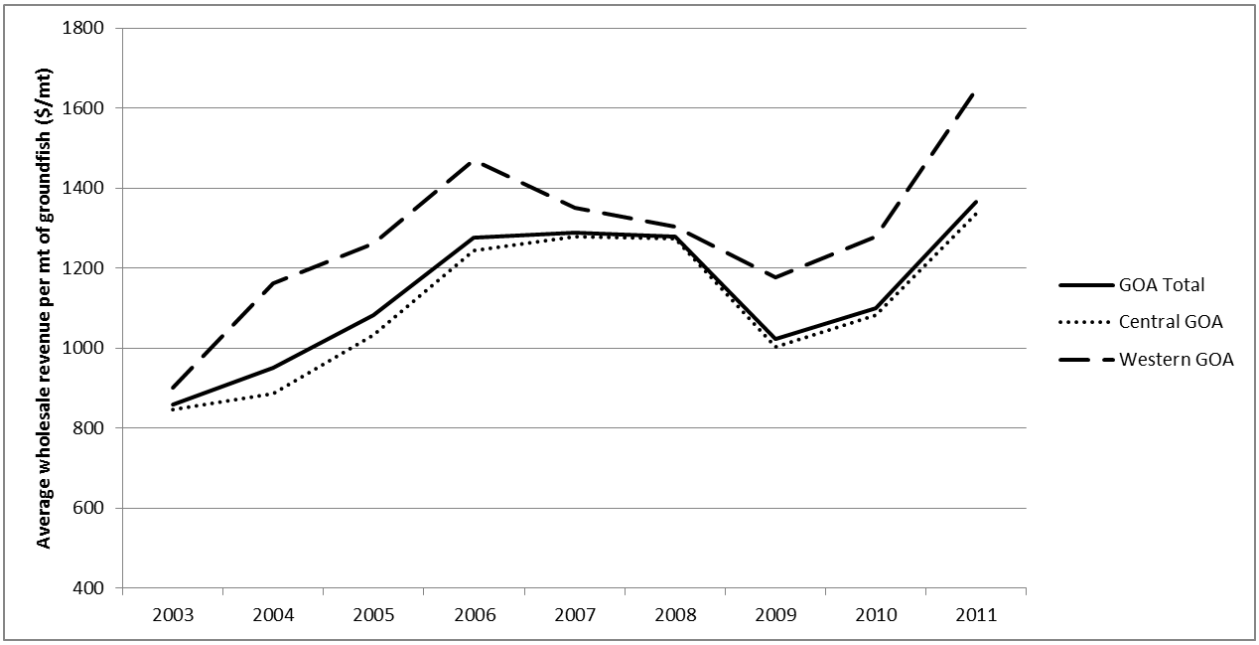
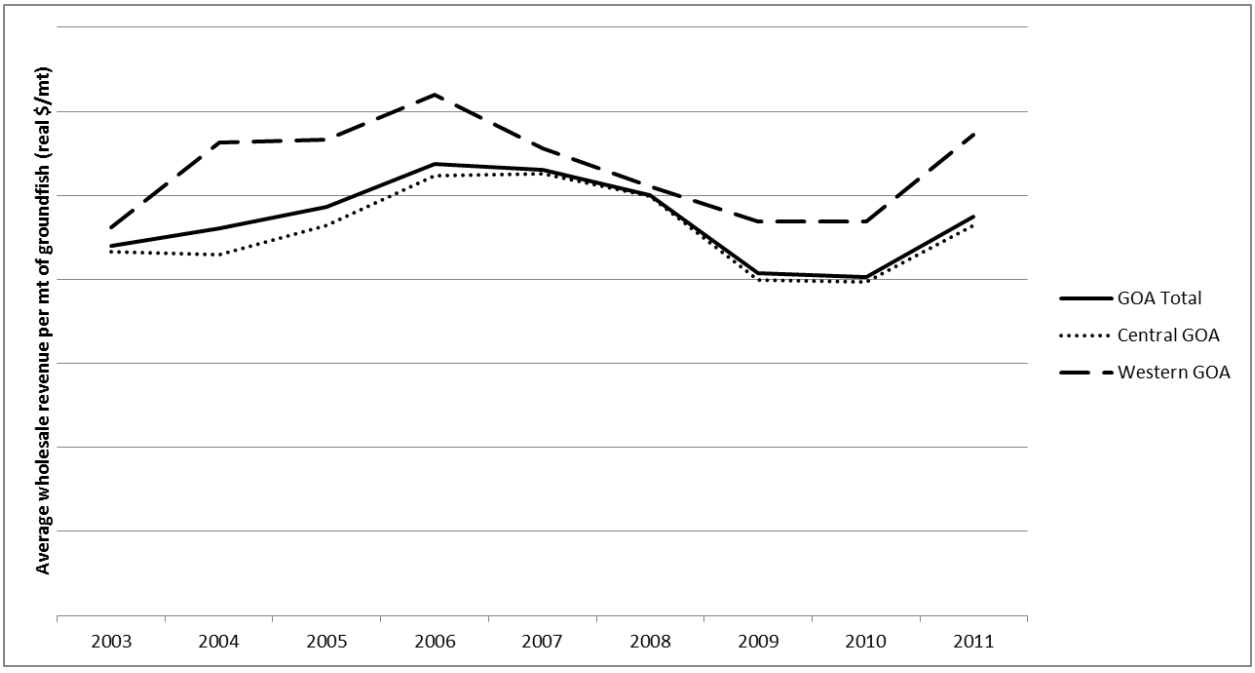


Figure 4-7 Annual average wholesale revenue per mt of GOA non-pollock groundfish harvest by regulatory area, inflation-adjusted trend from 2003 to 2011



4.4.7 Total Allowable Catch (TAC) and Utilization

NMFS Alaska Regional Office publishes annual catch reports that include harvest (mt) and total allowable catch (TAC, or "quota") by regulatory area and directed fishery. These figures provide a measure to assess the degree to which a particular fishery is being utilized. This information also provides

a broad understanding of whether a reduced ability to harvest a species, through PSC limits or any other restriction, is likely to alter fishers' behavior from recent patterns.

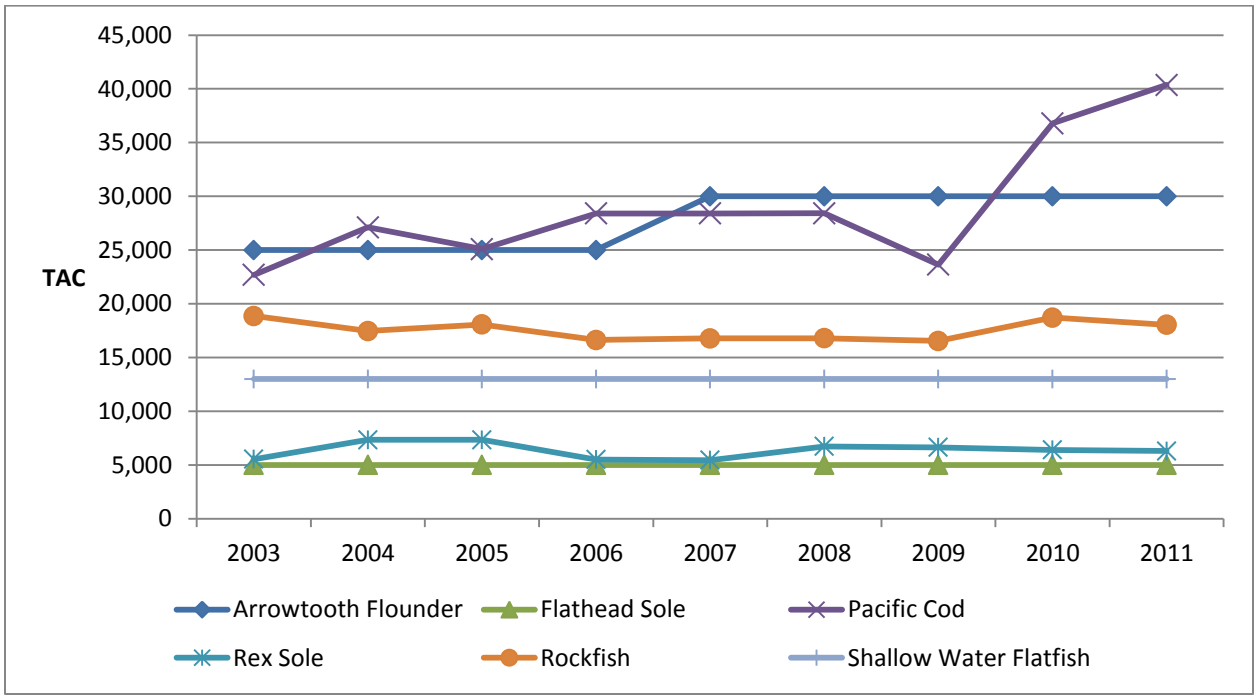
The catch report data cited in this section comes from the Gulf of Alaska Groundfish Annual Catch Reports. Most relevant species are reported by Central or Western GOA regulatory area. The exception is Atka mackerel, reported for the entire gulf, which is not a directed fishery but does appear as a target species in Central GOA records within NOAA's Catch Accounting System.

The species listings in the Annual Catch Reports reflect several direct allocations within the GOA groundfish fishery.

- Pacific cod is reported by inshore and offshore components, where inshore generally indicates catcher vessel prosecution and offshore indicates catcher/processor prosecution. Through 2011, GOA CVs received 90% of Pacific cod TAC and CPs received 10%. This remains the case in the Eastern GOA (outside of the scope of this analysis), but beginning in 2012 Western and Central GOA TAC is apportioned according to sector splits between CV and CP trawl, hook-and-line, and pot gear sectors (50 C.F.R. §679.20(a)(12)(i)). Within each regulatory area, 60% of TAC is available in the A-season and 40% is available in the B-season; this measure is related to Steller Sea Lion protection. For the entire fishing year, the trawl sector is apportioned 40.8% of Western GOA Pacific cod TAC and 45.8% of Central GOA Pacific cod TAC. Of the TAC apportioned to trawl vessels, CVs receive 94% of the Western GOA allowance and 91% of the Central GOA allowance.
- Rockfish harvest and TAC are reported by species. Elsewhere in this analysis, they have been viewed in aggregate, in accordance with the NOAA Catch Accounting System's trip target designations. Individual rockfish species include: Pacific ocean perch, rougheye rockfish, shortraker rockfish, pelagic shelf rockfish (dusky rockfish, yellowtail rockfish and widow rockfish), northern rockfish, thornyhead rockfish, and "other rockfish" (which includes slope rockfish and demersal shelf rockfish in the Central and Western regulatory areas). Directed fisheries exist for Pacific ocean perch, pelagic shelf rockfish, and northern rockfish. Shortraker rockfish and rougheye rockfish were separated and managed under separate TACs beginning in 2005. These species were of special concern in designing the Central GOA Rockfish Program to ensure that harvests would not affect stock conditions, particularly shortraker rockfish stocks. Shortraker and rougheye rockfish were not allocated to the catcher vessel sector in the Rockfish Pilot Program, as that fleet had relatively minimal historical catches of those species. Instead, catcher vessel harvests of shortraker rockfish and rougheye rockfish are managed under MRAs set low enough to discourage harvest in excess of historical catch amounts. Catcher/processors in the program receive a reduced allocation of the species to ensure that their harvests do not harm stocks.

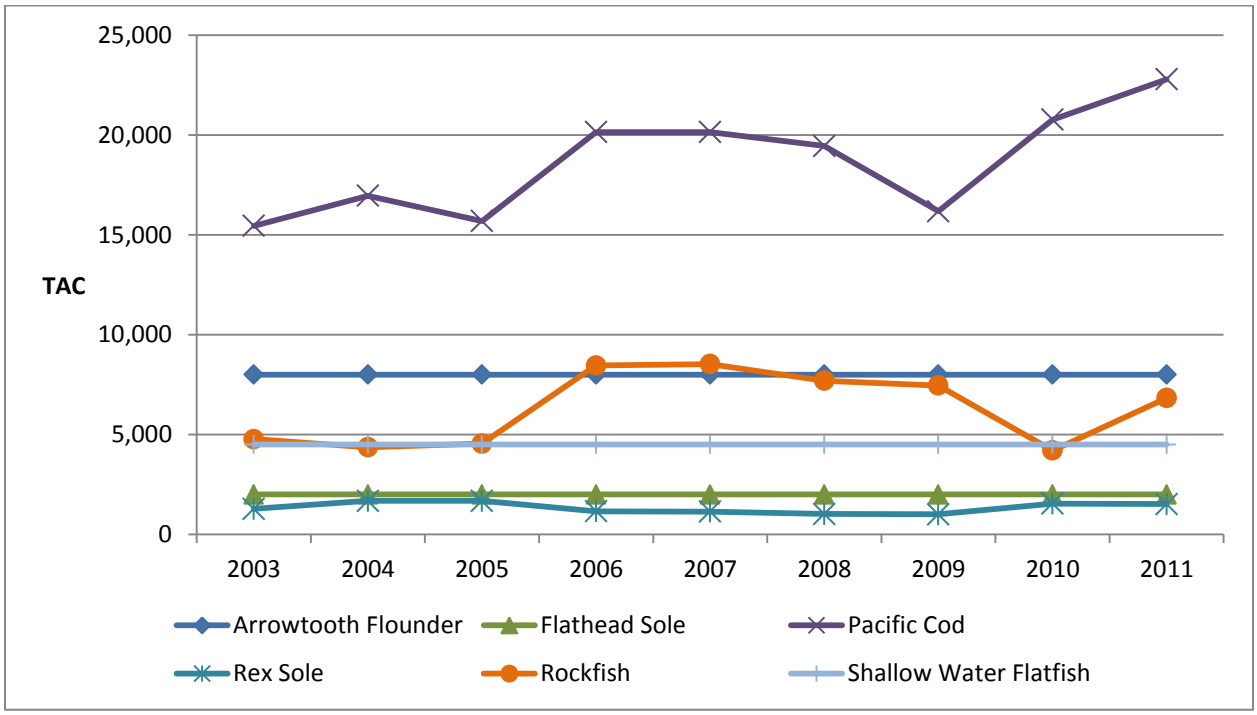
The previous section identified six species or species complexes that make up the majority of GOA non-pollock groundfish trawl harvest: arrowtooth flounder, Pacific cod, rockfish, rex sole, flathead sole, and shallow water flatfish. Figure 4-8 and Figure 4-9 illustrate the TAC levels for these key species over the analyzed period.

Figure 4-8 Recent TAC history for Central GOA non-pollock groundfish trawl fisheries



Source: NMFS Alaska Regional Office catch reports, available at: http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm

Figure 4-9 Recent TAC history for Western GOA non-pollock groundfish trawl fisheries



Source: NMFS Alaska Regional Office catch reports, available at: http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm

The following paragraphs provide a coarse summary of utilization relative to harvest specifications for these key fisheries, from 2003 to 2011. This information develops a preliminary notion of which fisheries are prosecuted to the fullest extent allowed (or beyond) and may be fished up to regulatory TAC closures,

which could raise the likelihood of being impacted by further constraints in the form of Chinook salmon PSC limits. It is important to note that some of the fisheries that are not fully utilized might currently be impacted by Pacific halibut PSC or could be secondary species fished under MRAs.

Arrowtooth flounder TAC has been exceeded in one year for each the Central (2006) and Western (2003) GOA. The arrowtooth flounder TAC in the Western GOA has been steady at 8,000 mt throughout the analyzed period, and less than 40% of this total was harvested in each year since 2004. The Central GOA TAC increased from 25,000 mt to 30,000 mt in 2008. In addition to the year when harvest exceeded the TAC, over 75% of Central GOA arrowtooth flounder TAC was harvested in four additional years.

Pacific cod CV TAC has ranged from around 20,000 to 36,000 mt in the Central GOA and 14,000 to 20,000 mt in the Western GOA. The Central GOA inshore TAC was exceeded in five of the nine years (peaking at 111% of TAC in 2003), and above 75% of the TAC was harvested in all other years considered. In the Western GOA, the inshore TAC was exceeded by a small margin (1% of TAC) in two years, 2003 and 2010. Harvest in the inshore component area was between 75% and 100% of TAC in the five other years considered. The Pacific cod CP TAC ranged from around 1,700 to 4,000 mt in the Central GOA and 1,500 to 2,200 mt in the Western GOA. The Central GOA offshore TAC was not exceeded in any year and harvests fell below 75% of available TAC in six of nine years. The Western GOA offshore TAC was exceeded by 661 mt in 2003 (43% of TAC), and harvest totaled more than 75% of TAC in three additional years. The roughly 2% of total Pacific cod trawl harvest allocated to Rockfish Pilot Program participants from 2008-2011 was harvested close to the limit annually, ranging from 83% to 98% of the allocated amount.

Rockfish trawl fisheries in the GOA harvest directed rockfish as well as other "secondary species," which are allocated in the Central GOA under the Rockfish Program. As mentioned, directed fisheries exist for Pacific ocean perch, pelagic shelf rockfish, and northern rockfish. The Central GOA Pacific ocean perch harvest level was never less than 94% of the available TAC, and has been consistently close to full harvest in all years since 2007 when cooperative management was put into place by the Rockfish Pilot Program. Central GOA northern rockfish was similarly harvested near or above capacity until the RPP years, reporting between 92% and 110% of TAC from 2003 to 2006; harvest in the fishery stayed between 74% and 89% of lowered TAC levels from 2008 to 2011. Central GOA pelagic shelf rockfish was less fully utilized, topping 75% of available TAC two times since the implementation of the RPP. The TAC for the three directed rockfish fisheries were slightly reduced under the RPP; these fisheries were not overharvested in 2007, with the directed fisheries taking between 71% and 89% of the available quota. Secondary species TACs in the Central GOA are considerably lower (less than 1,010 mt) and were not harvested at or near full utilization under the RPP. Other rockfish (slope and demersal shelf rockfish) had experienced overharvest in each year prior to 2007.

Though managed differently in recent years – the Western GOA is not included in the RPP or Rockfish Program – Western GOA rockfish harvest reflects similar outcomes for directed fisheries. Prior to 2008, Pacific ocean perch and northern rockfish were more fully utilized than pelagic shelf rockfish, though a lower percentage of the lower TACs were harvested in the Western GOA compared to the Central GOA (northern rockfish in 2004 was an exception with 134% of the available TAC harvested). From 2008 to 2010, Pacific ocean perch was fully utilized at between 100% and 108% of TAC (falling to 65% in 2011), while Northern rockfish and pelagic shelf rockfish were harvested between 60% and 95% of TAC. Western GOA secondary species fisheries, with low TAC levels (40 to 600 mt), experienced more variability in utilization. "Other rockfish" species were overharvested from 2003 to 2005 and from 2009 to 2011, but utilized as little as 44% of available TAC in the intervening years. Thornyhead rockfish harvest topped 75% of TAC in only three years. Shortraker and rougheye rockfish were overharvested in their jointly managed years (prior to 2005); shortraker rockfish have been relatively more utilized since then, topping 100% of available TAC in three of seven years.

Rex sole fisheries have not exceeded 70% of available TAC in either regulator area of the GOA, and are more typically below 50% of the allowed harvest. Central GOA TACs were set between 5,500 and 7,500 mt during this period, while Western GOA TAC ranged from 1,000 to 1,700 mt.

Utilization of flathead sole TAC was similarly low across the GOA. Central GOA flathead sole harvest has not exceeded 70% of the 5,000 mt TAC set throughout this period. Western GOA harvest was even lower at no more than 41% of the consistent TAC of 2,000 mt.

In the Central GOA, shallow water flatfish harvest has not exceeded 70% of the 13,000 mt TAC set throughout this period, and was more typically less than 50%. Western GOA TAC has been set at 4,500 mt; harvest has reached no greater than 17% of available TAC, and is more typically less than 10%.

4.4.8 Intra-annual pattern of fishing for GOA non-pollock trawl trips

Currently, fishery participants determine when and where to prosecute directed fisheries based on the scheduled season openings and the distribution of existing PSC limits for Pacific halibut and Chinook salmon. The NOAA Catch Accounting System data used to support this analysis reports activity by 11 trip target species. Of these, sablefish, Atka mackerel and "other species" (including sharks and skates) are managed, but not directed, trawl fisheries in the GOA – though participants in the Central GOA Rockfish Program do receive a secondary species allocation for sablefish. Individual decisions on the timing and targeting are typically made with the aim of generating the greatest economic return on fishing effort given the available target fisheries and the abundance of remaining PSC.

This analysis uses years 2007 to 2011 to describe the prevalent distribution of fishing, by targeted trips, during the course of a year. The 2007 starting point was selected because the implementation of the Rockfish Pilot Program altered the timing of rockfish fishing by establishing cooperatives in the Central GOA. For background purposes, the aggregate sum of harvest across this five-year period is separated by month to minimize the previously discussed challenge of reporting fishing activity by trip week-ending date (WED), which does not always correspond to the week in which the fish was caught (Section 4.4.1). Table 4-27 to Table 4-30 illustrate the annual distribution of each GOA non-pollock trawl target species' aggregate catch from 2007 to 2011. These figures are repeated and broken out to reflect the possible Chinook salmon PSC apportionment levels outlined in Alternative 2 of this action. As a measure of relative importance, the catch distribution tables indicate each species' proportional share of harvest at the considered apportionment levels and an of total aggregate GOA non-pollock trawl harvest.

Pacific cod

The GOA CV trawl fleet begins fishing Pacific cod heavily upon the January 20 fishery opening, harvesting over 30% (on aggregate) of total Pacific cod harvest during those last 12 days in January. The CV Pacific cod fleet typically reached its A season TAC allotment by late January in the Central GOA and by mid-to-late February in the Western GOA. The CP component of the Pacific cod fleet begins harvest in February and typically reached its A-season allotment by late February or early March in both regulatory areas. The Pacific cod B-season, beginning on September 1, has been intermittently interrupted by halibut PSC closures. On aggregate, roughly 30% of the GOA Pacific cod trawl fishery was harvested during September and October in the years analyzed. Only a very small amount of B-season harvest occurred in the Western GOA.

Arrowtooth Flounder

Arrowtooth flounder trawling begins in February, but is most heavily harvested in April until Halibut PSC limits closed the directed fishery – typically from May through the late summer. Approximately 60%

of Gulf-wide arrowtooth flounder harvest occurred between the January 20 fishery opening and May. February fishing occurred primarily in the Central GOA, while the majority of May fishing occurred in the Western GOA. February Central GOA arrowtooth fishing is mainly done by CVs that have just finished with the Pacific cod A-season or the pollock roe season. May Western GOA arrowtooth fishing is mainly done by CPs that have just finished with the Bering Sea rock sole and yellowfin sole (shallow water flatfish) season.

Fall arrowtooth flounder harvest concluded earlier in the Western GOA, where only 7% of subarea harvest occurred after August and none occurred in November or December. Nearly 40% of Central GOA harvest occurred between August and November; the subarea experienced several halibut PSC closures in October and November, but has typically ended the fishing year on December 31as an open directed fishery. The catcher vessel sector – which only prosecutes arrowtooth in the Central GOA – takes a greater proportion of its arrowtooth flounder harvest in the spring months, while the catcher/processor sector targets arrowtooth more heavily in the fall.

Rockfish

Gulf-wide, 87% of rockfish trawl harvest has occurred between May and July during the analyzed years. The Central GOA rockfish trawl fishery opens in May and the Western GOA rockfish trawl fishery opens in July. Western GOA rockfish harvests are smaller by harvested weight comparison. In general, the Central GOA rockfish TAC is allocated as a catch share program, and the Western GOA TAC is managed as a directed fishery.

Central GOA rockfish trawlers harvested 84% of their aggregate catch from May to July (46% in July). The Western GOA harvested 98% of its aggregate catch in July and August (93% in July).

The CV sector took nearly 60% of its harvest in May and June. Virtually all CV rockfish harvest occurred in the Central GOA. Gulf-wide, the CP sector harvested 98% of its catch from June to August (91% in July). In the Central GOA, the CP sector fished mainly in June and July, whereas the Western GOA CP sector fished in July and August.

In both regulatory areas, the CP sector took a small portion of aggregate 2007-to-2011 harvest (approximately 1.5%) in October. Secondary rockfish species – shortraker rockfish, rougheye rockfish, thornyhead rockfish and "other rockfish" (slope rockfish and demersal shelf rockfish) – were fished under MRAs throughout the calendar year. In the Western GOA, "Other rockfish" and shortraker rockfish were typically placed on no-retention PSC status between mid-July and early August.

In addition to the Central GOA Rockfish Program and the Western GOA limited entry fishery, GOA rockfish TAC is allocated to an entry level fishery and to other GOA fisheries with incidental catch allowances (under MRA limitations).

Shallow water flatfish

Shallow water flatfish are harvested across a relatively large part of the year in the GOA. Relatively high harvest months include April, May, July, August and October. Together, August and October accounted for 40% of aggregate harvest. Relative to other non-pollock GOA groundfish species, a significant percentage of shallow water flatfish harvest occurs in November and December (9%). Shallow water flatfish fisheries were typically open during the first half of the year, but harvest dipped in September due to halibut PSC closures. Halibut PSC closures occurred in August of 2007, and as early as March and May in 2008 (2008 also featured a short halibut PSC closure in January for sideboarded Amendment 80 vessels).

The Western GOA comprised less than one-tenth of one percent (< 0.1%) of total GOA shallow water flatfish harvest between 2007 and 2011. Likewise, the CP sector accounted for less than 3% of aggregate GOA shallow water flatfish harvest during this period. Accordingly, the Central GOA CV sector is the sector of interest for this fishery.

Rex sole

Nearly 60% of GOA rex sole is harvested from February to April, with 37% of aggregate catch occurring in April. Approximately 40% occurred from July through September, and low monthly harvest levels persisted through the end of the calendar year. 95% of gulf-wide rex sole harvest occurred in the Central GOA and 93% was taken by the CP sector, so the Central GOA CP sector is the sector of interest in this fishery.

From 2008 to 2011, the Central GOA rex sole fishery consistently closed from late April through June due to halibut PSC limits. An earlier halibut PSC closure occurred from early March to April 1 in 2009. The halibut PSC closure for Central GOA rex sole occurred later, in mid-May, in 2007. The Central GOA fishery also experienced halibut PSC closures during the last three weeks of August and parts of October in 2007. In 2008, halibut PSC closed the Central GOA fishery closed for the last three weeks of September and mid-November. Western GOA rex sole fisheries followed the same management pattern with the addition of a halibut PSC closure for CV participants in the Rockfish Program during July 2011.

Flathead sole

Though it made up only 2% of total GOA non-pollock groundfish trawl harvest between 2007 and 2011, GOA flathead sole fisheries recorded a greater proportion of its catch during the late-year months than any other target species (24% from October to December). Gulf-wide, late-year harvest occurred predominantly in the CP sector. 71% of aggregate gulf-wide harvest occurred from February through June.

October dominated late-year flathead sole harvest in the Central GOA, while November accounted for the majority of late-year harvest in the Western GOA. 77% of Western GOA harvest occurred from February through May. No flathead sole harvest occurred in the Western GOA CV sector.

Flathead sole fisheries experienced the same regulatory and PSC closures as the shallow water flatfish fisheries, with halibut PSC closures occurring mainly in September. Earlier halibut PSC closures in 2007 and 2008 are described above (see shallow water flatfish).

Table 4-27 Monthly distribution of GOA non-pollock groundfish trawl harvest, 2007 to 2011 (Gulf-wide)

	MONTH												
TARGET	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	% of TOTAL GOA HARVEST
Arrowtooth Flounder													29%
Deep Water Flatfish													0%
Flathead Sole													2%
Pacific Cod													20%
Rex Sole													5%
Rockfish													31%
Shallow Water Flatfish													13%

1-5% of species aggregate catch, 2007-11
5.01-10% of species aggregate catch, 2007-11
10.01-100% of species aggregate catch, 2007-11

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 4-28 Monthly distribution of GOA non-pollock groundfish trawl harvest by regulatory area, 2007 to 2011

		MONTH												% of Subarea Harvest	% of TOTAL GOA HARVEST
TARGET		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
CG	Arrowtooth Flounder													33%	27%
	Deep Water Flatfish													0%	0%
	Flathead Sole													2%	2%
	Pacific Cod													18%	15%
	Rex Sole													6%	5%
	Rockfish													25%	21%
	Shallow Water Flatfish													15%	13%
WG	Arrowtooth Flounder													9%	1%
	Flathead Sole													3%	0%
	Pacific Cod													27%	5%
	Rex Sole													2%	0%
	Rockfish													60%	10%
	Shallow Water Flatfish													0%	0%

1-5% of species aggregate catch, 2007-11
5.01-10% of species aggregate catch, 2007-11
10.01-100% of species aggregate catch, 2007-11

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 4-29 Monthly distribution of GOA non-pollock groundfish trawl harvest by operational type, 2007 to 2011

		MONTH												% of Operational Type Harvest	% of TOTAL GOA HARVEST
TARGET		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
CP	Arrowtooth Flounder													25%	8%
	Flathead Sole													4%	1%
	Pacific Cod													1%	0%
	Rex Sole													14%	5%
	Rockfish													55%	19%
	Shallow Water Flatfish													1%	0%
CV	Arrowtooth Flounder													31%	20%
	Deep Water Flatfish													0%	0%
	Flathead Sole													1%	1%
	Pacific Cod													29%	19%
	Rex Sole													1%	0%
	Rockfish													19%	12%
	Shallow Water Flatfish													19%	12%

1-5% of species aggregate catch, 2007-11
5.01-10% of species aggregate catch, 2007-11
10.01-100% of species aggregate catch, 2007-11

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 4-30 Monthly distribution of GOA non-pollock groundfish trawl harvest by regulatory area and operational type, 2007 to 2011

TARGET		MONTH												% of Sector Harvest	% of TOTAL GOA HARVEST
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
CGOA CP	Arrowtooth Flounder													33%	7%
	Flathead Sole													5%	1%
	Pacific Cod													0%	0%
	Rex Sole													21%	4%
	Rockfish													40%	9%
	Shallow Water Flatfish													2%	0%
CGOA CV	Arrowtooth Flounder													33%	20%
	Deep Water Flatfish													0%	0%
	Flathead Sole													1%	1%
	Other Species													0%	0%
	Pacific Cod													25%	15%
	Rex Sole													1%	0%
	Rockfish													20%	12%
	Shallow Water Flatfish													20%	12%
WGOA CP	Arrowtooth Flounder													12%	1%
	Flathead Sole													3%	0%
	Pacific Cod													2%	0%
	Rex Sole													2%	0%
	Rockfish													80%	10%
	Shallow Water Flatfish													0%	0%
WGOA CV	Pacific Cod													98%	4%

1-5% of species aggregate catch, 2007-11
5.01-10% of species aggregate catch, 2007-11
10.01-100% of species aggregate catch, 2007-11

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

4.4.9 Chinook Salmon Prohibited Species Catch in Non-pollock Trawl Fisheries

4.4.9.1 Chinook Salmon PSC Data and Estimation

NMFS determines the number of Chinook salmon PSC in the GOA groundfish fisheries using the catch accounting system (CAS; Section 5.1.3). Chinook salmon PSC estimates from trawl CP and non-pollock trawl CV fisheries in the GOA are based on at-sea sampling for salmon. NMFS uses the at-sea samples on observed trips and extrapolates the sample to the week (CP) or trip (CV). These estimates are used to create PSC rates that are applied to unobserved vessels. There is a relationship between the abundance of given species in a haul, sample size, and the level of precision in the resulting estimate of species catch from sampling. In general, we can have very high precision in the catch estimate for common (target species) with very small samples of the haul. Conversely, even extremely large samples of a haul provide relatively imprecise estimates of catch for very rare species, such as Chinook salmon.

This analysis uses CAS PSC estimates from 2003 to 2011. During that time period, vessels greater than 125' LOA (generally CPs or CVs delivering to motherships greater than 125' in length) were required to have 100% observer coverage. Vessels 60' LOA and above were required to have observers onboard during 30% of their fishing effort in each calendar quarter, including one trip in each target fishery. The majority of trawl CVs fishing in the central GOA fall into this category; also a small number of vessels fishing in the Western GOA. Vessels under 60' LOA were not required to have an observer onboard. Many trawl CVs fishing in the central GOA fall into this category.

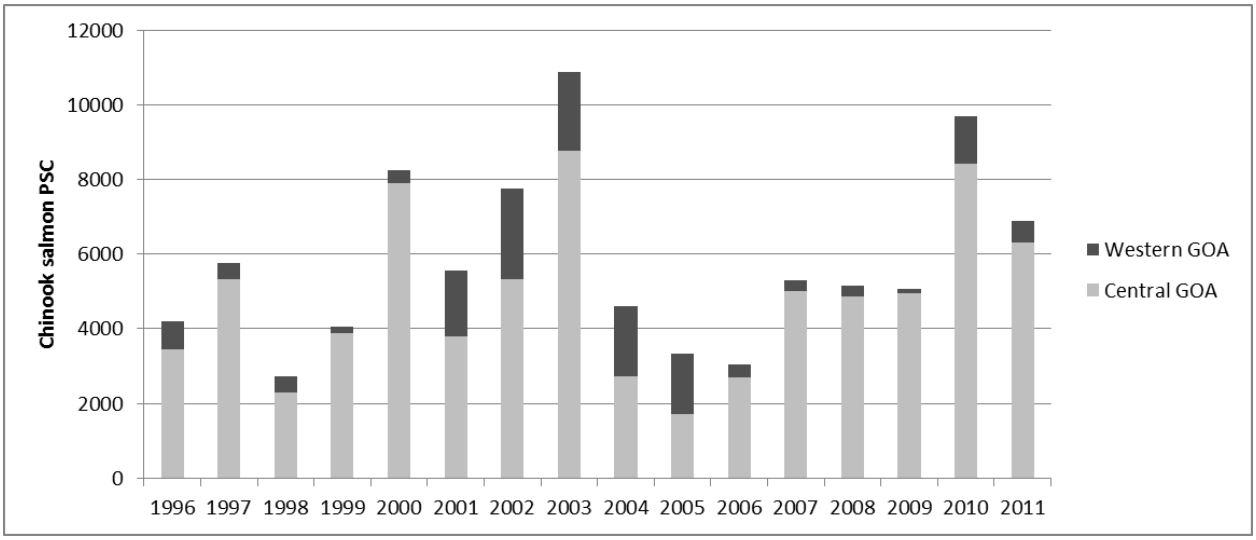
In October 2010, the Council took final action on Amendment 76 to the GOA Groundfish FMP, to restructure the Observer Program for vessels and processors (NPFMC 2010c). The final rule to implement the restructured program is expected to be effective for the beginning of the 2013 fishing year. The new Observer Program will make important changes to how observers are deployed, which will reduce sources of bias that currently jeopardize the statistical reliability of catch, bycatch and PSC data collected by the program. The restructuring also expands observer coverage to previously unobserved fisheries. Further description of the restructured program is included in Section 5.1.1.

4.4.9.2 Chinook salmon PSC trends in the Gulf of Alaska non-pollock trawl fisheries

Since 1996, annual Chinook salmon PSC in GOA non-pollock trawl fisheries has varied widely. Gulf-wide PSC averaged 5,770 Chinook salmon (5,231 median), with a maximum annual PSC of 10,877 in 2003 and a minimum PSC of 2,739 in 1998. The time series does not display a trend, and the standard deviation from the mean was 2,355. Moreover, Chinook salmon PSC levels displayed a weak statistical relationship to the harvested amount of non-pollock groundfish. Across all analyzed harvest records, the correlation coefficient between metric tons of harvest and the estimated number of Chinook salmon PSC was 0.23.[14]

Fishing trips in the Central GOA accounted for 84% of PSC during the 1996 to 2011 period. Mean annual Central GOA PSC was 4,842 (4,917 median), with a maximum of 8,755 in 2003 and a minimum of 1,728 in 2005. Mean annual Western GOA PSC was 928 (510 median), with a maximum of 2,420 in 2002 and a minimum of 117 in 2009. 2005 was the only year in which Central and Western GOA PSC were comparable. The Eastern GOA accounted for less than 2% of total Gulf PSC; a large part of this area, the Southeast Outside (Regulatory Area 650), has been closed to trawling since 1998.

Figure 4-10 Annual estimated Chinook salmon PSC in non-pollock groundfish fisheries, 1996 to 2011



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

4.4.9.3 Chinook salmon PSC by Alternative 2 PSC apportionment units and target species

During the 2003 to 2011 time period, GOA non-pollock trawl fisheries averaged 6,001 Chinook salmon PSC annually.[15] This figure represents 25% of trawl fishery Chinook salmon PSC in the action area, with trips targeting pollock recording the balance. The highest non-pollock Chinook salmon PSC level reported in a given year was 10,877 in 2003, and the lowest was 3,060 in 2006. Note that the 2003 to 2011 average PSC levels reported in Table 4-31 to Table 4-34 are not an exact match to the 10-year averages used to calculate the Alternative 2 PSC apportionments reported in Table 2-1. 2002 data was

[14] A correlation coefficient of 1.0 (or -1.0) signals a perfectly simultaneous percent change in the paired data – with positive coefficients indicating a change in the same direction and negative coefficients indicating a change in the opposite direction – while a coefficient of 0.0 indicates no relationship whatsoever.

[15] The following PSC summary tables exclude a negligible amount of Chinook salmon PSC that was taken by trips that were *ex post* designated in NOAA's CAS as having targeted Atka mackerel. This PSC occurred in only one year, and cannot be reported due to confidentiality constraints. This withholding explains the difference in the listed GOA average annual PSC, but does not impact the relative magnitude of overall PSC or PSC by principal target species.

excluded because it pre-dates the implementation of NOAA's Catch Accounting System and relies upon a blend of fish tickets and processors' weekly production reports.

Gulf-wide Chinook salmon PSC

Gulf-wide, the directed arrowtooth flounder trawl fisheries have reported the highest average Chinook salmon PSC. Arrowtooth flounder fisheries have taken the largest portion of Gulf-wide Chinook PSC in five of the nine reported years, with uncharacteristically low Chinook PSC years in 2004 and 2009. Trips targeting rex sole, rockfish, and Pacific cod typically account for the majority of remaining PSC. Flathead sole and shallow water flatfish fisheries experienced one-year PSC spikes in 2004 and 2009, respectively. Table 4-31 presents yearly PSC data for GOA non-pollock groundfish trawl targets in descending order of average annual PSC.

Table 4-31 Yearly Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries, 2003 to 2011

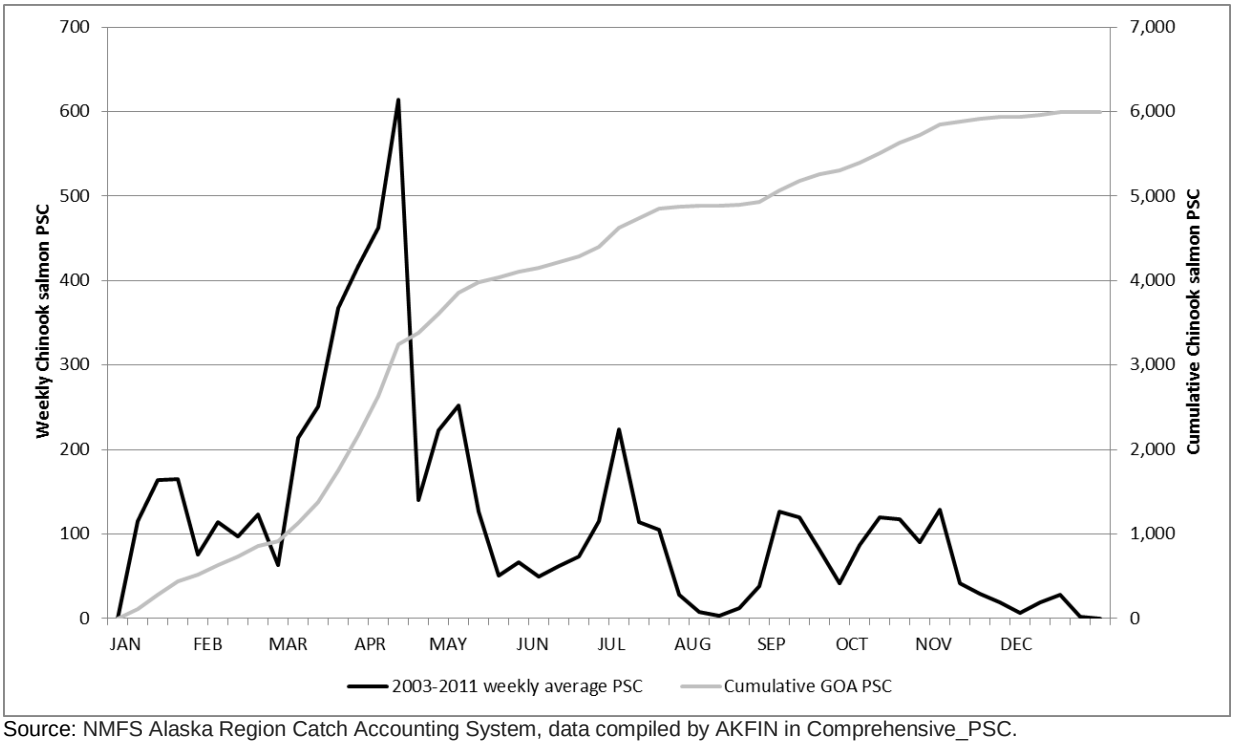
		Arrowtooth Flounder	Rex Sole	Rockfish	Pacific Cod	Shallow Water Flatfish	Flathead Sole	GOA TOTAL
2003	PSC	3,377	2,819	801	3,167	116	598	**10,877**
	%	31%	26%	7%	29%	1%	6%	**100%**
2004	PSC	359	498	885	908	498	1,446	**4,593**
	%	8%	11%	19%	20%	11%	31%	**100%**
2005	PSC	1,798	982	450	41	56	16	**3,343**
	%	54%	29%	13%	1%	2%	0%	**100%**
2006	PSC	408	1,444	263	888		56	**3,060**
	%	13%	47%	9%	29%		2%	**100%**
2007	PSC	1,502	714	2,026	624	438		**5,304**
	%	28%	13%	38%	12%	8%		**100%**
2008	PSC	2,596		1,918	436	208		**5,157**
	%	50%		37%	8%	4%		**100%**
2009	PSC	6	1,911	1,179	111	1,749	118	**5,075**
	%	0%	38%	23%	2%	34%	2%	**100%**
2010	PSC	3,943	2,299	1,510	435	1,012	496	**9,694**
	%	41%	24%	16%	4%	10%	5%	**100%**
2011	PSC	3,013	1,354	980	1,351	82	36	**6,816**
	%	44%	20%	14%	20%	1%	1%	**100%**
2003-2011 Avg.	**PSC**	**1,889**	**1,336**	**1,112**	**884**	**462**	**307**	**5,991**
	%	**31%**	**22%**	**19%**	**15%**	**8%**	**5%**	**100%**

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

Figure 4-11 illustrates the distribution of Chinook salmon PSC throughout the calendar year. Weekly levels represent the average Chinook PSC taken in all non-pollock target fisheries in a given calendar week, over the 2003 to 2011 period. Chinook PSC taken in Weeks 4 through 7 largely occurred in the Pacific cod A-season fishery. Chinook PSC taken in Weeks 8 through 11 are primarily recorded by trips targeting rex sole. The early spring spike in PSC (Weeks 12 through 17, typically falling in March and April) represents continued increasing PSC in the rex sole fishery as well as the most intense period of arrowtooth flounder-related PSC. The rockfish fishery, which occurs as late as November but falls off significantly in volume by August (Week 31), drives non-pollock PSC from the typical season opening (May, Week 18) through August. The highest weekly averages for rockfish-related PSC occur in July, as average weekly rockfish harvest peaks before falling sharply. Some additional PSC during this late spring (Weeks 18 through 20) occur in the arrowtooth and rex sole fisheries, but rockfish trips are the predominant source of summer PSC. Much of the September and October PSC (Weeks 35 through 42) is recorded by B-season Pacific cod trips, though shallow water flatfish trips emerge as a PSC source in late-

September (around Week 38) and continue through November once the cod season has ended. Trips targeting arrowtooth also display a resurgence in PSC after the end of the cod season (Weeks 43 through 46), though the increased Chinook catch does not correspond to an increase in arrowtooth target harvest levels.

Figure 4-11 Time distribution of Gulf-wide Chinook salmon PSC, 2003 to 2011



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

Central and Western GOA Chinook salmon PSC

Chinook salmon PSC in the Central GOA non-pollock trawl fisheries totaled 45,506 (84% of total GOA Chinook salmon PSC) from 2003 to 2011. Western GOA PSC totaled 8,500 (16% of total PSC) over the same period. On average, trips targeting rex sole, rockfish and shallow water flatfish fisheries contributed more to area PSC in the Central GOA than in the Western GOA. Conversely, PSC in the arrowtooth flounder and flathead sole fisheries was more prevalent in the Western GOA than it was in the Central GOA. Table 4-32 presents yearly PSC data for the principal GOA non-pollock groundfish trawl fisheries by regulatory area, in descending order of average annual PSC.

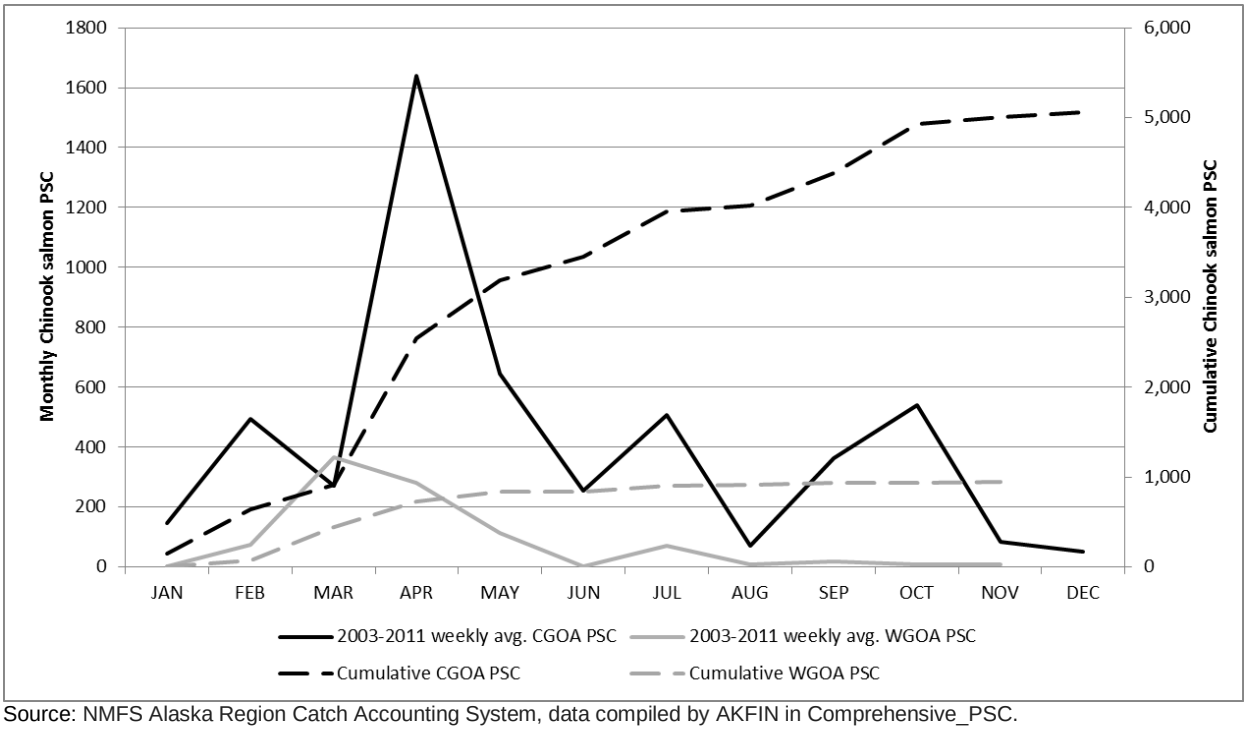
Table 4-32 Yearly Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries by regulatory area, 2003 to 2011

		Western GOA							Central GOA						
		Arrowtooth Flounder	Flathead Sole	Pacific Cod	Rockfish	Rex Sole	Shallow Water Flatfish	Western GOA TOTAL	Arrowtooth Flounder	Rex Sole	Rockfish	Pacific Cod	Shallow Water Flatfish	Flathead Sole	Central GOA TOTAL
2003	PSC	1,878		215		27	*	*	1,499	2,791	801	2,952	114	598	**8,755**
	%	88%		10%		1%	*	*	17%	32%	9%	34%	1%	7%	**100%**
2004	PSC	276	1,348	95		*	*	*	83	371	885	813	494	98	**2,743**
	%	15%	73%	5%		*	*	*	3%	14%	32%	30%	18%	4%	**100%**
2005	PSC	1,422	16			*	*	*	377	812	450	41	48		**1,728**
	%	88%	1%			*	*	*	22%	47%	26%	2%	3%		**100%**
2006	PSC	53	*	201		*		**351**	355	*	263	687	0	2	*
	%	15%	*	57%		*		**100%**	13%	*	10%	25%	0%	0%	*
2007	PSC	46		200	19	*	*	**304**	1,456	*	2,007	424	437		*
	%	15%		66%	6%	*	*	**100%**	29%	*	40%	8%	9%		*
2008	PSC	125		108	49			**282**	2,471		1,868	328	208		**4,876**
	%	44%		38%	18%			**100%**	51%		38%	7%	4%		**100%**
2009	PSC			10	107			**117**	6	1,911	1,072	101	1,749	118	**4,958**
	%			8%	92%			**100%**	0%	39%	22%	2%	35%	2%	**100%**
2010	PSC	*	144		292			**1,277**	3,103	2,299	1,217	435	1,012	352	**8,418**
	%	*	11%		23%			**100%**	37%	27%	14%	5%	12%	4%	**100%**
2011	PSC	*	*	342	225			**582**	3,012	1,354	755	1,009	82	21	**6,234**
	%	*	*	59%	39%			**100%**	48%	22%	12%	16%	1%	0%	**100%**
2003-2011	**PSC**	**516**	**175**	**130**	**77**	**45**	**2**	**945**	**1,374**	**1,291**	**1,035**	**754**	**460**	**132**	**5,047**
Avg.	**%**	**55%**	**19%**	**14%**	**8%**	**5%**	**0%**	**100%**	**27%**	**25%**	**20%**	**15%**	**9%**	**3%**	**100%**

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

The arrowtooth flounder fisheries in both the Western and Central GOA reported the most Chinook salmon PSC, accounting for over half of average annual Western GOA PSC (55%). With the exception of low PSC years in the Central GOA in 2004 and 2009, arrowtooth flounder typically ranked in the top three for yearly Chinook salmon PSC by species. Pacific cod fisheries recorded 14% and 15% of area subtotal PSC in the Western and Central GOA, respectively. Since 2007, the Central GOA Pacific cod fishery has decreased in PSC rank relative to other subarea target fisheries. Rockfish fisheries also accounted for significant proportions of Chinook salmon PSC in each region, reporting 8% of the Western GOA subtotal and 20% of the Central GOA subtotal. Yearly PSC ranking, relative to other subarea target fisheries, has increased in the Western GOA rockfish fishery since 2008. The Central GOA rockfish fishery displayed a PSC spike in 2007, following implementation of the Rockfish Pilot Program, and has declined steadily since then (further discussion of Central GOA rockfish PSC trends is included in Section 4.4.11). Western GOA flathead sole fisheries accounted for 19% of the Chinook salmon PSC area subtotal, while flathead sole Chinook PSC makes up only 3% of the Central GOA subtotal. The Western GOA flathead sole fishery experienced a one-year spike in PSC in 2004, reporting 1,348 Chinook salmon (73% of the subarea PSC total for that year). Rex sole and shallow water flatfish fisheries, on the other hand, were significant sources of Chinook salmon PSC in the Central GOA (25% and 9%, respectively), while together accounting for a very small proportion of total PSC in the Western GOA. The Central GOA shallow water flatfish target fishery experienced a PSC spike in 2009, reporting 1,749 Chinook salmon (35% of the subarea PSC total for that year).

Figure 4-12 Time distribution of Central GOA and Western GOA Chinook salmon PSC, 2003 to 2011



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

Figure 4-12 illustrates the distribution of Chinook salmon PSC in each regulatory area throughout the calendar year. Monthly levels represent the average PSC taken in all non-pollock target fisheries in a given calendar month, over the 2003 to 2011 period. Weekly PSC records were suppressed due to confidentiality constraints.

Chinook salmon PSC in the Western GOA mainly occurred from March to May (Weeks 11 through 20). 69% of the PSC recorded during this time of year occurred on trips targeting arrowtooth flounder; arrowtooth trips also accounted for 69% of non-pollock trawl harvest during that period. July PSC (Weeks 27 through 29) occurred during the early weeks of the Western GOA rockfish season. September PSC (Weeks 35 through 37) occurred largely in the Pacific cod B-season fishery, which was not a large fishery by harvest weight; on average, Western GOA B-season Pacific cod harvest totaled 75 mt on average (between Week 36 and Week 42). November PSC in the Western GOA accrued to trips that were designated as targeting rockfish and flathead sole.

Chinook PSC patterns in the Central GOA are largely similar to those observed for the Gulf as a whole (illustrated in Figure 4-11), which is not surprising considering that the area accounted for 84% of Chinook salmon PSC. Early year PSC occurred primarily in the Pacific cod A-season fishery and the rex sole fishery, though one February week exhibited an average of 35 arrowtooth-related Chinook salmon. The early spring spike is attributed mainly to rex sole and arrowtooth trips, while summer PSC was mainly associated with rockfish harvest. Fall and early-winter PSC occurred mainly in the Pacific cod B-season (Weeks 35 through 42) and in the shallow water flatfish fishery (Weeks 37 through 45).

GOA catcher/processor and catcher vessel Chinook salmon PSC

GOA catcher/processors took 53% of the total Chinook salmon PSC from 2003 to 2011 (28,477 Chinook salmon), while catcher vessels took 47% (25,529 Chinook salmon). The relative importance of individual target fisheries to Gulf-wide Chinook salmon PSC is somewhat different when taken by operational type

rather than regulatory area, in a manner that largely follows operation type participation in the various fisheries. Over the analyzed period, the rex sole fishery recorded the highest aggregate Chinook salmon PSC in the CP sector, while Pacific cod contributed the most PSC to the CV sector. During the analyzed years, the CV sector accounted for over 90% of the total Chinook salmon PSC taken by Pacific cod trips, which is not surprising given the split of Pacific cod TAC between the inshore and offshore sectors (and later CV and CP sectors). Arrowtooth flounder fisheries, which had recorded the highest aggregate Chinook salmon PSC levels by regulatory area, rank second in aggregate PSC for both CP and CV sectors. Rockfish fisheries remain an important contributor to Chinook salmon PSC for both operational types, accounting for 13% and 24% of the average yearly PSC for the CP and CV sector, respectively. 74% of Chinook salmon PSC in the flathead sole fisheries was taken by the CP sector, accounting for 7% of total CP PSC. Similarly, over 98% of Chinook salmon PSC in the shallow water flatfish fisheries was taken by the CV sector, representing 16% of total CV PSC. Table 4-33 presents yearly PSC data for GOA non-pollock groundfish trawl fisheries by operational type sector, in descending order of average annual PSC.

Table 4-33 Yearly Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries by operational type, 2003 to 2011

		Catcher Vessels							Catcher/Processors						
		Pacific Cod	Arrowtooth Flounder	Rockfish	Shallow Water Flatfish	Flathead Sole	Rex Sole	CV TOTAL	Rex Sole	Arrowtooth Flounder	Rockfish	Flathead Sole	Pacific Cod	Shallow Water Flatfish	CP TOTAL
2003	PSC	3,006	86	800	114	588	7	**4,601**	2,811	3,291	*	11	161	*	**6,275**
	%	65%	2%	17%	2%	13%	0%	**100%**	45%	52%	*	0%	3%	*	**100%**
2004	PSC	772	83	810	496	111		**2,271**	498	276	*	1,335	136	*	**2,322**
	%	34%	4%	36%	22%	5%		**100%**	21%	12%	*	58%	6%	*	**100%**
2005	PSC	41	434	98	44			**617**	982	1,364	352	16		12	**2,726**
	%	7%	70%	16%	7%			**100%**	36%	50%	13%	1%		0%	**100%**
2006	PSC	868	298	263		2		**1,431**	1,444	*		54	*		**1,628**
	%	61%	21%	18%		0%		**100%**	89%	*		3%	*		**100%**
2007	PSC	433	957	501	437			**2,329**	714	545	1,525		*	*	*****
	%	19%	41%	22%	19%			**100%**	24%	18%	51%		*	*	*****
2008	PSC	431	278	1,588	208			**2,506**		2,318	329		4		**2,651**
	%	17%	11%	63%	8%			**100%**		87%	12%		0%		**100%**
2009	PSC	111	6	773	1,749		153	**2,793**	1,758		406	118			**2,282**
	%	4%	0%	28%	63%		5%	**100%**	77%		18%	5%			**100%**
2010	PSC	435	2,676	966	957	5	*	*****	2,273	*	543	492		*	**4,631**
	%	9%	53%	19%	19%	0%	*	*****	49%	*	12%	11%		*	**100%**
2011	PSC	1,105	2,258	374	82	4	*	*****	1,260	755	607	32	*		*****
	%	28%	58%	10%	2%	0%	*	*****	43%	26%	21%	1%	*		*****
2003-2011	**PSC**	**800**	**786**	**686**	**454**	**79**	**70**	**2,837**	**1,305**	**1,103**	**426**	**229**	*****	*****	**3,155**
Avg.	**%**	**28%**	**28%**	**24%**	**16%**	**3%**	**2%**	**100%**	**41%**	**35%**	**13%**	**7%**	*****	*****	**100%**

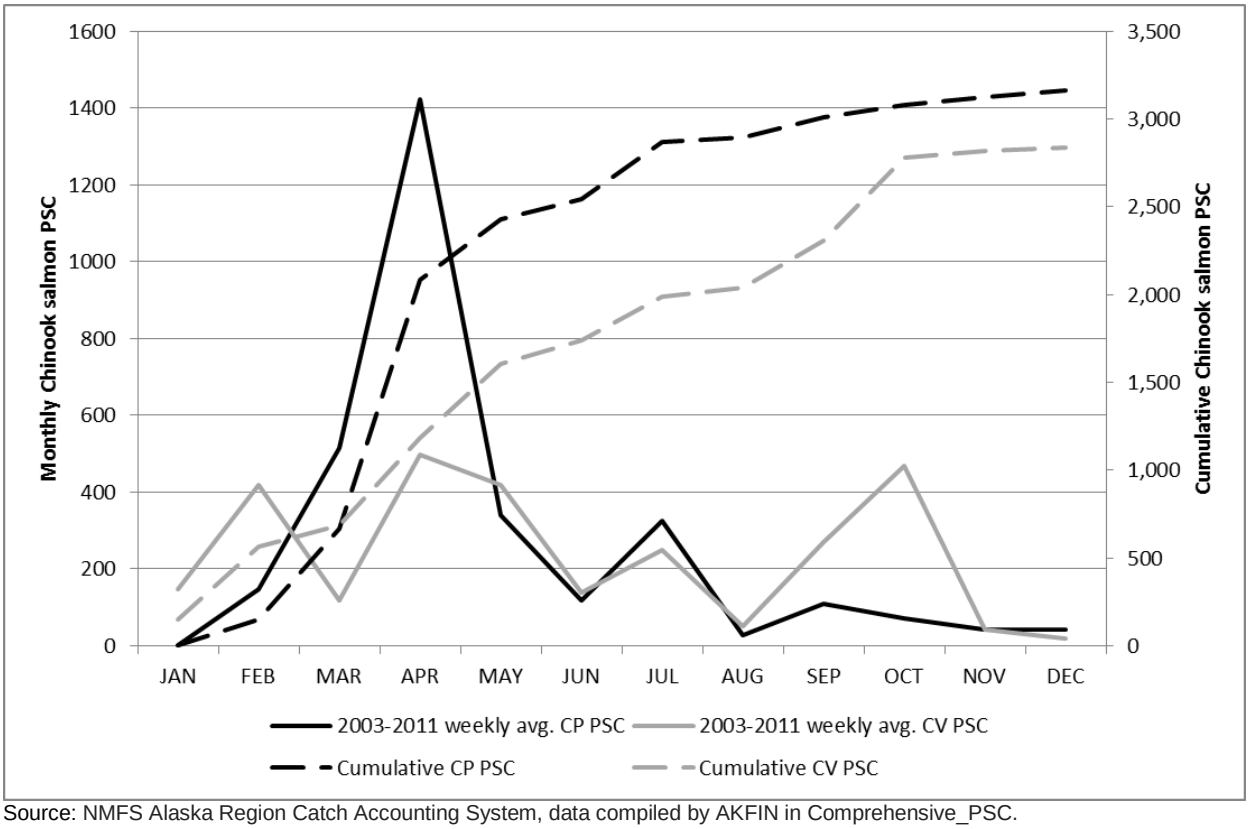
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

Figure 4-13 illustrates the distribution of Chinook salmon PSC in each operational type sector throughout the calendar year. Monthly levels represent the average PSC taken in all non-pollock target fisheries in a given calendar month, over the 2003 to 2011 period. Weekly PSC records were suppressed due to confidentiality constraints.

The CV sector records the majority of early season PSC, as it mainly occurs in the Pacific cod fishery for which CPs receive a relatively smaller portion of TAC. Between Weeks 14 and 20 (April and May), trips targeting arrowtooth flounder account for the majority of PSC in the CV sector. CVs harvest significant amounts of both rockfish and shallow water flatfish during the summer season, but nearly all PSC in Weeks 20 through 30 occurs in the rockfish fishery. Rockfish-related PSC decreases to very small average weekly amounts during Weeks 31 through 46 (late-July through November) when smaller, but not insignificant, amounts of rockfish have been harvested. Most of the CV sector's fall PSC occurs in the Pacific cod B-season, though shallow water flatfish trips emerge as the principal source of PSC from late-September through November. Weeks 43 through 45 (typically falling in late-October and early-November) recorded, on average, more than half of CV PSC in those weeks from arrowtooth trips, though those weeks do not directly correspond to the highest levels of late-year arrowtooth harvest.

The CP sector tended to record more of its average annual Chinook salmon PSC in the earlier part of the year. Trips targeting rex sole and arrowtooth flounder supplied the majority of the spring spike in PSC from Week 8 to Week 20, with two weeks in March (Weeks 12 and 13) displaying high average PSC from the flathead sole fishery. Summer CP PSC, from Week 24 to Week 30, occurred mainly in the rockfish fishery, with a re-emergence of rex sole-related PSC occurring in the latter half of the summer (Weeks 28 through 31). The majority of late year CP PSC was recorded in the rex sole fishery.

Figure 4-13 Time distribution of GOA catcher/processor and catcher vessel Chinook salmon PSC, 2003 to 2011



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

Operational type sector (CP/CV) Chinook salmon PSC within each GOA regulatory area (Central and Western GOA)

Gulf-wide Chinook salmon PSC totaled 54,006 from 2003 to 2011. The Central GOA CV sector caught 46% of this amount, followed by the Central GOA CP sector (38%), the Western GOA CP sector (15%), and the Western GOA CV sector (1%). Table 4-34 presents yearly PSC data for principal GOA non-pollock groundfish trawl fisheries by regulatory area and operational type sector, in descending order of average annual PSC.

Within the Central GOA CV sector, the arrowtooth flounder, Pacific cod and rockfish fisheries have produced the highest average annual Chinook salmon PSC. Though it ranks fourth in average annual PSC for this sector, the vast majority of Chinook salmon taken in the shallow water flatfish fishery comes from this sector. The Central GOA CV shallow water flatfish fishery experienced a one-year spike in PSC in 2009, reporting 1,749 Chinook salmon (63% of the 2009 sector subtotal). With the exception of a very low PSC year in 2009, the Central GOA CV arrowtooth fishery has been among the sector's highest

Chinook PSC targets since 2005. This sector's Pacific cod and rockfish target fisheries experienced notably high PSC years in 2003 and 2008, respectively.

Trips targeting the rex sole fishery accounted for 55% of average annual Chinook salmon PSC in the Central GOA CP sector. Excepting 2007 and 2008, the rex sole fishery was responsible for more than half of the sector's Chinook salmon PSC in every year. Arrowtooth flounder trips accounted for 26% of Chinook salmon PSC on average, with notably high PSC years in 2008 (89% of yearly sector PSC) and 2003 (33%). Central GOA CP rockfish trips accounted for 15% of Chinook salmon PSC on average, taking more than any other target fishery in 2007 (56% of yearly sector PSC).

In the Western GOA CP sector, trips targeting arrowtooth flounder accounted for 58% of Chinook salmon PSC on average. PSC in the arrowtooth flounder fishery was variable across years, but accounted for more than half of the Chinook salmon taken in the sector in four of nine years and 95% of PSC in 2003. The sector's flathead sole fishery took 20% of Chinook salmon PSC on average, though no Chinook PSC were recorded from 2007 through 2009. The flathead sole fishery experienced a particularly high PSC year in 2004, catching 1,333 Chinook salmon (73% of the yearly sector PSC). The rockfish and Pacific cod fisheries accounted for 9% and 8% of the sector's average annual PSC, respectively. Western GOA CP trips accounted for an atypically high proportion of the sector's PSC in 2007. Trips targeting rockfish species did not report any Chinook salmon PSC until 2007; the rockfish fishery's PSC level has been increasing since then, taking all 107 Chinook salmon reported in the sector in 2009 and peaking at 292 PSC in 2010.

The Western GOA CV sector has averaged only 72 Chinook salmon per year over the analyzed period. The Pacific cod fishery accounted for 88% of the average PSC total, reporting Chinook salmon catch in all years but 2005 and 2010. PSC data for other Western GOA CV targets are restricted due to confidentiality rules. No target species besides Pacific cod recorded Chinook salmon PSC in more than one of the analyzed years.

Table 4-34 Yearly Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries by regulatory area and operational type, 2003 to 2011

		Western GOA Catcher Vessels						Western GOA Catcher/Processors						
		Pacific Cod	Arrowtooth Flounder	Flathead Sole	Shallow Water Flatfish	Rockfish	WG CV TOTAL	Arrowtooth Flounder	Flathead Sole	Rockfish	Pacific Cod	Rex Sole	Shallow Water Flatfish	WG CP TOTAL
2003	PSC	143					**143**	1,878			*	27	*	**1,978**
	%	100%					**100%**	95%			*	1%	*	**100%**
2004	PSC	3		*	*		**20**	276	1,333		92	*	*	**1,830**
	%	16%		*	*		**100%**	15%	73%		5%	*	*	**100%**
2005	PSC		*				*	1,364	16			*	*	**1,558**
	%		*				*	88%	1%			*	*	**100%**
2006	PSC	201					**201**	53	*			*		**150**
	%	100%					**100%**	36%	*			*		**100%**
2007	PSC	9				*	*	46		19	*	*	*	**295**
	%	98%				*	*	16%		6%	*	*	*	**100%**
2008	PSC	107					**107**	125		49	*			*
	%	100%					**100%**	71%		28%	*			*
2009	PSC	10					**10**			107				**107**
	%	100%					**100%**			100%				**100%**
2010	PSC						**0**	*	144	292				**1,276**
	%						**100%**	*	11%	23%				**100%**
2011	PSC	96					**96**	*	*	225	*			**487**
	%	100%					**100%**	*	*	46%	*			**100%**
2003-2011	**PSC**	**63**	*	*	*	*	**72**	**509**	**174**	**77**	**67**	**45**	**1**	**873**
Avg.	**%**	**88%**	*	*	*	*	**100%**	**58%**	**20%**	**9%**	**8%**	**5%**	**0%**	**100%**

		Central GOA Catcher Vessels							Central GOA Catcher/Processors						
		Arrowtooth Flounder	Pacific Cod	Rockfish	Shallow Water Flatfish	Flathead Sole	Rex Sole	CG CV TOTAL	Rex Sole	Arrowtooth Flounder	Rockfish	Flathead Sole	Pacific Cod	Shallow Water Flatfish	CG CP TOTAL
2003	PSC	86	2,863	800	114	588	7	**4,458**	2,784	1,413	*	*	89		**4,297**
	%	2%	64%	18%	3%	13%	0%	**100%**	65%	33%	*	*	2%		**100%**
2004	PSC	83	769	810	494	96		**2,251**	371		*	*	44		**492**
	%	4%	34%	36%	22%	4%		**100%**	75%		*	*	9%		**100%**
2005	PSC	377	41	98	44			**559**	812	*	352			*	**1,168**
	%	67%	7%	18%	8%			**100%**	70%	*	30%			*	**100%**
2006	PSC	298	667	263		2		**1,230**	1,402	*			*		**1,479**
	%	24%	54%	21%		0%		**100%**	95%	*			*		**100%**
2007	PSC	957	424	501	437			**2,320**	*	*	1,506				**2,680**
	%	41%	18%	22%	19%			**100%**	*	*	56%				**100%**
2008	PSC	278	324	1,588	208			**2,399**		2,193	*		*		**2,477**
	%	12%	14%	66%	9%			**100%**		89%	*		*		**100%**
2009	PSC	6	101	773	1,749		153	**2,783**	1,758		*	*			**2,175**
	%	0%	4%	28%	63%		6%	**100%**	81%		*	*			**100%**
2010	PSC	2,676	435	966	957	*	*	**5,064**	2,273	*	251	*		*	**3,354**
	%	53%	9%	19%	19%	*	*	**100%**	68%	*	7%	*		*	**100%**
2011	PSC	2,258	1,009	374	82	*	*	**3,821**	1,260	754	*	*			**2,413**
	%	59%	26%	10%	2%	*	*	**100%**	50%	30%	*	*			**100%**
2003-2011	**PSC**	**780**	**737**	**686**	**454**	**77**	**31**	**2,765**	**1,259**	**594**	**349**	**55**	*	*	**2,282**
Avg.	**%**	**28%**	**27%**	**25%**	**16%**	**3%**	**1%**	**100%**	**55%**	**26%**	**15%**	**2%**	*	*	**100%**

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

Figure 4-14 illustrates the distribution of Chinook salmon PSC for each operational type sector in each considered regulatory area throughout the calendar year. Monthly levels, displayed in the upper panel, represent the average PSC taken in the principal non-pollock target fisheries in a given calendar month during the 2003 to 2011 period. The lower panel shows the accumulation of average annual sector PSC throughout the year. Weekly PSC records were suppressed due to confidentiality constraints.

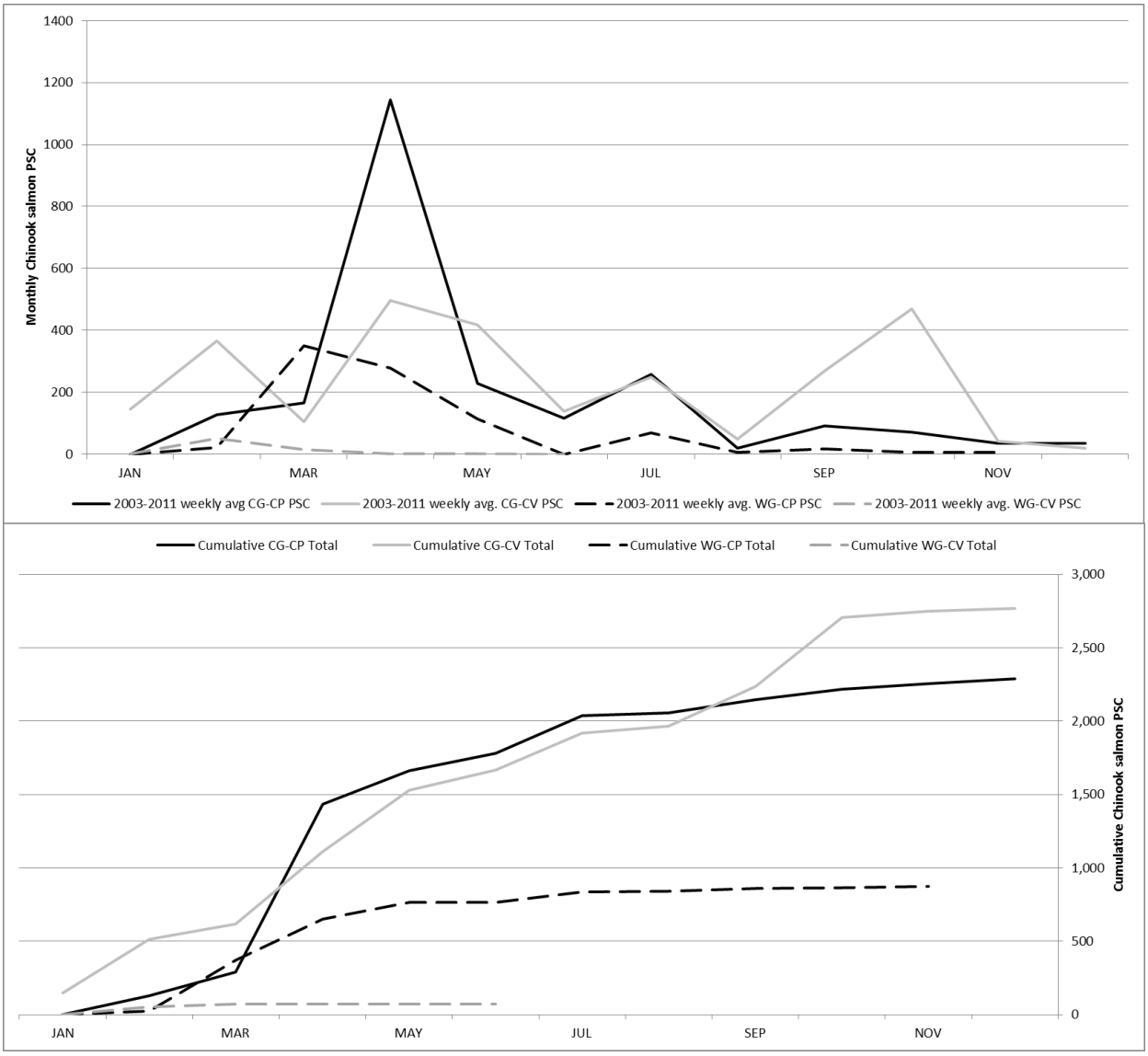
Central GOA CVs typically recorded the highest Chinook salmon PSC levels during the earliest and latest portion of the year. As is typically the case, January and February PSC (Weeks 3 through 8) are driven by the Pacific cod A-season. The uptick in Central GOA CV PSC in March (Weeks 9 through 11) come primarily from trips targeting flathead sole. Arrowtooth fishing also contributes to February PSC in this sector, but do not become the primary driver of PSC until the spring season from late-March through May (Weeks 13 through 19). Rockfish trips account for nearly all of the Central GOA CV sector's PSC from late-May through late-July (Weeks 18 through 30). The Pacific cod B-season accounts for most of the early-fall spike in PSC, while a second spike in November is mainly attributed to shallow water flatfish and arrowtooth fishing.

From February to May (Weeks 5 to 20), PSC in the Central GOA CP sector comes primarily from trips targeting rex sole. Arrowtooth trips contribute a similar amount of PSC during the peak PSC time that occurs in April (Weeks 14 to 17). This increase in arrowtooth-related PSC mirrors the increase in arrowtooth harvest at that time of year; however, one should note that significant amounts of flathead sole and shallow water flatfish are harvested during portions of this spring season, and are not generating much in the way of Chinook salmon PSC. Like the Central GOA CV sector, area CPs record the majority of summer PSC in the rockfish fishery. This activity begins later in the CP sector, as CP rockfish harvest does not begin until June (Week 24). In the Central GOA CP sector, fall PSC is mainly attributed to rex sole and, to a lesser extent, flathead sole fishing, whereas it was largely driven by Pacific cod and shallow water flatfish in the Central GOA CV sector. Several non-consecutive fall weeks recorded spikes in arrowtooth-related PSC; arrowtooth trips generally comprise the greatest proportion of Central GOA CP harvest from the late summer through the fall.

PSC in the Western GOA CP sector spiked in late-March and early-April (Weeks 12 through 14). These Chinook salmon were mainly recorded in the flathead sole and arrowtooth fisheries, which were also the leading harvest fisheries for the sector during that time. The late-April spike centered around the arrowtooth fishery in Week 17, which was again the dominant harvest fishery at the time. As with the Central GOA CP sector, summer PSC (July, Weeks 27 through 29) occurred at the start of the rockfish season. Fall PSC occurred at a low level in this sector, and was mainly related to the Pacific cod B-season.

Western GOA CV PSC occurred at low levels throughout the year, as harvested amounts were typically smaller in this sector. February and early-March PSC was linked to the Pacific cod A-season, while late-March PSC (Week 13) corresponded to the one week when the sector targeted arrowtooth.

Figure 4-14 Time distribution of GOA catcher/processor and catcher vessel Chinook salmon PSC within each regulatory area (Central and Western GOA), 2003 to 2011



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

4.4.10 Rates of Chinook Salmon PSC in GOA Non-pollock Fisheries

4.4.10.1 PSC Rate Trends by Year

The PSC rates reported and analyzed in this document reflect the number of Chinook salmon caught per metric ton of non-pollock groundfish trawl harvest. In considering the Chinook salmon PSC action for pollock trawlers (Amendment 93), the Council recognized that PSC rates are highly variable in GOA trawl fisheries. While not necessarily indicative of total Chinook salmon PSC, the PSC rate provides a measure of bycatch frequency or intensity in a given area or for a given sector. The historical Chinook salmon PSC rates reported here focus on annual average rates, and average rates for a given calendar month or week during a set of years (2003 to 2011 or 2007 to 2011; Table 4-35). Note that the PSC rates reported here are calculated directly from NOAA's CAS data, and are not the same rates used under the current Observer Program to estimate Chinook salmon PSC for unobserved trawl trips.

Given the variability in observed historical Chinook salmon PSC rates, the extrapolated nature of PSC estimates, and the confluence of environmental factors and harvester choices that determine Chinook salmon encounter in trawl fishing, this analysis does not attempt to speculate on the cause of PSC rate trend changes. Rather, this section provides a comparative history of PSC rates for the regulatory areas, operation types and target fisheries that are relevant to the Council's proposed alternatives. This review of PSC rate history also provides a comparison of the approximate 5- and 10-year time periods under consideration as the basis for Chinook PSC apportionment by this action. While describing recent PSC rate trends may highlight the relative importance of GOA areas, operational types, or target species, the high degree of annual variability should be a caution against expecting future rates to conform to recent average rate trends.

Table 4-35 Yearly average Chinook salmon PSC rates for all GOA non-pollock target fisheries

	YEAR										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2003-2011 Average	2007-11 Average
Total GOA	0.26	0.32	0.14	0.09	0.10	0.05	0.08	0.17	0.09	**0.14**	**0.10**
Central GOA	0.30	0.14	0.07	0.09	0.10	0.05	0.09	0.18	0.08	**0.12**	**0.10**
Western GOA	0.10	0.94	0.39	0.06	0.07	0.03	0.01	0.12	0.13	**0.21**	**0.07**
GOA Catcher/Processors	0.35	0.70	0.27	0.15	0.19	0.07	0.13	0.30	0.16	**0.26**	**0.17**
GOA Catcher Vessels	0.19	0.12	0.04	0.05	0.07	0.04	0.07	0.12	0.06	**0.09**	**0.07**
CGOA CP	0.49	0.18	0.15	0.19	0.27	0.10	0.17	0.34	0.15	**0.23**	**0.21**
CGOA CV	0.20	0.13	0.02	0.05	0.07	0.04	0.07	0.13	0.06	**0.09**	**0.07**
WGOA CP	0.10	1.32	0.47	0.06	0.09	0.03	0.02	0.16	0.17	**0.27**	**0.09**
WGOA CV	0.08	0.07	0.19	0.05	0.01	0.03	0.01	0.00	0.04	**0.05**	**0.02**

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Table 4-36 PSC rate by GOA non-pollock target species, 2003 to 2011 & 2007 to 2011

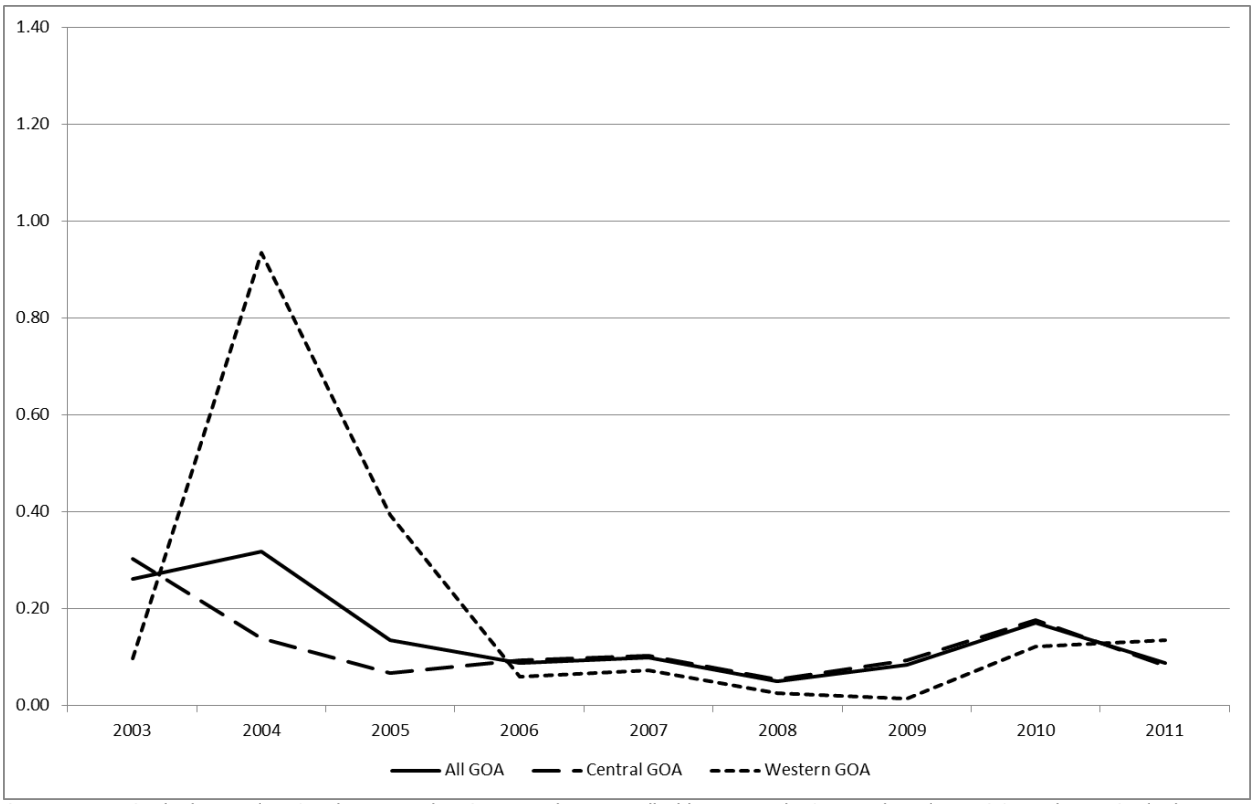
TARGET	PSC Rate (# Chinook/mt)	
	2003-2011	2007-2011
Rex Sole	0.477	0.367
Flathead Sole	0.223	0.063
Arrowtooth Flounder	0.115	0.112
Pacific Cod	0.066	0.043
Shallow Water Flatfish	0.064	0.075
Rockfish	0.053	0.072
Deep Water Flatfish	0.000	0.000

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Gulf-wide, the annual Chinook salmon PSC rate ranged between 0.05 and 0.32 during the analyzed period (Table 4-35). These rates suggest that the GOA non-pollock trawl fleet, which annually harvested an average of 62,437 mt, caught one Chinook salmon for every 20 mt of groundfish in the lowest PSC year, and one for every 3 mt in the highest PSC year. On the whole, Chinook salmon PSC rates during the five-year 2007 to 2011 period tend to be lower than PSC rates covering the entire 2003 to 2011 period. Rockfish and shallow water flatfish PSC rates are an exception to this observation, especially in the Central GOA. Trips targeting rex sole recorded the highest PSC rate for any species, at 0.48 from 2003 to 2011 and 0.37 from 2007 to 2011. The four target species that combined to make up 93% of total GOA non-pollock trawl fishery – arrowtooth flounder, Pacific cod, rockfish, and shallow water flatfish – each

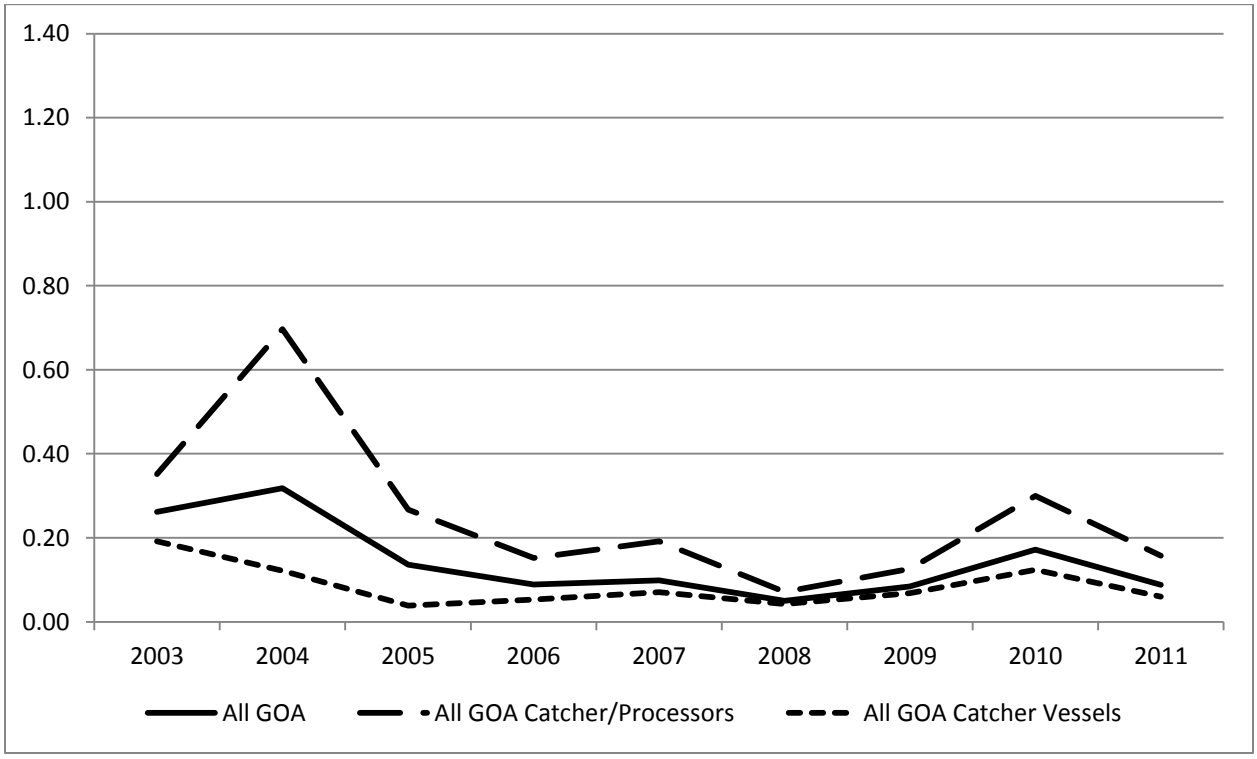
recorded PSC rates near or below the gulf-wide average rate, between 0.05 and 0.12 from 2003 to 2011 and between 0.04 and 0.11 from 2007 to 2011 (Table 4-36).

Figure 4-15 Yearly average PSC rates in Central and Western GOA non-pollock fisheries (2003 to 2011)



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Figure 4-16 Yearly average PSC rates in GOA non-pollock fisheries, by operational harvest type (2003 to 2011)

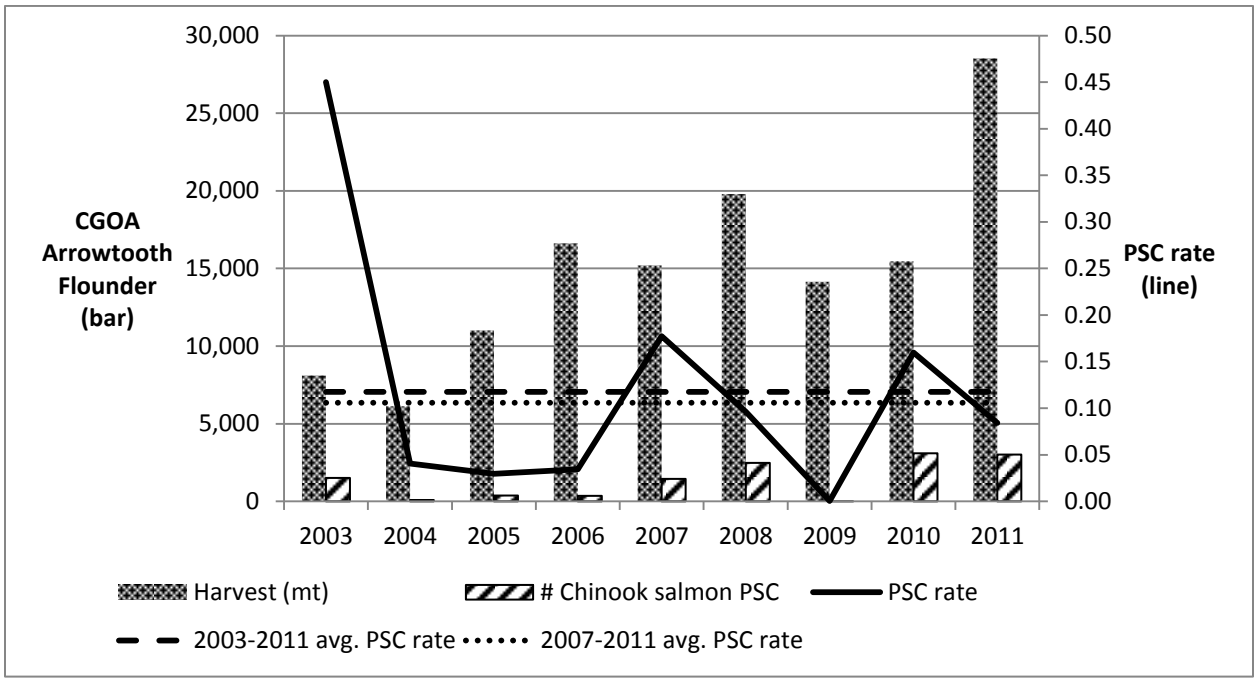


Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Chinook salmon PSC in the Western GOA was more variable than in Central GOA PSC. The nine-year PSC rate average is higher in the Western GOA, though one should recall that total harvest in this regulatory area was only 17.6% of the gulf-wide total (Table 4-16). The 2003 to 2011 Western GOA PSC rate is upwardly influenced by high Chinook salmon PSC years in 2004 and 2005. Western GOA PSC rates have been lower than rates in the Central GOA during all subsequent years except for 2011. Rex sole and flathead sole recorded the highest 2003 to 2011 PSC rates in the Western GOA (0.71 and 0.59, respectively), owing largely to very high Chinook PSC years in 2004 and 2005. These high PSC years were not the result of low target harvest years, which could affect any conclusions drawn from a superficial inspection of rates. PSC rates for these, and all other Western GOA target species, have declined since 2007. Only Pacific cod and rockfish recorded higher average PSC rates from 2007 to 2011 than for the entire nine-year period, but the increase was very small (0.01 and 0.02); Pacific cod and rockfish, along with shallow water flatfish, recorded the lowest average PSC rates in the Western GOA over the entire analyzed period (0.07, 0.03 and 0.05, respectively).

Central GOA PSC rates displayed less variability throughout the analyzed period, with all target species – except for rockfish and shallow water flatfish – experiencing a modest decrease in average PSC rate since 2007. Central GOA rex sole recorded the highest average rate (0.47). The area's key harvest target species (arrowtooth flounder, Pacific cod, rockfish and shallow water flatfish) each recorded period average PSC rates between 0.07 and 0.12. To illustrate the wide variation in annual PSC rates, Figure 4-17 provides harvest and Chinook salmon PSC trends for Central GOA arrowtooth flounder, which accounted for 29% of aggregate Central GOA harvest and 24% of total GOA harvest during the analyzed period. This example shows that PSC rates are not a necessarily a strong indicator of total Chinook salmon PSC or of harvest; it also shows that variable annual PSC rates do not necessarily result in dissimilar average PSC rates over five- and nine-year historical periods.

Figure 4-17 Yearly harvest, Chinook salmon PSC and PSC rate with period averages for Central GOA arrowtooth flounder (2003 to 2011)



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

From a Gulf-wide perspective, the catcher/processor sector recorded higher Chinook salmon PSC rates and displayed greater variability across years. CP vessels recorded an average annual PSC rate of 0.25 from 2003 to 2011, and 0.17 from 2007 to 2011. The sector's highest rates of Chinook salmon encounter occurred in 2003 (0.35), 2004 (0.70), 2005 (0.27), and 2010 (0.30) (Table 4-35). CP vessels accounted for only 35% of total non-pollock GOA groundfish harvest over the period, but took 53% of total GOA Chinook salmon PSC. By contrast, GOA catcher vessels recorded an average PSC rate of 0.08 from 2003 to 2011 and 0.07 from 2007 to 2011, with no years in excess of 0.20 Chinook salmon per metric ton of non-pollock groundfish harvest. As before, CP and CV trawlers targeting rockfish and shallow water flatfish experienced modest average PSC rate increases in the more recent five-year period, with Pacific cod PSC rates increasing in the CP sector as well. Rex sole and flathead sole recorded the highest PSC rates in both the CP and CV sector.

Higher average Chinook PSC rates for CP vessels persist when looking at operational types within each regulatory area (Table 4-35). Rex sole and flathead sole remain the target species with the highest PSC rates for the sectors in which they are targeted (Central GOA CP and CV, and Western GOA CP). Chinook salmon PSC rates have been lower in both Western GOA sectors during the 2007 to 2011 period.

4.4.10.2 PSC Rate Trends within Years (by month, by week)

Considering the historical record of Chinook salmon PSC rates in GOA non-pollock fisheries throughout the calendar year can aid in developing a sense for how PSC limits are likely to affect season closure dates. Moreover, if retrospective analysis of the 2003 to 2011 and 2007 to 2011 periods predicts that GOA non-pollock groundfish fisheries would close earlier under PSC limits, PSC rates for the weeks and months coming after that predicted closure could provide a measure of Chinook salmon savings.

One should keep in mind that, without considering the tons of target species harvested, high PSC rates do not necessarily predict large amounts of Chinook salmon PSC. PSC rates are simply a measure of Chinook salmon catch per unit of effort (where one unit is a metric ton of target species harvest). In light of this fact, it is also useful to look back to Section 4.4.8 on the monthly distribution of target harvest from 2007 to 2011. In doing so, the following notes bear mention:

- Gulf-wide –
    - 29% of non-pollock groundfish harvest occurred in July, when average PSC rates were very low (0.03) compared to the average annual rate (0.13);
    - only 0.3% of non-pollock harvest occurred in December, when average PSC rates were very high (0.38) compared to the average annual rate (0.13);
    - 18% of non-pollock groundfish harvest occurred in March and April (4% in March and 14% in April), when average PSC rates (0.29 in March and 0.28 in April) were well above the average annual rate (0.13);
- in the Western GOA –
    - 70% of harvest occurred in February and July (21% in February and 49% in July), when average PSC rates (0.05 in February and 0.01 in July) were low compared to the average annual rate (0.21);
    - only 0.02% of harvest occurred in June, when this extremely small sample created an outlying PSC rate of 3.37;
- in the catcher/processor sector –
    - 54% of harvest occurred in July, when average PSC rates (0.03) were very low compared to the average annual rate of 0.25;
    - only 0.2% of harvest occurred in December, when the PSC rate averaged 1.39 compared to the average annual rate of 0.25;
    - the 0.00 average PSC rate in January was recorded during a month that accounted for only 0.07% of sector harvest.

This and other information is reflected in Table 4-37. The average PSC rate reported for each potential Chinook salmon PSC apportionment subdivision of the GOA (row) is weighted by the number of records in each month (meaning not all months contribute equally to the average).

Table 4-37 Monthly average Chinook salmon PSC rates for all GOA non-pollock target fisheries

	MONTH												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average
2003-2011													
Total GOA	0.03	0.12	0.29	0.28	0.15	0.13	0.03	0.06	0.10	0.13	0.09	0.38	**0.14**
Central GOA	0.03	0.14	0.25	0.22	0.12	0.09	0.03	0.06	0.10	0.14	0.08	0.38	**0.12**
Western GOA	0.03	0.05	0.45	0.69	0.44	3.37	0.01	0.08	0.11	0.00	*		**0.21**
GOA Catcher/Processors	0.00	0.31	0.43	0.69	0.44	0.68	0.03	0.04	0.13	0.07	0.21	*	**0.26**
GOA Catcher Vessels	0.04	0.10	0.21	0.05	0.07	0.08	0.02	0.07	0.09	0.16	0.06	0.13	**0.09**
CGOA CP	*	0.39	0.35	0.67	0.43	0.14	0.05	0.03	0.13	0.09	0.20	*	**0.23**
CGOA CV	0.04	0.12	0.21	*	0.07	0.08	*	0.07	0.09	0.16	0.06	0.13	**0.09**
WGOA CP	*	0.17	0.52	0.74	0.44	3.37	0.01	0.08	0.11	0.00	*		**0.27**
WGOA CV	0.03	0.03	0.23	0.18			*			0.01			**0.05**
2007-2011													
Total GOA	0.02	0.05	0.11	0.17	0.11	0.11	0.03	0.06	0.10	0.15	0.09	0.38	**0.10**
Central GOA	0.02	0.04	0.09	0.17	0.11	0.11	0.03	0.05	0.10	0.16	0.08	0.38	**0.10**
Western GOA	0.01	0.06	0.17	0.16	0.04		0.02	0.13	0.00	0.00	*		**0.07**
GOA Catcher/Processors	0.00	0.25	0.23	0.37	0.23	0.21	0.04	0.08	0.19	0.07	0.21	*	**0.17**
GOA Catcher Vessels	0.02	0.02	0.04	0.06	0.09	0.10	0.01	0.06	0.08	0.17	0.06	0.13	**0.07**
CGOA CP	*	0.29	0.24	0.43	0.37	0.21	0.06	0.05	0.22	0.09	0.20	*	**0.21**
CGOA CV	0.02	0.02	0.04	0.06	0.09	0.10	*	0.06	0.08	*	0.06	0.13	**0.07**
WGOA CP	*	0.19	0.21	0.16	0.04		0.02	0.13	0.00	0.00	*		**0.09**
WGOA CV	0.01	0.02	0.02				*			0.02			**0.02**

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

The following paragraphs relate 2007 to 2011 Gulf-wide PSC rates to harvest on the trip target level.

On average, 35% of the arrowtooth flounder harvest occurred from August to October when Chinook salmon PSC rates were near or below the annual average rate. February, accounting for over 12% of arrowtooth harvest, was also well below the annual average PSC rate. On the other hand, 40% of harvest occurred in April when the PSC rate was 0.17 compared to an average annual rate of 0.11 for arrowtooth. Trips targeting arrowtooth in May incurred a relatively high PSC rate of 0.34, but these trips accounted for only 4% of average annual harvest.

Chinook salmon PSC rates for GOA Pacific cod trips are generally low, with an annual average of 0.06. 58% of Pacific cod harvest occurs at the A-season opening in January and February, when PSC rates are 0.02 and 0.04 respectively. A further 8% of average annual harvest occurs in March before the A-season closure; these trips incurred a higher PSC rate of 0.12. A further 31% of annual Pacific cod harvest occurs in September and October when the B-season opens. The average September PSC rate was 0.13 and the average rate for October was 0.07, both above the average annual rate.

GOA rockfish trips have recorded an annual average Chinook salmon PSC rate of 0.08. 26% of harvest occurred in May and June when PSC rates were high (0.16 and 0.19, respectively). 61% of harvest occurred in July when the PSC rate was much lower (0.04).

GOA Shallow water flatfish trips also recorded an average annual Chinook salmon PSC rate of 0.08. September and October were the only months where PSC rates exceeded this level (0.13 and 0.31, respectively). Trips occurring during these months accounted for 25% of total harvest (5% in September and 20% in October).

4.4.10.3 PSC Rate Trends by Regulatory Area

Central GOA

The key target species in each regulatory area display Chinook salmon PSC rates similar to those observed on a gulf-wide basis. Together, arrowtooth flounder, Pacific cod, rockfish and shallow water

flatfish accounted for 92% of Central GOA harvest. The PSC rates for these species in the Central GOA were 0.11, 0.06, 0.09 and 0.08, respectively. Considering trip target monthly PSC rates within a specific regulatory area may provide anecdotal evidence on Chinook salmon abundance as it relates to environmental factors. For example, a high PSC rate recorded in a month with low target species harvest could indicate that PSC was driven by a higher concentration of Chinook salmon.

Central GOA arrowtooth flounder displayed both high and low PSC rates during high harvest months. The annual average Chinook salmon PSC rate for Central GOA arrowtooth was 0.11. The PSC rate was only 0.01 in February, when 13% of 2007 to 2011 area harvest was taken. Conversely, trips targeting arrowtooth recorded a PSC rate of 0.17 in April when 39% of harvest was taken. The high harvest months of August through October also displayed great variation in PSC rates; the PSC rate in August was above the annual average level (0.13), the September PSC rate was less than 0.01, and the October rate was 0.09. May and December PSC rates were relatively high (0.41 and 0.29, respectively) but May harvest accounted for only 4% of total 2007 to 2011 harvest while December harvest was negligible, illustrating the previous point regarding randomly high Chinook salmon encounters.

Central GOA Pacific cod – which is most intensely harvested by CVs in January, February, September and October – displayed less PSC rate variation from the annual average of 0.06. Rates were low (0.02 and 0.03 in the early months) and above the average in the region's later harvest months (0.13 and 0.08).

Chinook PSC rates in the Central GOA rockfish fishery were highest in the early season harvest months (0.16 in May and 0.19 in June). The rate dropped to 0.05 in July, which covered the largest proportion of harvest at 46%. PSC rates remained below the annual average rate of 0.09 through the end of harvesting in November.

Because shallow water flatfish are almost exclusively harvested in the Central GOA (by CVs), monthly PSC rates in relation to harvest patterns are the same as described in the Gulf-wide section, above.

Flathead sole, which had been identified as a high-PSC rate species in the previous gulf-wide section, recorded only a 0.11 PSC rate in the Central GOA. However, late-year months (October-December) that accounted for 24% of species harvest in the area recorded PSC rates higher than the spring and summer months.

Rex sole, also a high-PSC rate species gulf-wide, are targeting primarily by CPs. Rex sole trips recorded a 0.30 annual average rate in the Central GOA. July and August, which accounted for 22% of area rex sole harvest, where low PSC rate months (0.01 and 0.07, respectively), but all other harvest months recorded high PSC rates (0.26-0.56) with little correlation to the total amount harvested.

Western GOA

Western GOA PSC rates were more variable and even less correlated to total species harvest amounts. The CP rockfish fishery, which made up 60% of the area's trawl fishery, recorded a 0.02 PSC rate in July (covering 92% of rockfish harvest), but 0.31 in August (5% of rockfish harvest). On the other hand, Western GOA Pacific cod trips – mainly CVs – encountered low PSC rates in January and February (0.01 and 0.07, together accounting for 73% of harvest) and high rates of Chinook salmon in some heavy harvest months (0.24 PSC rate in March, covering 26% of harvest). Western GOA CP arrowtooth flounder trips recorded high PSC rates in heavy harvest months (April and May), but had near-zero PSC rates during August and October when harvest combined to account for 20% of total catch. PSC rates for Western GOA CP rex sole and flathead sole were lower compared to the Central GOA, especially for months later in the year. Rex sole area PSC rates for July through September were near-zero; harvest in those months made up 63% of the area total.

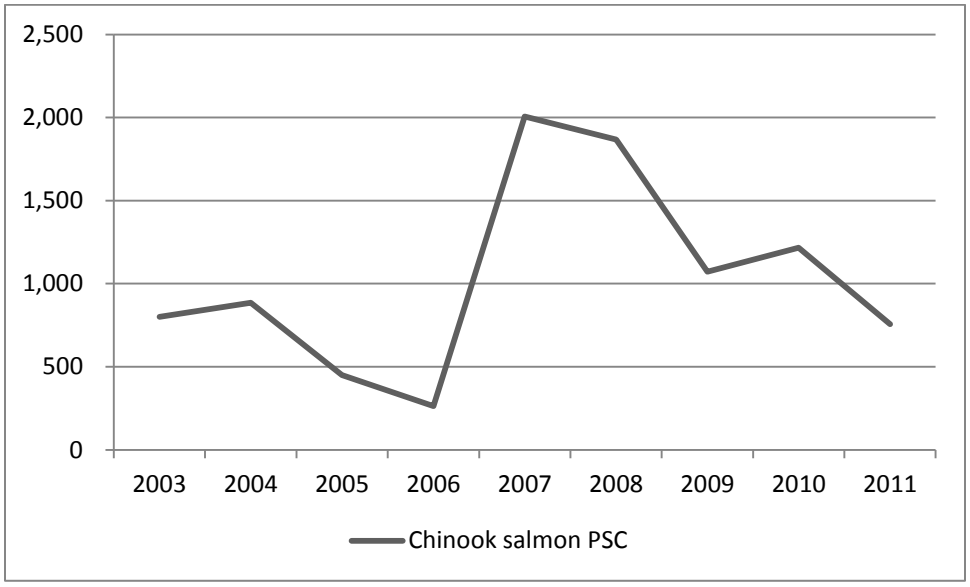
4.4.11 Rockfish Program

From 2003 to 2011, rockfish trips made up one-third of total GOA non-pollock groundfish trawl harvest, and the Central GOA landed 73% of that amount. Over that period, 84% of GOA non-pollock related Chinook salmon PSC occurred in the Central GOA. Trips targeting rockfish accounted for 19% of total non-pollock trawl fishery Chinook salmon PSC; Central GOA rockfish trips accounted for 93% rockfish-related PSC. [16]

The purpose and need drivers of the Rockfish Pilot Program (RPP)[17] identified fishers' limited ability to minimize bycatch under existing LLP management. The RPP, which was replaced by the Rockfish Program (RP)[18] after the RPP's sunset in 2011, established a cooperative management structure in which members can coordinate and distribute fishing activity over a greater portion of the year.

Many of the RP outcomes are beyond the scope of this analysis, but Central GOA rockfish trawlers made several behavioral changes that may be causally linked to a trend in Chinook salmon PSC. Implementation of the RPP in 2007 incentivized a shift from non-pelagic to semi-pelagic trawl gear – in an effort to reduce Pacific halibut PSC – and increased the length of the rockfish trawl season.[19] Figure 4-18 illustrates the post-RPP increase in Chinook salmon PSC. From 2007 to 2011, the Central GOA's share of non-pollock Chinook salmon PSC increased to 92%, and Central GOA rockfish trips accounted for 22% of that amount. However, the figure also suggests that rockfish trawlers have utilized the tools of coordinated cooperative harvest of exclusive groundfish allocations to reduce Chinook PSC in the Central GOA rockfish fishery since that time. In recent years, Central GOA rockfish CVs have made a programmatic effort to report Chinook salmon hot spots, and cooperative organizations have focused on building awareness about Chinook salmon PSC.

Figure 4-18 Chinook salmon PSC in the Central GOA rockfish fishery, 2003 to 2011



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC.

[16] If pollock trips are also considered, rockfish trips accounted for 17% of GOA groundfish harvest and 5% of Chinook salmon PSC.
[17] Established under Amendment 68 to the Gulf of Alaska FMP.
[18] Established under Amendment 88 to the Gulf of Alaska FMP.
[19] The RPP lengthened the rockfish trawl season by moving the regulatory start date from July 1 to May. Reasons for moving up the start date included: stabilizing residential processor work force opportunities in Kodiak (May and June had previously been a period of low worker utilization), allowing AFA participants for fish earlier in the Bering Sea (when BS salmon encounter was lower), and improving ex-vessel value by having fresh rockfish product available for a greater portion of the year.

4.4.12 Gulf of Alaska Non-pollock Groundfish Products and Product Prices

Non-pollock groundfish landed in the GOA generate a number of marketed products. AKFIN provides product price data from both the at-sea and shoreside processor reports.[20] Products that are processed by CP vessels at-sea and sold at wholesale include whole fish, headed-and-gutted fish, and headed-and-gutted fish with roe. Shoreside products, delivered by CVs to onshore processors or stationary floating processors include whole fish, bled whole fish, gutted fish (head on, viscera removed) headed-and-gutted fish, headed-and-gutted fish with roe, split-and-salted fish (head and viscera removed, fillets cut but attached, and salted), fillets, surimi (a paste made from fish flesh and additives), kirimi (headed, gutted, and cut for steaks), fish meal, fish oil, minced fish (ground flesh), and roe. Both processing sectors report a number of ancillary products that were retained, but these products were only priced and sold from the shoreside processing sector. Ancillary products include heads, stomachs, chins, cheeks, cartilage, flesh, and milt.

This section considers processor data from 2008 to 2011. Average price per pound is derived from actual prices received at the first wholesale (at-sea) or ex-vessel (shoreside) level, rather than applying yearly average prices per pound to total annual harvests.[21] Table 4-38 shows the product-type breakdown of prices for non-pollock groundfish products that were processed at-sea (CP vessels), and includes total weight harvested and total revenue generated. Table 4-39 show average prices for the products generated at shoreside operations (onshore and stationary floating processors). Shoreside product data is not available in gear-specific format; because these figures would include the products of hook-and-line and pot gear harvest, product weight and revenue are less relevant to the considered action and are not included. As mentioned in Section 4.4.2, many participants in the GOA groundfish trawl fleet also fish in BSAI waters. The data presented in this section comes from GOA processor reports, so it is impossible to state with absolute certainty that all of the fish going into these products were harvested in GOA waters. However, for analytical purposes, it is reasonable to apply these prices.

[20] The Draft 2012 Economic SAFE Report notes that prices declined in 2009 as a result of the general U.S. economic downturn. However, this external factor appears to have affected all non-pollock groundfish products in a similar fashion.
[21] Price data provided by AKFIN

Table 4-38 Product prices and volume for at-sea processing by catcher/processors active in the Gulf of Alaska, 2008 to 2011

Species	Product	Average Price ($/lb)	Total Weight (mt)	Total Revenue ($1,000)
Rex Sole	H&G	0.441	29.68	29.4
	Whole fish	0.985	9,249.34	19,336.9
Rex Sole Total		0.854	9,279.02	19,366.2
Rockfish	H&G	0.631	50,166.06	59,007.2
	Whole fish	1.168	1,729.74	3,954.6
Rockfish Total		0.742	51,895.80	62,961.8
Pacific Cod	H&G	0.597	4,145.86	5,464.1
	Whole fish	0.521	252.94	304.7
Pacific Cod Total		0.586	4,398.80	5,768.8
Flathead Sole	H&G	0.436	3,514.09	3,716.9
	H&G w.Roe	0.816	418.98	737.8
Flathead Sole Total		0.557	4,203.19	4,711.3
Flatfish	H&G	0.356	878.23	753.3
	H&G w.Roe	0.848	5.65	10.5
	Whole fish	0.399	3.63	3.7
Flatfish Total		0.447	887.51	767.6
Arrowtooth Flounder	H&G	0.334	16,798.64	12,496.2

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Table 4-39 Product prices for shoreside processors active in the Gulf of Alaska, 2008 to 2011

Species	Product	Average Price ($/lb)
Rockfish	Whole fish	0.977
	Whole (bled)	0.989
	Fillet	3.232
	H&G	1.743
	Gutted	1.609
	Kirimi	1.339
	Fish Meal	0.370
	Surimi	1.360
	Roe	1.317
	Ancillary	0.719
Rockfish Total		1.923
Pacific Cod	Whole fish	0.597
	Whole (bled)	0.603
	Fillet	2.932
	H&G	1.393
	Gutted	1.838
	Kirimi	1.200
	Salted & Split	1.643
	Fish Oil	1.364
	Minced	0.933
	Surimi	0.897
	Fish Meal	0.600
	Roe	0.896
	Ancillary	0.864
Pacific Cod Total		1.400
	Whole fish	0.935
	Fillet	2.106
	H&G	0.689
	Fish Meal	0.328
Rex Sole Total		1.200

Species	Product	Average Price ($/lb)
Flatfish	Whole fish	0.508
	Fillet	1.974
	Kirimi	0.856
	H&G	0.651
	H&G w.Roe	0.709
	Surimi	0.900
	Roe	0.430
	Fish Meal	0.464
	Ancillary	0.100
Flatfish Total		1.069
Flathead Sole	Whole fish	0.476
	Fillet	2.126
	Kirimi	0.681
	H&G	0.535
	H&G w.Roe	0.725
	Surimi	0.926
	Fish Meal	0.328
	Roe	0.430
	Ancillary	0.180
Flathead Sole Total		0.945
Arrowtooth Flounder	Whole fish	0.617
	Fillet	1.061
	Kirimi	0.653
	H&G	0.517
	H&G w.Roe	0.902
	Surimi	0.833
	Fish Meal	0.328
	Ancillary	0.341
Arrowtooth Flounder Total		0.642
Atka Mackerel	Whole fish	0.900
	Fish Meal	0.306
Atka Mackerel Total		0.504

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

4.4.13 Taxes Generated by the GOA Non-pollock Fishery

4.4.13.1 State of Alaska taxes

There are three fisheries taxes that are levied on groundfish catch by the State of Alaska. The descriptions of these taxes were taken from the Alaska Department of Revenue Tax Division website (http://www.tax.alaska.gov/programs/programs/index.aspx?60620), and are provided below. The first two taxes are levied as a percentage of ex-vessel value, and the third is based on first wholesale value. For the ex-vessel linked taxes, the State calculates actual tax liability by multiplying unprocessed harvest weight by a statewide average price (SWAP). Here, the analysts use an average of AKFIN data on actual ex-vessel prices paid to harvesters (based on fish ticket records), which should not be substantially different

from the SWAP method. Aggregated, annual average tax liabilities are presented in order to preserve processor confidentiality.

The ex-vessel value of non-pollock trawl harvest was provided by AKFIN, and is based on fish ticket records.

1) "A **Fisheries Business Tax** is levied on persons who process or export fisheries resources from Alaska. The tax is based on the price paid to commercial fishers or fair market value when there is not an arms-length transaction. Fisheries business tax is collected primarily from licensed processors and persons who export fish from Alaska."

Shore-based processors are assessed at a rate of 3%, and floating processors are assessed at a rate of 5% of the ex-vessel price paid to GOA CVs. Between 2003 and 2011, non-pollock groundfish were delivered to 26 different shore-based processors[22] and three floating processors in Alaska communities. During the analyzed period the GOA shore-based processors, as a group, paid the State an average of $563,999 per year in Fisheries Business Tax levied on non-pollock groundfish trawl product. Over the same period, the group of three floating processors paid a combined average of $13,169 per year. Note that not all processors took deliveries in every year, and these figures represent the yearly portion of a nine-year average as if they did.

2) "A **Fishery Resource Landing Tax** is levied on fishery resources processed outside the 3-mile limit and first landed in Alaska or any processed fishery resource subject to sec. 210(f) of the American Fisheries Act. The tax is based on the unprocessed value of the resource, which is determined by multiplying a statewide average price (determined by the Alaska Department of Fish and Game data) by the unprocessed weight. The Fishery Resource Landing Tax is collected primarily from factory trawlers and floating processors which process fishery resources outside of the state's 3-mile limit and bring their products into Alaska for transshipment."

The Fishery Resource Landing Tax is also levied at a rate of 3% of ex-vessel value. 46 different vessels processed non-pollock groundfish outside of the 3-mile limit between 2003 and 2011. As a group, these operators paid the State an average of $217,993 per year in Fishery Resource Landing Tax.

3) "A **Seafood Marketing Assessment** is levied at a rate of 0.5% of the value of seafood products processed first landed in, or exported from Alaska."

The Seafood Marketing Assessment is based upon the first wholesale value of seafood products, regardless of whether the products were processed at sea or on shore. The first wholesale prices used in this analysis are provided by AKFIN and are based upon COAR data. From 2003 to 2011, the 75 processing operations that landed non-pollock groundfish in Alaska (or exported non-pollock groundfish from Alaska) collectively paid the State an average of $376,075 per year under the Seafood Marketing Assessment.

4.4.13.2 Municipality raw fish taxes

Some municipalities levy raw fish taxes on fish first landed at processing plants located in their communities. Municipalities that levied fish taxes and had processors that took deliveries of GOA non-pollock groundfish between 2003 and 2011 are listed in Table 4-40. The table reports the municipalities' populations, raw fish tax rates, 2011 reported raw fish tax revenues for all species, and an estimated

[22] One of the operations included as a shore-based processor is listed as an exporter-buyer, which are also taxed at a rate of 3% of the ex-vessel value paid to harvesters.

annual average of raw fish tax revenue from non-pollock groundfish. Estimated non-pollock tax revenues are calculated by applying each municipality's raw fish tax rate to the ex-vessel value derived from fish ticket records and reported by AKFIN.

Table 4-40 Raw fish (and other) taxes imposed by Alaska municipalities

Municipality	Population	Raw Fish Tax	2011 Raw Fish Tax Revenue	Est. average annual GOA non-pollock tax revenue (2003-2011)
Kodiak Island Borough	13,592	1.05%^	$1,649,275^	$172,359
Unalaska	4,376	2%	$5,381,778	(confidential)
Aleutians East Borough	3,141	2%	$4,584,570	$48,596
King Cove	938	2%/Flat amount*	$100,000*	(confidential)
Sand Point	976	2%	$834,681	(confidential)
Akutan	1,027	1%	$478,460	(confidential)

* Fisheries Impact Tax of $100,000

^ Kodiak Borough imposes a severance tax on harvested natural resources, including commerical fishing, timber sales, gravel extraction, and mining activities.

Source for population, tax rate and 2011 tax revenue: State of Alaska, DCED, 2012, available at http://www.dced.state.ak.us/dca/osa/pub/11Taxable.pdf

Kodiak Island Borough, which is home to 13 shore-based processors that took non-pollock groundfish deliveries, levies a severance tax of 1.05%. This levy is a form of excise tax on the performance of commercial fishing, but also applies to the harvest or extraction of other natural resources. Processors located in King Cove, Sand Point and Akutan pay a raw fish tax to both their respective municipalities and to the Aleutians East Borough. Two processors taking non-pollock deliveries operate in King Cove, and Sand Point and Akutan have one non-pollock processor each. King Cove levies a Fisheries Impact Tax that is a flat fee of $100,000 per year; this charge helps pay for city resourcs that are utilized by the processing operations.

The reported value of $48,596 is an estimate of the average annual tax paid to the Borough, only. Collectively, these processors paid a similar amount to their municipalities. The estimate of the annual tax paid to Unalaska on non-pollock groundfish processing is also withheld for confidentiality, as only one non-pollock processor is located there. In general, estimates of the tax paid on non-pollock processing indicate that these shore-based processors generate a significant portion of their revenue from species that are not regulated by this proposed action.

Harvest constraints that may result from the implementation of a Chinook salmon PSC limit could reduce the amount of tax revenue available to these communities.

4.4.14 Market Profiles for Selected GOA Non-pollock Target Species

This section provides additional information on the markets for several of the non-pollock target species that comprise a significant part of GOA trawl harvest (as identified in Section 4.4.6), that could experience reduced harvest under the considered Chinook salmon PSC limits (as assessed in Section 4.7.1), and for which the Alaska Fisheries Science Center has compiled market profiles. The species-markets profiled here include Pacific cod, yellowfin and rock sole, and arrowtooth flounder. Note that yellowfin and rock sole are only two of the seven species that are jointly considered as "shallow water flatfish" within this document.[23]

[23] Other shallow water flatfish include Alaska plaice, starry flounder, sand sole, butter sole, and English sole.

Not all target species are profiled because the amount of information available for explaining historical market trends varies greatly by species (Hiatt, 2011). Generally, the amount of information available for each species is related to its value or market share. AFSC's market profiles, provided in annual Economic SAFE reports, describe recent trends in pricing, volume, supply and demand for each species. The profiles consider trends in the volume of exports to different trading partners; these trade relationships are important for identifying the species for which Alaska fisheries have a large share of the world market. If Alaska fisheries do contribute a large share of a given species's world supply, product prices may be tied to TAC in the North Pacific region. For other species, the Alaskan share of the world product may be relatively low and market dynamics could be driven by the actions of other countries. AFSC market profiles attempt to define whether Alaska fisheries' product market share is growing or declining.

The impacts of proposed Alternative 2 (discussed in detail in Section 4.7) do not go so far as to speculate on how a Chinook salmon PSC limit could affect world product markets and prices. At a broad level, it may be useful to consider the possibility that a harvest-constraining PSC limit could have a price effect for species where Alaska is a dominant supplier to the world market. In such a case, resulting increased product prices may mitigate some of the revenue lost to reduced harvest under early season closures.

4.4.14.1 Pacific cod markets

U.S. Pacific cod harvest has remained relatively stable since the 1980s, as production volume in Japan and the Soviet Union/Russia declined by roughly half.[24] By the middle of last decade, the U.S. supplied more than two-thirds of the world Pacific cod supply as a result (Knapp, 2006). Alaska fisheries account for about 99% of U.S. Pacific cod harvest. Because of declining Atlantic cod harvest, Pacific cod has recently increased its market share to between one-fourth and one-third of all types of cod product. This Atlantic cod decline has opened new European markets for U.S. Pacific cod.

Most Pacific cod filets enter the domestic market, while the majority of H&G product is exported to international markets. Wholesale prices are highest for fillet products, but headed-and-gutted (H&G) fish account for the largest share of Alaska Pacific cod production – roughly 69% in 2010. The shift from fillets to H&G is attributed to increased exports to China, where H&G are processed into boneless fillets and re-exported. Trawl vessels tend to receive a lower price for Pacific cod than fixed gear freezer longliners. This is mostly attributable to freezer longliners' ability to first process the fish while they are fresh, and the fact that most trawl caught fish come from inshore areas where the cod can be infected with parasitic codworms (causing shoreside processors to treat at an increased cost).

World market prices for Pacific cod – mainly H&G product in the international and re-export market – have strengthened since 2006, when Pacific cod gained acceptance as a substitute for decreasingly available Atlantic cod and European whitefish. Recent increases in demand for healthy, sustainably caught whitefish has increased demand for "Alaska cod" since 2008. Alaska Pacific cod may face future competition from growing cod aquaculture development in Norway, Scotland, Ireland and Canada.

4.4.14.2 Yellowfin sole and rock sole markets

AFSC's profile of yellowfin and rock sole markets indicates that the majority of Alaskan product comes from BSAI fisheries. In any event, an assessment of demand for these Alaskan shallow water flatfish as a whole can still be informative on the potential for price effects if GOA harvest is reduced.

Together, yellowfin sole and rocksole account for around 50% of U.S. flatfish landings. Domestic catch of yellowfin sole occurs entirely in the waters off Alaska, as does over 99% of domestic rock sole catch.

[24] U.S. harvests include both GOA and BSAI Pacific cod. GOA Pacific cod harvest in the trawl and longline fisheries is tied to a Pacific halibut mortality limit, which has sometimes constrained the timing and amount of GOA harvest.

Inadequate data from other countries and a lack of uniformity in flatfish species grouping for landings data make it impossible to state that *all* yellowfin and rock sole on the world market come from U.S. fisheries, but it is clear that Alaskan waters are the predominant source of world product.[25]

Alaskan yellowfin and rock sole compete with substitute flatfish products from revitalized New England flatfish fisheries. Demand for Alaskan yellowfin has remained strong in Europe due to the E.U. Fishing Council's quota cuts for their most valuable flatfish, plaice. Alaska products also compete in domestic and foreign markets with farmed flatfish. Flatfish aquaculture accounts for a small percentage of worldwide flatfish production, but it is expected to increase steadily. Flatfish aquaculture is driven by declining trends in wild catch and the higher prices that these declining catches have created. Domestic flatfish aquaculture has, thusfar, included commercial farming of summer flounder and Southern flounder on the Atlantic Coast.

H&G products from the CP sector are primarily exported to re-proccesors in China, who often re-export fillets to the United States. Re-exporters commonly include yellowfin and rock sole in the same pack, so it is not surprising that market prices for fillets of the two species follow the same trends. Whole rock sole with roe are exported to Japan; while the price for this product has been decreasing since 2006, it remains an important source of early season revenue for the H&G trawl fleet. Whole yellowfin sole are generally sold to South Korea, while H&G product is shipped to China for re-processing into fillets and eventual Chinese domestic consumption or re-exportation to North America and Europe. The Chinese and European markets for re-processed yellowfin fillets have largely emerged since 2007.

Shore-based processors in the U.S. produce some fillets for Chinese and domestic markets, though an increasing proportion of yellowfin is being exported to Chinese re-processors who employ cheaper labor. Yellowfin that is processed as kirimi (steak-like cuts) are exported to Japan. The export value of U.S. yellowfin and rock sole going to Japan has declined since 2004. The value of product going to China grew from 2000 to 2007, but has since flattened for rock sole and significantly fallen for yellowfin sole.

4.4.14.3 Arrowtooth flounder markets

According to the AFSC's market profile (Hiatt, 2011), most of the total world arrowtooth flounder harvest comes from Alaska fisheries. Arrowtooth are abundant in the waters off of the Pacific Northwestern United States, but catch is constrained by efforts to rebuild the overfished canary rockfish.

Past efforts to market arrowtooth were constrained by the rapid degradation of muscle tissue at cooking temperature, resulting in a paste-like texture of the cooked product. In recent years, several food grade additives have been successfully used to inhibit the enzymatic breakdown of the muscle tissue. These discoveries have enabled a targeted fishery in the Kodiak Island area for marketable products, including whole fish, surimi, headed and gutted (both with and without the tail on), fillets, frills (fleshy fins), bait, and meal (NMFS, 2007d). Most arrowtooth flounder are processed as H&G product with the tail removed. Frills are the primary arrowtooth product; they are used for sashimi, soup stock, and a more affordable version of engawa (normally a premium sushi made from halibut or Greenland turbot). Japan is the primary market for arrowtooth flounder engawa. Arrowtooth has also been used to make surimi, and this market could expand in the future if U.S. pollock harvest declines.

The U.S. Department of Commerce does not track export data specifically for arrowtooth flounder, so the AFSC's market profile does not address export volumes and prices. However, industry representatives indicate that all of the H&G product is sent to China for re-processing. A large portion of the arrowtooth

[25] AFSC notes that scientific and industry literature makes reference to Russsian harvest of yellowfin sole in the Bering Sea, but records of such catch are not reported in United Nations Food and Agriculture Organization statistics.

exported to China is re-imported to the U.S. as inexpensive flounder fillets. China re-exports some fillets to the Japanese market and, recently, has sent a smaller portion to European markets.

4.5 Description of Potentially Affected Chinook Salmon Fisheries

North Pacific Chinook salmon are the subject of commercial, subsistence, personal use, and sport/recreational (used interchangeably) fisheries. Chinook salmon are the least abundant of the five salmon species found on both sides of the Pacific Ocean and the least numerous in the Alaska commercial harvest. The majority of the Alaska commercial catch is made in Southeast Alaska, Bristol Bay, and the Arctic-Yukon-Kuskokwim area. The majority of commercial catch is made with troll gear or gillnets. Approximately 90% of the subsistence harvest is taken in the Yukon and Kuskokwim rivers. Predominant gear types in the subsistence fishery include gill nets, seine, fish wheels and long lines. Alaska Department of Fish & Game (ADF&G) reports that harvest by subsistence and personal use fishers averaged 167,000 fish from 1994-2005. The Chinook salmon is one of the most highly prized sport fish in Alaska and is extensively fished by anglers in the Southeast and Cook Inlet areas. ADF&G reports that the Alaska sport fishing harvest averaged 170,000 Chinook salmon per year from 1989-2006 (60% taken in South-central Alaska; 26% in Southeast Alaska; and 4% in the Arctic-Yukon-Kuskokwim area). Unlike other Pacific salmon species, Chinook salmon rear in inshore marine waters and are, therefore, available to commercial and sport fishermen all year round.[26]

The Alaska State Constitution establishes, as state policy, the development and use of replenishable resources, in accordance with the principle of sustained yield, for the maximum benefit of the people of the state. In order to implement this policy for the fisheries resources of the state, the Alaska Legislature created the Alaska Board of Fisheries (BOF) and the Alaska Department of Fish & Game. The BOF was given the responsibility to establish regulations guiding the conservation and development of the state's fisheries resources, including the distribution of benefits among subsistence, commercial, recreational, and personal uses. ADF&G was given the responsibility to implement the BOF's regulations and management plans through the scientific management of the state's fisheries resources. Scientific and technical advice is provided by ADF&G to the BOF during its rule-making process. The first priority for management is to meet spawning escapement goals in order to sustain salmon resources for future generations. The highest priority use is for subsistence, under both state and federal law. Salmon surpluses above escapement needs and subsistence uses are made available for other uses.[27]

ADF&G's fishery management activities fall into two categories: inseason management and applied science. For inseason management, the division employs fishery managers near the fisheries. Local fisheries managers are given authority to open and close fisheries to achieve two goals: the overriding goal is conservation to ensure an adequate escapement of spawning stocks, and the secondary goal is an allocation of fish to various user groups based upon management plans developed by the BOF. The BOF develops management plans in open, public meetings after considering public testimony and advice from various scientists, advisors, fishermen, and user interest groups (Woodby et al. 2005). Decisions to open and close fisheries are based on the professional judgment of area managers, the most current biological data from field projects, and fishery performance. Research biologists and other specialists conduct applied research in close cooperation with the fishery managers. The purpose of the division's research staff is to ensure that the management of Alaska's fisheries resources is conducted in accordance with the sustained yield principle and that managers have the technical support they need to ensure that fisheries are managed according to sound scientific principles and utilizing the best available biological data. The division works closely with the ADF&G Division of Sport Fisheries in the conduct of both management and research activities.

[26] http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main; http://www.adfg.alaska.gov/index.cfm?adfg=chinook.uses
[27] http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management

By far, most salmon in Alaska are caught in commercial troll, gillnet, and purse seine fisheries, in which participation is restricted by a limited entry system. Troll gear works by dragging baited hooks through the water. Gillnet gear works by entangling the fish as they attempt to swim through the net. Gillnets are deployed in two ways: from a vessel that is drifting and from an anchored system out from the beach. Purse seines work by encircling schools of fish with nets that are drawn up to create giant "purses" that hold the school until the fish can be brought aboard. Other kinds of gear used in Alaska's smaller fisheries include fishwheels, which scoop fish up as the wheel is turned by river currents (Woodby et al., 2005).

Information on the status of Chinook salmon stocks in Alaska is included in Section 3.3.5, although a summary is also provided below in Section 4.5.6. The High Seas Salmon Research Program states that almost all stock-specific information on spatial and temporal distribution of Chinook salmon with in the U.S. 200-mile EEZ in the Northern and Western GOA comes from recoveries of coded-wire tagged fish by the U.S. North Pacific Groundfish Observer Program. These recoveries show that North American stocks, originating from Central Alaska to the Sacramento River, California, range northward into the Eastern Bering Sea. The reference further states that coded-wire tag recoveries provided the first information on winter distribution of Yukon Territory Chinook salmon in the Bering Sea, revealing their distribution along the shelf break (200-meter contour) from Unimak Pass and Northwestward into the Central Bering Sea. A recovery off the South Central Oregon coast of a coded-wire tagged immature Chinook salmon from the Kenai River, Alaska marks the southernmost recovery of an Alaska origin Chinook salmon on the U.S. Pacific Coast.[28] More information on the origin of Chinook salmon intercepted in the GOA groundfish fisheries is included in Section 3.3.3, and a discussion of Pacific Northwest salmon listed under the ESA is included in Section 3.3.6.

4.5.1 State Commercial Salmon Fishery Management

Commercial fishing is defined by the State of Alaska as the taking of fish with the intent of disposing of them for profit, or by sale, barter, trade, or in commercial channels (AS 16.05.940 (5)). Commercial fisheries in Alaska fall under a mix of state and federal management jurisdictions. In general, the state has management authority for all salmon, herring, and shellfish fisheries, and for groundfish fisheries within three nautical miles of shore. Under the Magnuson-Stevens Act, the Federal Government has management authority for the majority of groundfish fisheries three to two hundred nautical miles offshore.

The state manages a large number of commercial salmon fisheries in waters from Southeast Alaska to the Bering Strait. Management of the commercial salmon fisheries is the responsibility of the ADF&G Division of Commercial Fisheries, under the direction of the BOF. The fisheries are managed under a limited entry system; participants need to hold a limited entry permit for a fishery in order to fish and the number of permits for each fishery is limited. The state originally issued permits to persons with histories of participation in the various salmon fisheries. Permits can be bought and sold; thus, new persons have entered into the commercial fishery since the original limitation program was implemented by buying permits on the open market.

Alaska's commercial salmon fisheries are administered through the use of management areas throughout the state. For information on commercial regulations refer to: www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.main.

The value of the commercial salmon harvest varies with both the size of the runs and with foreign currency exchange rates. Information on the annual commercial Chinook salmon harvest in Alaska is

[28] http://www.fish.washington.edu/research/highseas/known_range.html

reported at http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.bluesheet. Blue Sheet reports extend back to 1994 and provide information by region as well as the state total. Table 4-41 summarizes commercial Chinook salmon harvest and ex-vessel value for the period considered throughout this analysis.

Table 4-41 Alaska commercial Chinook salmon harvest and ex-vessel value (2003 to 2012)

Year	Number of Fish	Pounds (million)	Ex-vessel value (million $)
2003	634,000	10.3	13.5
2004	816,000	12.9	24.9
2005	699,000	10.7	24.4
2006	645,000	10.1	30.7
2007	571,000	8.7	26.7
2008	376,000	5.6	25.6
2009	359,000	5.1	14.1
2010	376,000	5.3	19.2
2011	445,000	6.1	20.4
2012 (preliminary)	333,000	4.4	17.6

Source: ADF&G Commercial Fisheries Division,
http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.exvesselquery

4.5.2 State Management of Personal Use and Sport Salmon Fisheries

The State of Alaska defines personal use fishing as the taking, fishing for, or possession of finfish, shellfish, or other fishery resources, by Alaska residents for personal use and not for sale or barter, with gill or dip net, seine, fish wheel, longline, or other means defined by the BOF (AS 16.05.940(25)). Personal use fisheries differ from subsistence fisheries because they either do not meet the criteria established by the Joint Board of Fisheries and Game (Joint Board) for identifying customary and traditional fisheries (5 AAC 99.010) or because they occur within nonsubsistence areas.

The Joint Board is required to identify "nonsubsistence areas,'" where "dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community" (AS 16.05.258(c)). The BOF may not authorize subsistence fisheries in nonsubsistence areas. Personal use fisheries provide opportunities for harvesting fish with gear other than rod and reel in nonsubsistence areas. The Joint Board has identified Ketchikan, Juneau, Anchorage-Matsu-Kenai, Fairbanks, and Valdez as nonsubsistence areas (5 AAC 99.015). Persons may participate in personal use or recreational harvests for subsistence purposes within nonsubsistence use areas, but subsistence use does not have a preference in those areas.

Generally, fish may be taken for personal use purposes only under authority of a permit issued by ADF&G. Personal use fishing is primarily managed by ADF&G, Division of Sport Fish, but some regional or area fisheries for various species of fish are managed by the Division of Commercial Fisheries. For more information on state management of personal use fisheries, refer to the ADF&G website: www.adfg.alaska.gov/index.cfm?adfg=fishingPersonalUse.main.

The ADF&G Division of Sport Fish also manages the state's recreational fisheries. Alaska statute defines sport fishing as the taking of or attempting to take for personal use, and not for sale or barter, any fresh water, marine, or anadromous fish by hook-and-line held in the hand, or by hook-and-line with the line attached to a pole or rod which is held in the hand or closely attended, or by other means defined by the BOF (AS 16.05.940(30)). By law, the division's mission is to protect and improve the state's recreational fisheries resources. For more information on state management of recreational fisheries, refer to the ADF&G website: www.adfg.alaska.gov/index.cfm?adfg=fishingSport.main.

Per Alaska statute (5 AAC 75.075(c)), the ADF&G, Division of Sport Fish is also responsible for overseeing the annual licensing of sport fish businesses and guides. A "sport fishing guide" means a person who is licensed to provide sport fishing guide services to persons who are engaged in sport fishing (AS 16.40.299). "Sport fishing guide services" means assistance, for compensation or with the intent to receive compensation, to a sport fisherman to take or to attempt to take fish by accompanying or physically directing the sport fisherman in sport fishing activities during any part of a sport fishing trip. Salmon is one of the primary species targeted in the states' recreational fisheries. For further information, refer to the ADF&G website: www.adfg.alaska.gov/index.cfm?adfg=prolicenses.sportfishguides. This site contains information important to the ADF&G requirements for sport fish charter businesses, sport fish guides, and saltwater charter vessels.

Chinook salmon are a prized sport fish in Alaska's recreational fisheries, and most anglers sport fishing for anadromous (sea-run) Chinook salmon (king) salmon must have purchased (and have in their possession) a current year's king salmon stamp. For further information, refer to the ADF&G website: http://www.sf.adfg.state.ak.us/Guides/index.cfm/FA/guides.home. This site contains information important to the ADF&G requirements for sport fish charter businesses, sport fish guides, and saltwater charter vessels. Table 4-42 reports Alaska's total and regional sport harvest of Chinook salmon for recent years.

Table 4-42 Statewide sport harvest of Chinook salmon by region, freshwater and saltwater combined

Region	2008	2009	2010	2011
Southeast	49,265	69,565	58,503	66,575
Southcentral	77,334	59,855	55,291	57,511
Arctic-Yukon-Kuskokwim	5,658	3,908	3,850	4,021
Alaska Total	**132,257**	**133,328**	**117,644**	**128,107**

Source: http://www.adfg.alaska.gov/sf/sportfishingsurvey/index.cfm?ADFG=region.results

4.5.3 State Subsistence Management

ADF&G, under the direction of the Alaska BOF, manages subsistence, personal use, and commercial salmon harvests in waters within the State of Alaska out to the three nautical mile limit. The state has 82 local fish and game advisory committees that review, make recommendations, submit proposals, and testify to the Alaska BOF concerning subsistence and other uses in their areas.

The state defines subsistence uses of wild resources as noncommercial, customary, and traditional uses for a variety of purposes. These include:

> Direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption (AS 16.05.940[33]).

Under Alaska's subsistence statute, the BOF must identify fish stocks that support subsistence fisheries and, if there is a harvestable surplus of these stocks, determine the amount of the harvestable surplus that is reasonably necessary for subsistence uses, and adopt regulations that provide reasonable opportunities for these subsistence uses to take place. Statute defines "reasonable opportunity" as an opportunity that allows a subsistence user to participate in a subsistence fishery that provides a normally diligent participant with a reasonable expectation of success of taking of fish (AS 16.05.258(f)). The BOF evaluates whether reasonable opportunities are provided by existing or proposed regulations by reviewing harvest estimates relative to the "amount reasonably necessary for subsistence use" findings as well as subsistence fishing schedules, gear restrictions, and other management actions. Whenever it is necessary

to restrict harvest, subsistence fisheries have a preference over other uses of the stock (AS 16.05.258). ADF&G, Division of Commercial Fisheries, manages subsistence fisheries in the area of potential effect. Subsistence and other uses may be restricted or closed to provide for sustainability based upon relevant adopted fishery management plans.

Alaska subsistence fishery regulations do not, in general, permit the sale of resources taken in a subsistence fishery. State law recognizes "customary trade" as a legal subsistence use. Alaska statute defines customary trade as "…the limited noncommercial exchange, for minimal amounts of cash, as restricted by the appropriate board, of fish or game resources" (AS 15.05.940(8)). This is applicable in certain regions of Alaska, including the customary trade in finfish (including salmon) within the Norton Sound-Port Clarence Area (5 AAC 01.188). Presently, the BOF has not received regulatory change proposals to allow customary trade in salmon resources under state subsistence regulations in other areas under consideration in this document.

ADF&G Division of Commercial Fisheries prepares annual fishery management reports for most fishery management areas in the state. Although fishery management reports focus primarily on commercial fisheries, most also routinely summarize basic data for programs that collect harvest information for subsistence fisheries. Detailed annual reports about subsistence fisheries harvest assessment programs are prepared for the Norton Sound/Kotzebue, Yukon River, and Kuskokwim areas; however, it is important to recognize the limitations associated with the effort to present a comprehensive annual report on Alaska's subsistence fisheries. Because of such limitations, harvest data may be a conservative estimate of the number of salmon being taken for subsistence uses in Alaska. These limitations include:

1) Annual harvest assessment programs do not take place for all subsistence fisheries although programs are in place for most salmon fisheries such as the Yukon and Kuskokwim river drainages through post-season household surveys and for the Bristol Bay Area through subsistence salmon permits. There is no longer an annual subsistence harvest monitoring program for the Kotzebue Fisheries Management Area. Similarly, since 2004 annual harvest monitoring in the Norton Sound-Port Clarence Area has been limited to post-season household surveys in Shaktoolik and Unalakleet and through catch and gear information obtained from subsistence fishing permits in other parts of the Norton Sound-Port Clarence Area.
2) Annual subsistence harvest data are largely dominated by fish harvested under efficient gear types authorized by regulation, which, especially for salmon, generally means fish taken with gillnets, beach seines, or fish wheels. However, in portions of the Kotzebue Fisheries Management Area (5 AAC 01.120(b) &(f)), Norton Sound-Port Clarence Area (5 AAC 01.170(b) & (h)), and Yukon-Northern Area (5 AAC 01.220(a) & (k)), as well as the entire Kuskokwim Fisheries Management Area (5 AAC 01.270(a)), hook-and-line attached to a rod or pole (i.e., rod and reel) are recognized as legal subsistence gear under state subsistence fishing regulations. In these areas significant numbers of households take salmon for subsistence uses with rod and reel or retain salmon from commercial harvests for home use. Where the BOF has recognized rod and reel gear as legal subsistence gear, annual harvest assessment programs or subsistence fishing permits also document salmon harvested with rod and reel. Federal subsistence management represents different subsistence gear regulations in some cases. For example, in Kotzebue Sound federally qualified users are authorized under federal subsistence regulations to harvest salmon by gillnet, beach seine, or rod and reel, but these harvests are not documented through either a state or federal harvest monitoring program and the numbers of salmon (largely chum salmon) harvested by gillnet or beach seine compared to rod and reel is unknown.
3) Annual harvest assessment programs are generally limited to post-season household surveys in communities located within the fisheries management area. Subsistence permits are used as a basis for annual harvest assessments, but such permits are not required in some areas (such as the

Yukon River drainage). No subsistence salmon harvest data collection took place in the Kotzebue area from 2005 through 2009 due to a lack of funding.

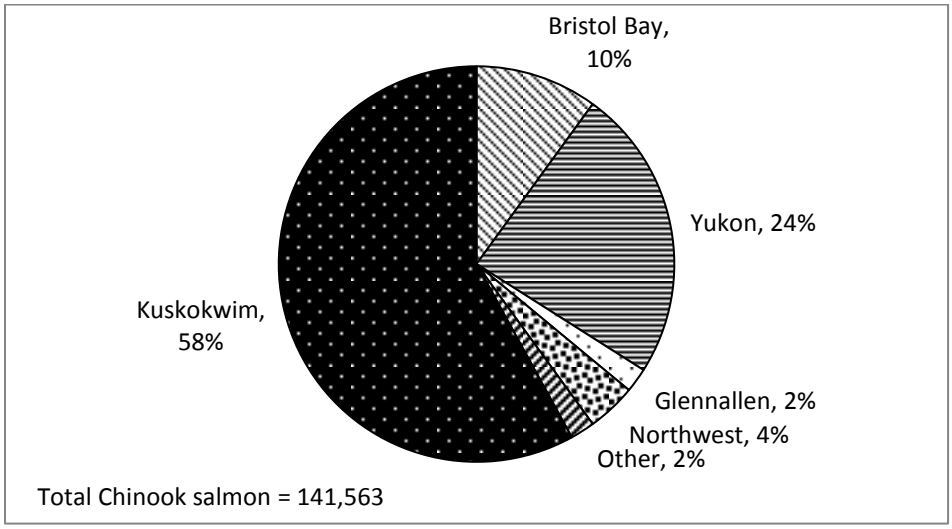
4) Between management areas, and sometimes between districts within management areas, there is inconsistency in how subsistence harvest data are collected, analyzed, and reported.
5) In some areas there are no routine mechanisms for evaluating the quality of subsistence harvest data. For example, in some areas it is not known if all subsistence fishermen are obtaining permits and providing accurate harvest reports. This can result in an underestimation of harvests.
6) There are few programs for contextualizing annual subsistence harvest data so as to interpret changes in harvests. However, in some cases, Fishery Management Reports do contain discussions of data limitations and harvest trends.

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 2009 Annual Report at http://www.adfg.alaska.gov/techpap/TP373.pdf.

Chinook salmon are the first salmon to arrive in the spring, which is fundamental to their importance for subsistence. In 2009, subsistence take of Chinook salmon was estimated at 141,563 fish (16% of the total 879,185 subsistence salmon harvested). Information on State management of the salmon subsistence fisheries is provided in the Alaska Subsistence Salmon Fisheries 2009 Annual Report, available on the State of Alaska website.[29] This is the most recent publicly available report, published and revised in June 2012.

The amount of Chinook salmon harvested for subsistence use and the portion of subsistence Chinook salmon harvested relative to other species of salmon varies greatly by region. 12 subsistence fishing areas are defined in the state of Alaska: Northern, Northwest, Yukon, Kuskokwim, Bristol Bay, Aleutian Islands, Alaska Peninsula, Chignik, Kodiak, Cook Inlet, Prince William Sound/Copper River, and Southeast.[30] The largest estimated subsistence harvests of Chinook salmon in 2009 occurred in the Kuskokwim Area (82,100 salmon, 58%), followed by the Yukon Area (33,932 salmon; 24%), Bristol Bay Area (14,020 salmon; 10%), the Northwest Area (5,171 salmon; 4%), and the Glennallen Subdistrict (3,341 salmon; 2%).

Figure 4-19 Alaska subsistence Chinook salmon harvest by area, 2009



[29] http://www.adfg.alaska.gov/techpap/TP373.pdf
[30] See Figure 1-1 of the Alaska Subsistence Salmon Fisheries 2009 Annual Report (p. 5) for a map of the Alaska subsistence areas.

4.5.4 Federal Subsistence Management

The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 mandates that, among consumptive uses of fish and wildlife, rural residents of Alaska be given a priority opportunity for customary and traditional subsistence use on federal lands. In 1986 Alaska amended its subsistence law, mandating a rural subsistence priority to bring it into compliance with ANILCA. However, in the 1989 McDowell decision the Alaska Supreme Court ruled that the priority in the state's subsistence law could not be exclusively based on location of residence under provisions of the Alaska Constitution. Other federal court cases regarding the state's administration of Title VIII of ANILCA ruled that the state would not be given deference in interpreting federal statute. Proposed amendments to ANILCA and the constitution were not adopted to rectify these conflicts, so the Secretaries of Interior and Agriculture implemented a duplicate regulatory program to assure the rural subsistence priority is applied under ANILCA on federal lands. As a result, beginning in 1990, the state and federal governments both provide subsistence uses on federal public lands and waters in Alaska, which covers about 230 million acres or 60% of the land within the state.[31] In 1992, the Secretaries of the Interior and Agriculture established the Federal Subsistence Board and ten Regional Advisory Councils to administer the responsibility. The Board's composition includes a chair appointed by the Secretary of the Interior with concurrence of the Secretary of Agriculture; the Alaska Regional Director, U.S. Fish and Wildlife Service; the Alaska Regional Director, National Park Service; the Alaska State Director, Bureau of Land Management; the Alaska Regional Director, Bureau of Indian Affairs; and the Alaska Regional Forester, U.S. Department of Agriculture Forest Service.

Through the Federal Subsistence Board, these agencies participate in developing regulations which establish the program structure, determine which Alaska residents are eligible to take specific species for subsistence uses, and establish seasons, harvest limits, methods and means for subsistence take of species in specific federal areas. The Regional Advisory Councils provide recommendations and information to the Federal Subsistence Board; review proposed regulations, policies, and management plans; and provide a public forum for subsistence issues. Each Regional Advisory Council consists of residents representing subsistence, sport, and commercial fishing and hunting interests.

4.5.5 Pacific Salmon Treaty

Overview information on the Pacific Salmon Treaty can be found at:
http://www.psc.org/about_treaty.htm.

Interception of Pacific salmon bound for rivers of one country in fisheries of the other has been the subject of discussion between the Governments of Canada and the United States for over a century. Intercepting fisheries were identified through research conducted by the two countries on species and stocks originating from Alaska, British Columbia, Washington, and Oregon. Management of stocks subject to interception became a matter of common concern to both Canada and the United States. A mechanism to enable the countries to reap the benefits of their respective management and enhancement efforts was required and that mechanism is currently provided through the Pacific Salmon Treaty, ratified by the United States and Canada in 1985.

The Pacific Salmon Treaty is built upon two basic principles:

- Prevent overfishing and provide for optimum production both countries agree to respond to conservation concerns related to the interception of stocks of mutual concern.

[31] The U.S. Supreme Court has ruled that ANILCA's use of "in Alaska" refers to the boundaries of the State of Alaska and concluded that ANILCA does not apply to the outer continental shelf region (*Amoco Prod. Co. v. Village of Gambell*, 480 U.S. 531, 546-47 (1987)). However, NMFS aims to protect such uses pursuant to other laws, such as the National Environmental Policy Act and the Magnuson-Stevens Act.

- Equity each country should receive benefits equivalent to the production of salmon originating in its waters.

The twin principles of conservation and equity are to be implemented, taking into account:

- The desirability in most cases of reducing interceptions;
- The desirability in most cases of avoiding undue disruption of existing fisheries; and
- Annual variations in abundance.

The arrangements and institutions established in 1985 were effective in the early years of the Treaty but became outmoded after 1992 when the original fishing arrangements expired. From 1992 to 1998, Canada and the United States were not able to reach agreement on comprehensive, coast-wide fisheries arrangements. In 1999, government-to-government negotiations culminated in the successful renewal of long-term fishing arrangements under the Pacific Salmon Treaty.

Some of the key elements introduced with the 1999 Agreement include the creation of the Transboundary Panel and the Committee on Scientific Cooperation; the inclusion of habitat provisions in the Treaty; a move from fisheries based on negotiated catch ceilings to abundance-based management fisheries; and the establishment of the Northern and Southern Restoration and Enhancement funds ("Northern Fund" and "Southern Fund").

In May 2008, the Pacific Salmon Commission recommended a new bilateral agreement for the conservation and harvest sharing of Pacific salmon to the Governments of Canada and the United States. The product of nearly 18 months of negotiations, the agreement represents a major step forward in science-based conservation and sustainable harvest sharing of the salmon resource between Canada and the United States of America. Approved in December 2008 by the respective governments, the new fishing regimes are in force from the beginning of 2009 through the end of 2018.

The agreement replaces previous versions of the Chapters. The new fishing regimes are contained in the following Chapters of Annex IV of the Treaty:

- Chapter 1. Transboundary Rivers
- Chapter 2. Northern British Columbia and Southeast Alaska Boundary Area
- Chapter 3. Chinook salmon
- Chapter 5. Coho Salmon
- Chapter 6. Southern British Columbia and Washington State Chum Salmon

4.5.6 Summary of 2012 Alaska Chinook Salmon Stock Status

Chinook salmon runs in Western Alaska have been below average since 2007, and management of the fisheries has been conservative in many systems. No directed Chinook salmon commercial fisheries occurred in the Yukon River, Kuskokwim River, or in Norton Sound in 2012, and only small commercial fisheries occurred in the Nushagak and Kuskokwim Bay (Table 3-8). Sport fisheries were restricted or closed in the Nushagak River, Yukon (Chena River), Kuskokwim (Kwethluk and Tuluksak rivers), and Unalakleet and Shaktoolik rivers of Norton Sound Management Area. More significantly, subsistence fisheries in the Nushagak River, two tributaries of the Kuskokwim River (Kwethluk and Tuluksak rivers; U.S. Fish and Wildlife Service [USFWS] federal closure), and Norton Sound (Unalakleet and Shaktoolik rivers) were restricted or closed. In spite of conservative management strategies, which in some cases were at great cost to the people who rely on these resources for food and income, few escapement goals were achieved in Western Alaska.

Kodiak Island Chinook salmon escapement was well below the previous 10-year average. Returns to the Karluk River barely met the escapement goal despite restrictions of nonretention implemented preseason so the sport and commercial fisheries. Escapement through the Ayakulik weir was within the established escapement goal due in part to preseason emergency order fishery restrictions to the sport fishery. The 2012 escapement to the Chignik River was approximately 100 fish above the lower end of the escapement goal. Only 4 of 17 Chinook salmon escapement goals were met in northern Cook Inlet, despite preseason restrictions to sport and commercial fisheries, and inseason closures of several inriver sport fisheries. At this time it does not appear the escapement goal was met for early-run Kenai River Chinook salmon and, if achieved for late-run Kenai River Chinook salmon, it happened at the cost of closure of the inriver and marine sport fisheries and the Upper Subdistrict set gillnet commercial fishery.

Note, a more detailed discussion of the Alaska Chinook salmon stocks, as well as other Chinook salmon stocks that are present in the GOA, is included in Section 3.3.5.

Table 4-43 Overview of Alaskan Chinook salmon stock performance, 2012.

Chinook salmon stock	Total run size?	Escapement goals met?[a]	Subsistence fishery?	Commercial fishery?	Sport fishery?	Stock of concern?
Bristol Bay	Below average	0 of 1[b] (4 not surveyed)	Yes	Limited in Nushagak	Restricted on Nushagak for a portion of the season	No
Kuskokwim	Poor	2 of 7 (5 not surveyed)	Restricted on Kuskokwim River	None on Kuskokwim River, limited in Bay	Closed on Kuskokwim River, not in Bay	No
Yukon	Poor	3 of 5 (1 not surveyed)	Restricted	No	Bag limit reduced in all tributaries, no retention in mainstem and Tanana, no bait allowed on Tanana tributaries; Chena closed	Yield
Norton Sound	Poor	0 of 2 (3 not surveyed)	Restricted	No	No	Yield
Alaska Peninsula	Below average	0 of 1	Yes	Yes	Closed	No
Kodiak	Below average	2 of 2	Yes	Restricted, nonretention in Karluk and Ayakulik areas	Restricted, nonretention in Karluk, reduced bag and annual limits in Ayakulik	Management (Karluk)
Chignik	Below average	1 of 1	Yes	Yes	Restricted, nonretention, reduced bag and annual limits	No
Upper Cook Inlet	Poor	4 of 21[c]	Yes, with restrictions	Restricted in Northern District and Eastside set gillnets in Central District	Various restrictions including complete closure	6 stocks of conern
Lower Cook Inlet	Below average	3 of 3	Yes	Yes	Restricted; Closed Anchor River	No
Prince William Sound	Below average	1 of 1	Yes	Yes	Yes	No
Southeast	Below average	N/A	Yes	Yes	Yes	No

[a] Some aerial survey-based escapement goals were not assessed due to inclement weather or poor survey conditions, therefore we do not know if the escapement goals were met for these systems.
[b] The Chinook salmon escapement goal of 40,000 – 80,000 and the inriver goal of 75,000 were exceeded on the Nushagak River in 2012.
[c] Uncertainty in measuring the inriver abundance of early- and late-run Kenai River Chinook salmon do not provide clear assessment if the escapement goal of these two stocks were met.

4.6 Analysis of Impacts: Alternative 1, Status Quo

Selecting the status quo alternative would maintain the current regulations for the non-pollock groundfish trawl fisheries in the action area. Recording a certain level of Chinook salmon PSC would not lead to the closure of any of the fisheries under consideration. Directed fishing would only close if directed fishery TAC had been harvested, if Pacific halibut PSC limits had been reached, or in accordance with prescribed season end dates.[32] While the fisheries would not close due to the fulfillment of Chinook salmon PSC allowances, it is still incumbent upon fishery participants to avoid catching Chinook salmon to the extent practicable under existing regulation. Yet, no regulatory measures are defined for enforcing this requirement.

[32] Section 4.4.8 reviews the annual pattern of GOA non-pollock trawl fishery closures for these reasons during recent fishing years.

Estimated Chinook salmon PSC in the GOA non-pollock fisheries has varied greatly between 2003 and 2011. Moreover, the annual Chinook salmon PSC rate (number of Chinook salmon PSC per mt of non-pollock groundfish) is not always a clear indicator of the magnitude of annual Chinook PSC (Figure 4-20). Studies of salmon PSC rates in the Bering Sea similarly concluded that rates were highly variable across a number of factors beyond the pattern of fishing fleet effort; these factors include water temperature, location, and salmon abundance by year and season (Ianelli, 2010). The data analyzed in this document also show continued variation in estimated PSC rates throughout the year. A published report that reviewed earlier bycatch patterns found that Chinook salmon PSC occurred in every week that groundfish were prosecuted (Witherell, 2002).

Figure 4-20 Estimated Chinook salmon PSC in the GOA non-pollock groundfish fisheries, 2003 to 2011

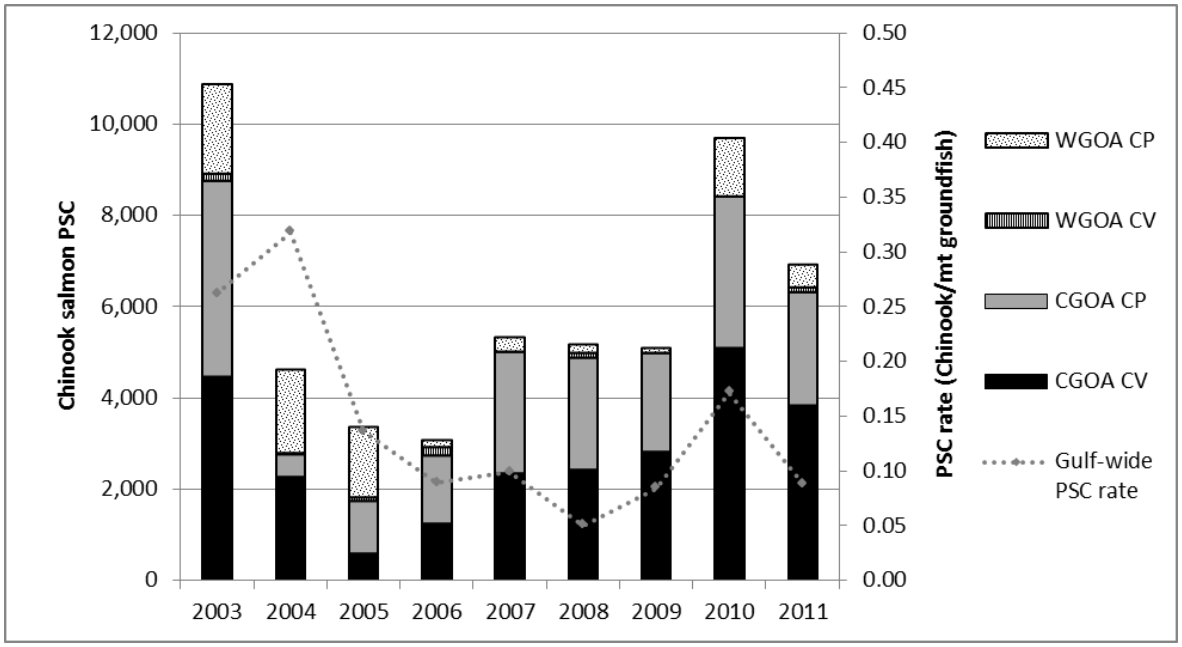


Table 4-44 to Table 4-47 report 2003-to-2011 average annual non-pollock groundfish trawl harvest, Chinook salmon PSC, and Chinook PSC rate (by GOA trip target) for the regulatory areas and/or operational harvest sectors to which this action could apportion Chinook PSC allowances. These figures summarize the recent historical disposition of non-pollock trawl harvests and Chinook salmon PSC in the GOA.

Under current regulations, GOA non-pollock groundfish harvest levels are unlikely to increase significantly. In general (as previously discussed in Section 3.2), GOA flatfish TACs are set conservatively below acceptable biological levels (ABCs) in order to protect other species, such as halibut. As a result, directed flatfish fishing is frequently restricted before TACs are fully harvested. GOA rockfish and Pacific cod TACs are set in relation to ABC. The TAC levels for GOA flatfish and rockfish have been relatively stable over the analyzed period (Figure 4-8 and Figure 4-9). GOA Pacific cod TAC has displayed an upward trend since 2009, but this trend is not expected to continue in 2013.[33]

In addition, it is possible that harvest rates could decline. The recent action to reduce available halibut PSC for Gulf fisheries could lead to earlier seasonal closures, if those lower rates are exceeded. These closures could reduce harvests from the Gulf. Since any of these closures would be seasonal, they could affect both total harvests and the distribution of harvests throughout the year. The closures, however,

[33] Final 2013 TAC levels will not be set until the December 2012 Council meeting.

would limit the amount of fishing during periods of the year when halibut catch rates are particularly high. While these closures have the potential to reduce Chinook PSC, they will not affect Chinook PSC in the Central Gulf rockfish fishery, as cooperatives in that fishery have exclusive allocations of rockfish and halibut PSC apportionments.

Table 4-44 Average annual GOA non-pollock harvest, Chinook salmon PSC, and PSC rate by trip target

TARGET	2003 to 2011 annual average		
	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Rockfish	20,813	1,112	0.053
Arrowtooth Flounder	16,451	1,889	0.115
Pacific Cod	13,055	884	0.066
Shallow Water Flatfish	7,389	462	0.064
Rex Sole	2,873	1,336	0.477
Flathead Sole	1,271	307	0.223
Deep Water Flatfish	217	0	0.000

Table 4-45 Average annual trip target non-pollock harvest, Chinook salmon PSC, and PSC rate, by regulatory area

	TARGET	2003 to 2011 annual average		
		Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Central GOA	Rockfish	15,178	1,035	0.071
	Arrowtooth Flounder	14,998	1,374	0.087
	Pacific Cod	9,913	754	0.075
	Shallow Water Flatfish	7,341	460	0.064
	Rex Sole	2,620	1,291	0.507
	Flathead Sole	839	132	0.124
	Deep Water Flatfish	217	0	0.000

	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Western GOA	Rockfish	5,635	77	0.012
	Arrowtooth Flounder	1,453	516	0.519
	Pacific Cod	3,142	130	0.047
	Shallow Water Flatfish	48	2	0.027
	Rex Sole	253	45	0.178
	Flathead Sole	432	175	0.249

Table 4-46 Average annual trip target non-pollock harvest, Chinook salmon PSC, and PSC rate, by operational harvest type

	TARGET	2003 to 2011 annual average		
		Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
CP	Rockfish	11,656	426	0.035
	Arrowtooth Flounder	5,880	1,103	0.209
	Pacific Cod	444	84	0.168
	Shallow Water Flatfish	319	8	0.024
	Rex Sole	2,746	1,305	0.484
	Flathead Sole	872	229	0.225

	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
CV	Rockfish	9,157	686	0.076
	Arrowtooth Flounder	10,571	786	0.071
	Pacific Cod	12,611	800	0.063
	Shallow Water Flatfish	7,070	454	0.068
	Rex Sole	128	31	0.128
	Flathead Sole	399	79	0.112

Table 4-47 Average annual trip target non-pollock harvest, Chinook salmon PSC, and PSC rate, by regulatory area and operational harvest type

	TARGET	2003 to 2011 annual average		
		Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Central GOA CP	Rockfish	6,060	349	0.066
	Arrowtooth Flounder	4,429	594	0.108
	Pacific Cod	231	17	0.050
	Shallow Water Flatfish	276	7	0.020
	Rex Sole	2,492	1,259	0.514
	Flathead Sole	449	55	0.072

	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Central GOA CV	Rockfish	9,118	686	0.076
	Arrowtooth Flounder	10,569	780	0.070
	Pacific Cod	9,682	737	0.075
	Shallow Water Flatfish	7,065	454	0.068
	Rex Sole	128	31	0.128
	Flathead Sole	390	77	0.119

	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Western GOA CP	Rockfish	5,596	77	0.012
	Arrowtooth Flounder	1,451	509	0.516
	Pacific Cod	213	67	0.179
	Shallow Water Flatfish	43	1	0.021
	Rex Sole	253	45	0.178
	Flathead Sole	423	174	0.258

	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Western GOA CV	Pacific cod	2,929	63	0.025

Selecting the status quo alternative would not alter current regulations, and thus would not directly affect the costs or revenues that non-pollock groundfish harvests bring to harvesters, processors, consumers and communities. While some of the trawl fleet may continue to take actions to voluntarily limit Chinook PSC, in the absence of PSC limits, vessels working in relatively short, competitive fisheries may lack the incentives to stop fishing in an area with high Chinook salmon PSC. This tendency may be exacerbated

by the recent decrease in halibut PSC, if participants in the fisheries expect those limits to be reached. In that case, participants may perceive added pressure to disregard Chinook PSC rates if they believe that the fishery will be closed soon due to halibut PSC. Taking action to avoid salmon may further reduce their own target catch and gross revenue (and likely net revenue), particularly if other participants do little or nothing to avoid Chinook PSC. On the other hand, if halibut PSC limits close fisheries early, the reduction in fishing effort from those closures could reduce Chinook PSC.

Without a Chinook PSC limit, fishermen are left to weigh the individual economic risks associated with Chinook avoidance against the unenforceable regulatory directive to avoid PSC to the extent practicable. Some participants in the fisheries affected by this action have taken steps to reduce Chinook PSC in the absence of a regulatory limit. To date, some groundfish fishers have attempted voluntary standdowns during times of high Chinook salmon encounters, and some have participated in salmon excluder gear trials (further discussed in Section 5.1.4). Under the status quo alternative, fishers who are members of voluntary harvest cooperatives could still utilize the tools of coordinated action. The Council has heard testimony that indicates some concern about the future viability of voluntary Chinook avoidance. Industry reports and preliminary 2012 fishing year harvest data suggest that participation in GOA groundfish fisheries has increased due to speculation about future catch share management.[34] An influx of vessels that are not a party to voluntary avoidance measures could reduce the amount of TAC available to those salmon-avoiding vessels, under the current limited access management structure. This influx of fishing pressure could compound the pressure to disregard Chinook PSC rates, as historical participants' shares of the catch will be eroded by the additional added effort, particularly if those new entrants attempt to maximize catches by deploying maximum effort and taking no steps to avoid Chinook PSC.

One Chinook PSC trend that is not evident in summary tables above is the 2007 spike in Chinook PSC from Central GOA rockfish trips, followed by a moderate annual decline (illustrated in Figure 4-18). Industry representatives indicate that the increase may have been related to gear changes, meant to avoid halibut PSC, and an earlier CV season opening (in May), that both allowed vessels to harvest fish earlier to avoid delivery conflicts and stabilized residential processor employment. Voluntary measures to reduce Chinook PSC in this fishery include fleet awareness and communication between vessels about Chinook encounters. These voluntary measures are unlikely to be successful outside of the Central Gulf Rockfish Program, as participants in those fisheries expose themselves to loss of harvest share when adopting Chinook avoidance measures that slow their rate of target catch. In the Rockfish Program, share allocations insulate participants from that risk.

The full retention alternative (Alternative 3) is intended to improve the understanding of the stock origins of Chinook salmon taken as PSC in the non-pollock trawl fishery. Under the status quo, no full retention requirement would be set in place. In the absence of a full retention requirement, the 2013 implementation of the restructured observer program may create some additional opportunity for biological sampling of Chinook salmon, as more vessels – particularly in the CV fleet – will be carrying an observer. If an observer is aboard, salmon are prohibited from being discarded at sea until data collection and biological sampling has taken place.

4.7 Analysis of Impacts: Alternative 2, PSC limit(s) between 5,000 and 12,500 Chinook Salmon

This section of the analysis will consider the impacts of the Chinook salmon PSC limits that the Council has proposed for consideration. Analysis of Alternative 2 is retrospective. Given the variation in TACs,

[34] This analysis does not include a quantitative assessment of the recent deviation from historical participation levels that industry representatives have anecdotally reported, as complete 2012 fishing year data is not yet available. Further discussion on recent changes to GOA groundfish participation is included in Section 1.6.

annual Chinook salmon PSC (illustrated in Figure 4-10 and Figure 4-20), and the lack of fishing experience under Chinook salmon PSC limits, there is no solid basis for making forecasts of actual future PSC levels. For each option under Alternative 2, the analysis first examines the potential direct effect on Chinook PSC and Central and Western GOA non-pollock groundfish harvests and revenues. Direct impacts on harvest and revenue include the avoided Chinook PSC and forgone groundfish harvest that might arise from early seasonal closures triggered by usage of Chinook salmon PSC allowances. Other potential related impacts are addressed in Sections 4.7.2 through 4.7.4; they include changes in the number of Chinook salmon available to non-trawl users, reduced processing revenue and available hours of employment at groundfish processing facilities, reduced groundfish products available to consumers, reduced groundfish skipper and crew employment, and reduced groundfish harvester wages.

This analysis also considers – in broader terms – potential benefits for Chinook salmon harvesters, processors, and product consumers (Section 4.7.2). PSC limits could increase the number of Chinook salmon available to inshore and freshwater fisheries. Any such benefit should be considered when assessing a Chinook salmon PSC limit's net benefit to the nation. Potential benefits to the Chinook salmon fishery are not directly quantifiable with present data, as we lack the biological data to assess the origin of Chinook salmon caught in GOA trawl nets. Future analyses should benefit from the mandatory full retention for biological sampling that the Council approved for the GOA pollock fisheries in GOA Groundfish Amendment 93 and, potentially, Alternative 3 of this action. Further, no available studies address the total ecosystem benefit that trawl-caught salmon, regardless of stock origin, would have provided had they not been taken.

Because the impact analysis that follows is retrospective, it assumes no change in fleet behavior as a result of implementing a PSC limit. This assumption does not affect the validity of comparing one PSC limit option to another, but one can presume that all estimates of forgone harvest may be overstated to a degree. Regulated trawlers are, to the extent practicable, likely to modify their behavior in order to reduce their Chinook salmon PSC rate (salmon per metric ton of groundfish catch). With no behavior change, some GOA fisheries are predicted to close earlier than in recent years, once proxy (historical average) PSC limits are reached. Reducing PSC rates through salmon avoidance could mitigate the predicted shift in fishery closure dates. However, since historical Chinook salmon PSC encounter has been highly variable and unpredictable, in both time and space, the analysts note that avoidance measures could be unreliable in their effectiveness. Therefore, the analysts believe that any overstatement of forgone harvest and gross revenue caused by assumptions about fishing behavior should be modest. Moreover, when thinking about the potential effect of PSC avoidance strategies, one should consider that behavior changes often impose a cost. These could include increased variable costs (fuel, ice, time) associated with relocating from areas of high Chinook salmon encounter, or increased fixed costs associated with capital investment in any salmon excluding gear that may be developed in the future.[35]

On the other hand, a retrospective analysis could potentially underestimate the cost of PSC closures if future non-pollock groundfish TAC levels were to increase. An early closure would be costly in terms of lost opportunities to harvest and process the additional available fish. Fleet-wide reductions in Chinook salmon PSC rates could extend the fishing season and mitigate such opportunity costs. However, recent TAC history (Figure 4-8 and Figure 4-9) has been stable or only moderately increasing over the past 10 years. Upward trends in Pacific cod TAC (in both the Central and Western GOA) provide the only real concern for this type of underestimation.[36] Additional information on recent TAC history can be found in Section 4.4.7.

[35] Note, to date, salmon excluder gear has only been developed for the pollock trawl fishery; gear modifications have yet to be designed for non-pelagic trawl target fisheries.
[36] Recall that – through 2011 – 90% of Pacific cod TAC is allocated to the inshore (CV) fleet, meaning that the underestimation of forgone benefits would primarily impact CVs.

Revenue impacts are roughly proportional to harvest impacts, so a reduction in groundfish harvest would likely decrease the fleet's revenue (and likely profit, as well). This statement is based on the assumption that ex-vessel and first wholesale values will remain in line with recent trends, in which harvest weight and gross wholesale revenue are closely related by a consistent ratio, and no price effect was observed in low harvest years. Refer back to Section 4.4.6.3 for information on the statistical relationship between harvest and revenue trends.

The following impact analysis does not specifically detail the revenue impact under each considered PSC limit alternative, as the general magnitude of the impact can be discerned from the harvest impact. However, it may be useful to reference Table 4-48 along with the potential forgone harvest percentages (reported in Table 4-51 through Table 4-57) to understand the potential magnitude of revenue exposed to loss. All revenue figures in Table 4-48 represent processor first wholesale values, in order to maintain uniformity across the CP and CV sectors.

Table 4-48 2003 to 2011 average annual first wholesale value of principal GOA non-pollock groundfish target fisheries

TARGET	Average Annual First Wholesale Value ($), 2003-2011				
	Gulf-wide	By Regulatory Area		By Operational Type	
		Central GOA	Western GOA	Catcher/Processor	Catcher Vessel
Rockfish	27,523,844	20,680,687	6,843,157	14,991,187	12,532,658
Pacific Cod	19,738,978	14,454,931	5,284,047	566,136	19,172,842
Arrowtooth Flounder	14,534,425	13,099,955	1,434,470	6,374,093	8,160,332
Shallow Water Flatfish	6,349,924	6,298,344	51,580	371,249	5,978,675
Rex Sole	3,359,242	3,055,580	303,662	3,233,075	126,167
Flathead Sole	1,349,977	829,923	520,054	1,034,822	315,155
All non-pollock sp. Total	74,311,876	59,871,013	14,440,863	26,640,178	47,671,698

Source: NMFS Alaska Region At-Sea Production Reports, data compiled by AKFIN in Comprehensive_WPR, and ADFG/CFEC Fish Tickets, data compiled by AKFIN in Comprehensive_FT and AFSC Gross Earnings data compiled by AKFIN.

4.7.1 Impacts on Chinook salmon PSC levels and non-pollock groundfish trawl harvest

This section of the analysis assesses the effect of Chinook salmon PSC limits on both Chinook PSC and non-pollock groundfish trawl harvests. These effects depend on the likelihood that a Chinook salmon PSC limit will constrain non-pollock groundfish harvest and, by extension, reduce groundfish revenues. These harvest constraints arise if the Chinook salmon allowance is met and the fishing season is closed prior to either harvesting all available TAC or reaching a PSC limit on a different species.

Below, the analysts review the key target harvest species for each operational harvest type (CP and CV trawlers) in each regulated GOA subarea (Central GOA and Western GOA). This information aids in understanding which target fisheries might be avoided if fishers adopt a PSC-reducing strategy, or which are likely to receive increased effort if fishers adopt a defensive position and increase effort over a shortened season (more detail on these, and other, behavioral responses to a PSC limit is provided in Section 4.7.3). While reviewing the CV and CP sector in each regulatory area, the analysts also note the distribution of endorsements to trawl for groundfish. License and participation information reflects harvesters' ability to redirect effort to a different regulatory area in response to Chinook PSC limits; effort redirection is discussed as a potential behavioral response Section 4.7.3. Next, the analysts provide a high-level overview of how using either a 5- or a 10-year historical PSC record to apportion PSC allowances differently shapes the timing and number of simulated fishery closures during the analyzed period (2003 to 2011). The numbered subsections that follow summarize the range of projected future impacts that Alternative 2 (and its options) might have, in terms of forgone non-pollock groundfish harvest and avoided Chinook salmon PSC.

Though it is not presented here, one could approximate forgone revenue impacts as a simple function of forgone harvest. Harvest and gross revenue are strongly correlated, displaying a correlation coefficient of 0.94 across all analyzed trip reports. In other words, reduced harvest would result in reduced gross revenue. As described in Section 4.4.6.3, the relationship between harvest weight and wholesale revenue has been stable in real dollar terms. Figure 4-4 and Figure 4-6 provide a sense of how many dollars in wholesale revenue would be forgone with each metric ton of forgone harvest. Figure 4-2 provides the same information at a trip target species level. Below, Table 4-49 reports the 2011 average first wholesale price received by shoreside and at-sea processors for GOA non-pollock groundfish species products. In 2011, rockfish and Pacific cod generated higher wholesale revenue per unit in the Central GOA than in the Western GOA, while rex sole, flathead sole and arrowtooth generated higher per unit revenue in the Western GOA (shallow water flatfish were only recorded in the Central GOA during 2011). Again looking at the most recent year, per unit rockfish revenue was roughly equivalent in the CP and CV sectors. The CV sector generated higher per unit revenue from Pacific cod, and the CP sector generated higher per unit revenue from the flatfish targets.

Table 4-49 2011 Gulf-wide first wholesale price per metric ton, by processor type

Species	First wholesale price ($/mt)	
	Shoreside	At-sea
Rockfish	3,122	3,644
Pacific cod	3,772	3,362
Flatfish	1,457	1,642

Note: First wholesale prices are reported at the species level; Flatfish includes arrowtooth flounder, shallow water flatfish, rex sole and flathead sole, among others.
Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD

Using retrospective data reported by week-ending date, it is possible to determine the date in each year when the non-pollock groundfish trawl fisheries would have been closed due to the Chinook PSC limit being reached for each PSC-apportionment. Any harvest recorded in weeks following that simulated closure would have been forgone by the fisheries subject to the limit. Similarly, any Chinook salmon PSC recorded in the post-closure weeks would not have occurred. Post-closure PSC in the analyzed years is referred to as "salmon savings."

This analysis does not make suppositions about the Council's preference, or lack of preference, on generating a specified percentage return in salmon savings on forgone harvest. Fishery managers' desire to reduce Chinook salmon PSC at the potential cost of groundfish trawl harvest will likely be guided by the Magnuson-Stevens Act National Standards, and an assessment of the net benefit to the nation (50 C.F.R §600.350(d)). Under this criterion, it may be deemed preferable to reduce PSC at a higher percentage cost in forgone harvest. However, this is difficult to assess without greater information on the proportion of GOA trawl-caught Chinook salmon that return to United States rivers, and their total socioeconomic value to United States entities.

Alternative 2 and its associated options create nine possible levels at which a Chinook salmon PSC limit could be apportioned, with each level representing a portion of the total GOA trawl fleet that could be closed out of directed non-pollock trawl fishing due to full PSC use. Each of these nine subdivisions could be allotted a portion of one of four considered total PSC limits. Each of the four limits could be apportioned according to either a 5- or 10-year PSC history in the regulated fishery. Under Alternative 2, there are 28 different ways to set and apportion Chinook salmon PSC, resulting in 68 possible individually managed apportionments. Table 4-50 summarizes the number of years during the analyzed period that each fleet subdivision would have experienced a closure to directed non-pollock trawl fishing, had those Chinook PSC limits been in place from 2003 through 2011.

Table 4-50 Number of years (2003 to 2011) during which a trawl fishery closure would have occurred under the analyzed Chinook salmon PSC limits and apportionments thereof

		Total GOA PSC Limit							
		12,500	10,000	7,500	5,000	12,500	10,000	7,500	5,000
Alternative 2	Gulf-wide	0	1	2	6				
Subdivision		5-year History				10-year History			
Option 1	Central GOA	0	0	2	6	0	2	3	6
	Western GOA	4	4	4	5	0	2	3	4
Option 2	Catcher/Proccesors	1	1	2	6	0	1	2	6
	Catcher Vessels	0	0	3	4	0	1	3	5
Options 1 & 2	CGOA CP	0	1	2	6	0	1	2	6
	CGOA CV	0	0	2	4	0	2	3	7
	WGOA CP	4	4	4	5	3	3	4	4
	WGOA CV	4	4	5	5	0	0	0	0

Key non-pollock harvest species, by GOA trawl harvest sector

The Central GOA CV trawl sector records the highest average annual harvest of non-pollock trawl groundfish, by a wide margin (see Table 4-16). Participants in this sector derive a significant portion of average annual harvest from trips targeting arrowtooth flounder, Pacific cod, rockfish, and shallow water flatfish. The majority of arrowtooth and Pacific cod harvest is taken by trips that occur in the first half of the year, while shallow water flatfish tend to be harvested in later months. Trips targeting arrowtooth and Pacific cod contribute the greatest proportion of the sector's average annual Chinook salmon PSC. PSC in the arrowtooth fishery tends to be higher in the first half of the year, while the Pacific cod fishery takes similar amounts of Chinook PSC in both the A- and the B-seasons. Rockfish trips, which rank third within this sector for both harvested weight and Chinook salmon PSC, begin four to six weeks before the Central GOA CP rockfish harvest.[37] In 2011, 51 of the 97 CVs with Central GOA trawl endorsements were also licensed to trawl in the Western GOA, and 37 were licensed in the Bering Sea (one was also licensed to trawl in the Aleutian Islands regulatory area). Of the 47 Central GOA CVs that were active in 2011, 27 also landed BSAI groundfish, 8 also landed Western GOA groundfish, and 3 were active in both GOA regulatory areas *and* the BSAI. 46 of the 47 vessels active in 2011 participated in the Central GOA pollock fishery. 14 of the 15 active vessels who only participated in the Central GOA in 2011 landed some amount of Pacific cod, rockfish, flatfish and pollock; the remaining Central GOA-only vessel did not record any rockfish landings.

The Western GOA CV sector is almost entirely a Pacific cod fishery. Nearly all of the sector's harvest and PSC is linked to the Pacific cod A-season. In 2011, 51 of the 78 CVs with Western GOA trawl endorsements were also licensed to trawl in the Central GOA, and 21 were licensed in the Bering Sea (one was also licensed to trawl in the Aleutian Islands regulatory area). Of the 14 Western GOA CVs that were active in 2011, 4 also landed BSAI groundfish, 8 also landed Central GOA groundfish, and 3 were active in both GOA regulatory areas *and* the BSAI. 13 of the 14 vessels that were active in 2011 participated in the Western GOA pollock fishery. Most harvesters who fished only in the Western GOA landed some amount of Pacific cod, rockfish, flatfish and pollock, but the 3 active vessels who displayed more selective participation in 2011 targeted only Pacific cod or cod and pollock.

The Central GOA CP sector mainly harvests rex sole early in the fishing year, and trips targeting this species account for the greatest proportion of the sector's average annual PSC. Rockfish trips account for the most significant percentage of harvested weight; this sector's rockfish fishery primarily occurs in June

[37] This timing difference between the Central GOA CV and CP rockfish fisheries has emerged since the implementation of the Rockfish Pilot Program, in 2007. Refer to Section 4.4.11 for further detail.

and July (Weeks 24 and 31), owing to harvesters' demonstrated preference to prosecute fisheries other fisheries in May. Selecting a limit that does not separately apportion PSC to the CP and CV sectors could create an incentive for Central GOA CPs to start targeting rockfish earlier in the year, as a defensive measure against losing revenue to a PSC closure; this behavioral shift would, of course, require a trade-off in the harvest that Central GOA CPs currently target in May. It is likely that such a trade-off would result in decreased revenue, or else they would already be prosecuting rockfish at that time. The majority of Central GOA CP trips targeting arrowtooth tend to occur in the summer and fall months, which is later than the arrowtooth harvest occurring in other sectors. In 2011, 13 of the 21 CPs with Central GOA trawl endorsements were also licensed to trawl in the Western GOA, and 20 were licensed in the Bering Sea (15 were also licensed to trawl in the Aleutian Islands regulatory area). Of the 9 Central GOA CPs that were active in 2011, 8 also landed BSAI groundfish, and 6 were active in both GOA regulatory areas *and* the BSAI. All active Central GOA CPs in 2011 landed some amount of Pacific cod, rockfish, flatfish, and pollock. The 3 Central GOA CPs that did not also fish in the Western GOA are each members of Amendment 80 cooperatives. This is noteworthy in that these vessels have other opportunities to harvest groundfish if the Central GOA CP fishery is closed for PSC. Were it not the case, a PSC limit that apportioned Chinook salmon allowances by regulatory area would have placed these vessels in a more precarious situation if dual-licensed vessels redirected effort from the Western GOA and triggered an earlier closure in the Central GOA.

The Western GOA CP sector primarily targets rockfish, but also recorded significant arrowtooth harvest. As stated above, arrowtooth tend to be targeted earlier in the year in the Western GOA than in the Central GOA (refer back to Table 4-28 to see the monthly distribution of target harvest broken out by regulatory area). Spring arrowtooth harvest contributed the greatest proportion of the sector's Chinook salmon PSC, though trips targeting flathead sole accounted for the most PSC relative to harvested target species weight. Voluntary action to reduce Western GOA CP PSC rates could potentially focus on avoiding flathead sole fisheries during March. In 2011, 13 of the 20 CPs with Western GOA trawl endorsements were also licensed to trawl in the Central GOA, and all 20 carried Bering Sea endorsements as well (18 were also licensed to trawl in the Aleutian Islands regulatory area). All 14 of the Western GOA CPs that were active in 2011 also landed BSAI groundfish, and 6 were active in both GOA regulatory areas. All active Western GOA CPs in 2011 landed some amount of Pacific cod, rockfish, flatfish, and pollock. 19 Western GOA CPs actually made non-pollock groundfish landings from 2003 to 2011, and 5 of these did not operate in the Central GOA. Each of these 5 CPs are Amendment 80 cooperative members, so, as noted in the previous paragraph, there should be somewhat less concern about these vessels losing all of their groundfish access due to increased redirected effort from dual-licensed vessels under an area-apportioned PSC limit.

Option to base apportionment on either a 5-year or 10-year Chinook salmon PSC history

The choice between a 5- or 10-year basis period for apportioning future PSC limits affects expected closure dates for all considered apportionments. The difference in potential outcomes – as evaluated by looking back on the 2003 to 2011 period – is most dramatic if the Council chooses both Options 1 and 2 under Alternative 2.

If only Option 1 is chosen, a 10-year basis period would decrease the likelihood of Western GOA PSC closures under any of the considered PSC limits and would shift the closures that do occur to later in the year, relative to outcomes under a 5-year basis period. Conversely, a 10-year basis period would generally increase the likelihood of Central GOA PSC closures and would shift the closures that do occur to earlier in the year. This effect is the result of higher historical Chinook salmon PSC in the Western GOA from 2002 to 2006, relative to the 2007 to 2011 period. Considering the five additional earlier years increases the Western GOA's PSC apportionment from 8% of the total PSC cap under a 5-year basis period to 18% under a 10-year basis period, at cost to the Central GOA's apportionment percentage (Table 2-2).

If Option 2 is chosen, using either a 5- or 10-year basis period has a similar effect on the CP sector. CP closures would be expected to occur one to two weeks later in the year under a 10-year basis compared to a 5-year basis. Conversely, using a 10-year basis would shift expected CV closures one to two weeks earlier in the year.

Jointly applying Options 1 and 2 further partitions the selected total PSC limit, meaning that a given sector's Chinook salmon allowance is lower. Simulated closure dates during the analyzed period were less stable from year to year. At worst, unpredictable high-PSC events can eat up most or all of a sector's annual area allowance in the course of a single week. The Western GOA CV sector recorded consistently low PSC rates from 2003 to 2011, but this low PSC history led to small apportionments of PSC. Western GOA CV PSC was so low from 2007 to 2011 that the sector would receive an annual allowance of only 1% of the total PSC limit (35 to 86 Chinook salmon) if PSC is apportioned by a 5-year basis period. Such small apportionments led to very early (February or March) simulated closures in four to five of the analyzed years, depending on the size of the selected total PSC limit. In-season management could be very difficult with such a short season, and some directed fisheries may not be opened at all. By contrast, the Western GOA CV sector would receive an annual allowance of 5% of the total PSC limit (243 to 606 Chinook salmon) under a 10-year basis period. Western GOA CV PSC apportionments at these levels would not have triggered a PSC closure in any of the analyzed years.

For combined Options 1 and 2, the other sectors experienced a less dramatic difference in expected closure dates between 5- and 10-year area apportionment scenarios. Nevertheless, the range of observed closure dates was still less stable and less predictable than when PSC allowances were apportioned to entire regulatory areas or GOA operational harvest type sectors. The Central GOA CV sector would likely experience earlier closures under a 10-year apportionment basis; the sector would receive a smaller Chinook salmon allowance, which is less robust to high-PSC events and generated a wider range of closure dates during the analyzed historical period. Simulated Central GOA CP closures also occurred earlier under a 10-year apportionment basis, while Western GOA CP closures occurred slightly later in the year.

4.7.1.1 Impact analysis results

Introduction to reported impacts

The following subsections describe the range of potential Chinook salmon PSC and GOA non-pollock groundfish harvest impacts that are suggested by observations of harvest and Chinook PSC records from 2003 to 2011. Because this analysis is retrospective, and fishers were not under a PSC cap at the time, regulatory impacts must be viewed with the caveat that fishers did not alter their behavior to avoid Chinook salmon and forestall PSC-related fishery closures. Total GOA and target fishery harvest has varied from year to year, and Chinook salmon interception is an unpredictable event. As such, the reported impacts should not be interpreted as a forecast of future conditions. The presented range of impacts is derived by identifying the dates of the earliest and latest simulated closures that would have occurred if a PSC limit had been in place from 2003 to 2011. These closure dates are then applied to groundfish harvests and Chinook salmon PSC of a "characteristic fishing year" that typifies the analyzed period.

The characteristic fishing year is constructed by averaging Chinook PSC and non-pollock groundfish harvest levels of each calendar week from 2003 to 2011. For each apportionment scenario, the closure weeks that were retrospectively simulated on 2003 to 2011 records are applied to the characteristic fishing year Chinook PSC usage and groundfish harvests to estimate the effects of the closure. These resulting salmon savings and forgone harvest estimates reflect the regulatory impacts that might be experienced in

the best approximation of a typical fishing year, given the available historical record. The characteristic fishing year displayed annual Gulf-wide key species harvest of 62,070 mt and 5,991 Chinook salmon PSC, which is very near to the observed average levels for all GOA non-pollock target species – 62,43 mt and 6,001 Chinook salmon.

Analysts elected to rely on a "characteristic fishing year" for two reasons. First, the use of a characteristic fishing year allows analysts to present estimated salmon savings and forgone groundfish harvests for all years and options without being restricted by confidentiality limitations. Confidentiality issues would prevent the disclosure of estimates for a large number of weeks as a result of relatively few vessels participating in some of the non-pollock target fisheries at the time. These low-vessel weeks typically occur later in the year, and frequently coincide with the time at which retrospective simulated Chinook PSC limits are being triggered. The second reason for using a characteristic fishing year is to smooth potential impact changes that arise from variability in annual Chinook PSC and distributions of target harvest. Because of this variability, simply relying on past simulated closures to identify the range of likely future outcomes likely over- or understates expected salmon savings and forgone harvest. To illustrate this point, recognize that 7 of the 68 considered PSC apportionments would have resulted in a fishery closure during only one of the analyzed years. Six of those seven closures would have occurred in 2003, when Chinook PSC was atypically high and harvest was slightly below average. Because harvests and PSC display no stable trend, simulated forgone harvest and salmon savings for 2003 are not necessarily a reliable indicator of future expected outcomes under those six PSC apportionment scenarios. Many factors could have made 2003, or any year, exceptional or simply different from harvest and PSC conditions in the future.

The use of a characteristic fishing year circumvents an analytical problem where potential impacts under one apportionment scenario are based on the fishing history of a particular historical year, while impacts under another scenario are based upon a different year or a set of years. Simulated closures (determined using actual PSC usage in each historical year) occurred in multiple years – and different calendar weeks – for 43 of the 68 PSC possible apportionments (Table 4-50). In these cases, the analysts provide the maximum and minimum salmon savings and forgone harvest that the range of closures would generate in the characteristic year, as well as the number of analyzed years in which a closure would have occurred.[38]

Note that "minimum" impacts, derived from analyzing the characteristic year under the latest observed simulated PSC closure, represent minimum impact during a year that would have experienced a PSC closure; Table 4-50 clearly indicates that PSC closures were not observed and cannot be expected to occur in every year. One can think of direct harvest and PSC impacts as "zero" for years in which the Chinook PSC limit was not attained, but it is important to remember that the existence of a PSC cap may alter fishers' behavior, even if the limit is non-constraining. These behavioral impacts are discussed further in Section 4.7.3.

This analysis breaks down the potential range of impacts by target species. However, one should keep in mind that Alternative 2 would apply a Chinook salmon PSC limit to all non-pollock groundfish trawl target fisheries. PSC recorded by trips targeting a given species accrues to the entire PSC apportionment group (as determined by the Alternative 2 option, or options, selected). Because of this, harvesters cannot simply switch targets *in response to* a PSC closure. However, harvesters may alter their fishing behavior in anticipation of a constraining PSC limit. Such a preemptive response could take one (or more) of three forms: (1) harvesters may shift fishing activity away from target fisheries that record high levels of PSC

[38] Appendix 1 provides the entire set of Chinook salmon savings for each simulated closure as they would have occurred from 2003 through 2011. A separate table is presented for each of the 68 combinations of considered non-pollock GOA Chinook salmon PSC limits and Alternative 2 apportionment options. Metric tons of forgone harvest cannot be reported due to the confidentiality limitations mentioned above. As an alternate measure of harvester impacts, the analysts instead report the number of vessels that were active in any week from the date of the Chinook PSC closure through the end of the year.

in order to prevent or forestall a non-pollock groundfish closure; (2) harvesters could execute a standdown within a directed fishery that is, or is expected to be, recording high Chinook salmon PSC; or (3) harvesters may accept that a closure is imminent and respond by increasing participation in early season or high-value target fisheries in order to generate as much revenue as possible while the season is still open. Harvesters may be limited in their ability to adjust in-season behavior according to these strategies. Limiting factors include seasonal TAC allocations for Pacific cod (described in Section 4.4.7), Pacific halibut PSC limits, and competitive disincentives to coordinate temporary standdowns, among others. The behavioral response aspect of shared PSC limits is further discussed in Section 4.7.3.

Results tables, by Alternative 2 apportionment options

The following tables summarize the best available estimation of potential Chinook salmon and non-pollock groundfish harvest impacts for each apportionment scenario under Alternative 2. In addition to total GOA (or sector) avoided Chinook PSC and forgone harvest impacts, these tables report expected outcomes by target species. The key target species – rockfish, Pacific cod, rex sole, shallow water flatfish, flathead sole, and arrowtooth flounder – are ordered (left to right) by descending average ex-vessel value of their products (as described in Table 4-39).

Table 4-51 Gulf-wide PSC closure impacts: historical simulated closures (2003 to 2011) applied to harvest and Chinook salmon PSC in a characteristic year

PSC Limit	# Years with PSC closure	Week of Closure	Impact	GOA Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water Flatfish		Flathead Sole		Arrowtooth	
				mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved
5,000	6	17 (earliest)	Forgone Harvest	42,208	68%	20,813	100%	4,264	33%	1,485	52%	6,319	86%	581	46%	8,705	53%
			Chinook Savings	3,361	56%	1,112	100%	369	42%	523	39%	411	89%	48	16%	898	48%
		50 (latest)	Forgone Harvest	101	0%	0	0%	0	0%	16	1%	58	1%	9	1%	18	0%
			Chinook Savings	30	0%	0	0%	0	0%	8	1%	0	0%	16	5%	5	0%
7,500	2	20 (earliest)	Forgone Harvest	38,351	62%	20,517	99%	4,246	33%	1,054	37%	5,602	76%	377	30%	6,555	40%
			Chinook Savings	2,384	40%	1,054	95%	368	42%	149	11%	371	80%	43	14%	400	21%
		39 (latest)	Forgone Harvest	6,291	10%	694	3%	945	7%	184	6%	1,633	22%	191	15%	2,644	16%
			Chinook Savings	729	12%	8	1%	102	12%	64	5%	307	66%	40	13%	207	11%
10,000	1	36	Forgone Harvest	11,181	18%	1,016	5%	3,926	30%	318	11%	1,931	26%	191	15%	3,801	23%
			Chinook Savings	1,057	18%	16	1%	330	37%	104	8%	343	74%	40	13%	224	12%
12,500	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-52 Option 1 - PSC closure impacts by regulatory area (5-year basis period): historical simulated closures (2003 to 2011) applied to harvest and Chinook salmon PSC in a characteristic year

Total GOA PSC Limit (allocation)	# Years with PSC closure	Week of Closure	Impact	Area Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water Flatfish		Flathead Sole		Arrowtooth	
				mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved
Central GOA																	
5,000 (4,601)	6	17 (earliest)	Forgone Harvest	35,119	69%	15,178	100%	4,182	42%	1,320	50%	6,277	86%	471	56%	7,651	51%
			Chinook Savings	2,938	58%	1,036	100%	350	46%	511	40%	410	89%	37	28%	594	43%
		46 (latest)	Forgone Harvest	604	1%	38	0%	3	0%	79	3%	254	3%	53	6%	177	1%
			Chinook Savings	90	2%	2	0%	0	0%	26	2%	10	2%	25	19%	27	2%
7,500 (6,902)	2	21 (earliest)	Forgone Harvest	31,172	61%	14,519	96%	4,170	42%	891	34%	5,341	73%	300	36%	5,950	40%
			Chinook Savings	2,024	40%	907	88%	350	46%	133	10%	369	80%	34	26%	231	17%
		44 (latest)	Forgone Harvest	1,472	3%	215	1%	17	0%	120	5%	519	7%	53	6%	548	4%
			Chinook Savings	260	5%	2	0%	1	0%	34	3%	86	19%	25	19%	112	8%
10,000 (9,202)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12,500 (11,503)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Western GOA																	
5,000 (399)	5	13 (earliest)	Forgone Harvest	7,581	69%	5,635	100%	89	3%	209	82%	45	94%	282	65%	1,321	91%
			Chinook Savings	660	70%	77	100%	18	14%	33	73%	2	100%	111	63%	420	81%
		29 (latest)	Forgone Harvest	2,086	19%	1,515	27%	76	2%	120	47%	19	40%	48	11%	308	21%
			Chinook Savings	55	6%	24	31%	18	14%	4	9%	0	13%	8	5%	0	0%
7,500 (598)	4	13 (earliest)	Forgone Harvest	7,581	69%	5,635	100%	89	3%	209	82%	45	94%	282	65%	1,321	91%
			Chinook Savings	660	70%	77	100%	18	14%	33	73%	2	100%	111	63%	420	81%
		18 (latest)	Forgone Harvest	6,719	61%	5,635	100%	82	3%	144	57%	38	80%	98	23%	721	50%
			Chinook Savings	224	24%	77	100%	18	14%	10	22%	1	85%	11	6%	107	21%
10,000 (797)	4	14 (earliest)	Forgone Harvest	7,437	68%	5,635	100%	89	3%	198	78%	45	94%	201	47%	1,268	87%
			Chinook Savings	502	53%	77	100%	18	14%	33	73%	2	100%	31	18%	342	66%
		18 (latest)	Forgone Harvest	6,719	61%	5,635	100%	82	3%	144	57%	38	80%	98	23%	721	50%
			Chinook Savings	224	24%	77	100%	18	14%	10	22%	1	85%	11	6%	107	21%
12,500 (996)	4	14 (earliest)	Forgone Harvest	7,437	68%	5,635	100%	89	3%	198	78%	45	94%	201	47%	1,268	87%
			Chinook Savings	502	53%	77	100%	18	14%	33	73%	2	100%	31	18%	342	66%
		28 (latest)	Forgone Harvest	4,139	38%	3,562	63%	76	2%	126	50%	19	40%	48	11%	308	21%
			Chinook Savings	96	10%	65	85%	18	14%	4	9%	0	13%	8	5%	0	0%

Table 4-53 Option 1 - PSC closure impacts by regulatory area (10-year basis period): historical simulated closures (2003 to 2011) applied to harvest and Chinook salmon PSC in a characteristic year

Total GOA PSC Limit (allocation)	# Years with PSC closure	Week of Closure	Impact	Area Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water Flatfish		Flathead Sole		Arrowtooth	
				mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved
Central GOA																	
5,000 (4,117)	6	17 (earliest)	Forgone Harvest	35,119	69%	15,178	100%	4,182	42%	1,320	50%	6,277	86%	471	56%	7,651	51%
			Chinook Savings	2,938	58%	1,036	100%	350	46%	511	40%	410	89%	37	28%	594	43%
		45 (latest)	Forgone Harvest	910	2%	139	1%	3	0%	98	4%	337	5%	53	6%	281	2%
			Chinook Savings	132	3%	2	0%	0	0%	34	3%	24	5%	25	19%	46	3%
7,500 (6,175)	3	20 (earliest)	Forgone Harvest	31,945	63%	14,882	98%	4,170	42%	926	35%	5,575	76%	311	37%	6,082	41%
			Chinook Savings	2,202	44%	977	94%	350	46%	145	11%	369	80%	34	26%	326	24%
		46 (latest)	Forgone Harvest	604	1%	38	0%	3	0%	79	3%	254	3%	53	6%	177	1%
			Chinook Savings	90	2%	2	0%	0	0%	26	2%	10	2%	25	19%	27	2%
10,000 (8,233)	2	37 (earliest)	Forgone Harvest	8,339	16%	876	6%	1,856	19%	268	10%	1,882	26%	144	17%	3,313	22%
			Chinook Savings	904	18%	10	1%	207	28%	99	8%	339	74%	32	24%	216	16%
		50 (latest)	Forgone Harvest	101	0%	0	0%	0	0%	16	1%	58	1%	9	1%	18	0%
			Chinook Savings	30	1%	0	0%	0	0%	8	1%	0	0%	17	12%	5	0%
12,500 (10,291)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Western GOA																	
5,000 (884)	4	14 (earliest)	Forgone Harvest	7,437	68%	5,635	100%	89	3%	198	78%	45	94%	201	47%	1,268	87%
			Chinook Savings	502	53%	77	100%	18	14%	33	73%	2	100%	31	18%	342	66%
		18 (latest)	Forgone Harvest	6,719	61%	5,635	100%	82	3%	144	57%	38	80%	98	23%	721	50%
			Chinook Savings	224	24%	77	100%	18	14%	10	22%	1	85%	11	6%	107	21%
7,500 (1,326)	3	14 (earliest)	Forgone Harvest	7,437	68%	5,635	100%	89	3%	198	78%	45	94%	201	47%	1,268	87%
			Chinook Savings	502	53%	77	100%	18	14%	33	73%	2	100%	31	18%	342	66%
		20 (latest)	Forgone Harvest	6,406	58%	5,635	100%	76	2%	128	51%	27	56%	66	15%	474	33%
			Chinook Savings	182	19%	77	100%	18	14%	4	9%	1	85%	8	5%	73	14%
10,000 (1,768)	2	21 (earliest)	Forgone Harvest	6,223	57%	5,635	100%	76	2%	126	50%	24	50%	53	12%	309	21%
			Chinook Savings	108	11%	77	100%	18	14%	4	9%	0	27%	8	5%	0	0%
		38 (latest)	Forgone Harvest	212	2%	98	2%	15	0%	4	2%	0	0%	47	11%	47	3%
			Chinook Savings	14	1%	5	7%	0	0%	0	0%	0	0%	8	5%	0	0%
12,500 (2,210)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-54 Option 2 - PSC closure impacts by operational type (5-year basis period): historical simulated closures (2003 to 2011) applied to harvest and Chinook salmon PSC in a characteristic year

Total GOA PSC Limit (allocation)	# Years with PSC closure	Week of Closure	Impact	GOA Operational Type Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water Flatfish		Flathead Sole		Arrowtooth	
				mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved
**** Catcher/Processors ****																	
5,000 (2,416)	6	17 (earliest)	Forgone Harvest	18,631	85%	11,656	100%	282	63%	1,455	53%	277	87%	421	48%	4,540	77%
			Chinook Savings	1,541	49%	426	100%	35	42%	520	40%	8	100%	47	21%	505	46%
		38 (latest)	Forgone Harvest	2,139	10%	151	1%	80	18%	219	8%	36	11%	183	21%	1,469	25%
			Chinook Savings	200	6%	5	1%	10	12%	75	6%	6	78%	40	18%	63	6%
7,500 (3,623)	2	20 (earliest)	Forgone Harvest	17,238	79%	11,656	100%	276	62%	1,024	37%	235	74%	295	34%	3,751	64%
			Chinook Savings	908	29%	426	100%	35	42%	145	11%	8	100%	43	19%	250	23%
		28 (latest)	Forgone Harvest	13,201	60%	8,093	69%	276	62%	957	35%	167	52%	224	26%	3,483	59%
			Chinook Savings	578	18%	277	65%	35	42%	133	10%	6	80%	41	18%	84	8%
10,000 (4,831)	1	21	Forgone Harvest	16,921	77%	11,656	100%	276	62%	987	36%	210	66%	272	31%	3,519	60%
			Chinook Savings	729	23%	426	100%	35	42%	133	10%	7	89%	43	19%	85	8%
12,500 (6,039)	1	41	Forgone Harvest	1,222	6%	45	0%	73	16%	122	4%	14	4%	171	20%	797	14%
			Chinook Savings	113	4%	5	1%	10	12%	39	3%	0	0%	40	18%	19	2%
**** Catcher Vessels ****																	
5,000 (2,584)	4	9 (earliest)	Forgone Harvest	30,657	76%	9,157	100%	4,918	39%	85	67%	6,863	97%	373	93%	9,073	86%
			Chinook Savings	2,302	81%	686	100%	346	43%	19	62%	444	98%	76	97%	731	93%
		45 (latest)	Forgone Harvest	677	2%	139	2%	3	0%	14	11%	337	5%	7	2%	177	2%
			Chinook Savings	60	2%	2	0%	0	0%	3	11%	24	5%	0	0%	30	4%
7,500 (3,876)	3	29 (earliest)	Forgone Harvest	13,598	34%	3,243	35%	3,831	30%	30	23%	3,745	53%	13	32%	2,736	26%
			Chinook Savings	941	33%	109	16%	328	41%	4	11%	354	78%	0	0%	146	19%
		45 (latest)	Forgone Harvest	677	2%	139	2%	3	0%	14	11%	337	5%	7	2%	177	2%
			Chinook Savings	60	2%	2	0%	0	0%	3	11%	24	5%	0	0%	30	4%
10,000 (5,168)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12,500 (6,460)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-55 Option 2 - PSC closure impacts by operational type (10-year basis period): historical simulated closures (2003 to 2011) applied to harvest and Chinook salmon PSC in a characteristic year

Total GOA PSC Limit (allocation)	# Years with PSC closure	Week of Closure	Impact	GOA Operational Type Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water Flatfish		Flathead Sole		Arrowtooth	
				mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved
**** Catcher/Processors ****																	
5,000 (2,559)	6	17 (earliest)	Forgone Harvest	18,631	85%	11,656	100%	282	63%	1,455	53%	277	87%	421	48%	4,540	77%
			Chinook Savings	1,541	49%	426	100%	35	42%	520	40%	8	100%	47	21%	505	46%
		38 (latest)	Forgone Harvest	2,139	10%	151	1%	80	18%	219	8%	36	11%	183	21%	1,469	25%
			Chinook Savings	200	6%	5	1%	10	12%	75	6%	6	78%	40	18%	63	6%
7,500 (3,839)	2	20 (earliest)	Forgone Harvest	17,238	79%	11,656	100%	276	62%	1,024	37%	235	74%	295	34%	3,751	64%
			Chinook Savings	908	29%	426	100%	35	42%	145	11%	8	100%	43	19%	250	23%
		29 (latest)	Forgone Harvest	9,594	44%	4,654	40%	276	62%	890	32%	167	52%	224	26%	3,382	58%
			Chinook Savings	423	13%	128	30%	35	42%	128	10%	6	80%	41	18%	84	8%
10,000 (5,118)	1	21	Forgone Harvest	16,920	77%	11,656	100%	276	62%	687	36%	210	66%	272	31%	3,519	60%
			Chinook Savings	729	23%	426	100%	35	42%	133	10%	7	89%	43	19%	85	8%
12,500 (6,398)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**** Catcher Vessels ****																	
5,000 (2,442)	5	8 (earliest)	Forgone Harvest	31,970	80%	9,157	100%	5,845	46%	100	79%	6,886	97%	373	93%	9,422	89%
			Chinook Savings	2,352	83%	686	100%	377	47%	25	81%	451	99%	76	97%	737	94%
		45 (latest)	Forgone Harvest	677	2%	139	2%	3	0%	14	11%	337	5%	7	2%	177	2%
			Chinook Savings	60	2%	2	0%	0	0%	3	11%	24	5%	0	0%	30	4%
7,500 (3,662)	3	28 (earliest)	Forgone Harvest	15,548	39%	4,982	54%	3,832	30%	30	23%	3,954	56%	14	3%	2,736	26%
			Chinook Savings	1,010	36%	178	26%	328	41%	4	11%	354	78%	0	0%	146	19%
		43 (latest)	Forgone Harvest	1,601	4%	308	3%	24	0%	14	11%	675	10%	7	2%	573	5%
			Chinook Savings	275	10%	2	0%	1	0%	3	11%	126	28%	0	0%	143	18%
10,000 (4,883)	1	46	Forgone Harvest	413	1%	38	0%	3	0%	8	6%	254	4%	7	2%	104	1%
			Chinook Savings	25	1%	2	0%	0	0%	2	6%	10	2%	0	0%	11	1%
12,500 (6,104)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-56 Options 1 & 2 - PSC closure impacts by regulatory area and operational type (5-year basis period): historical simulated closures (2003 to 2011) applied to harvest and Chinook salmon PSC in a characteristic year

Total GOA PSC Limit (allocation)	# Years with PSC closure	Week of Closure	Impact	Sector Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water Flatfish		Flathead Sole		Arrowtooth	
				mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved
**** Central GOA Catcher/Processors ****																	
5,000 (2,052)	6	17 (earliest)	Forgone Harvest	11,596	83%	6,060	100%	211	91%	1,290	52%	235	85%	314	70%	3,487	79%
			Chinook Savings	1,118	49%	349	100%	17	97%	508	40%	7	100%	36	66%	201	34%
		47 (latest)	Forgone Harvest	108	1%	0	0%	0	0%	44	2%	0	0%	46	10%	17	0%
			Chinook Savings	42	2%	0	0%	0	0%	17	1%	0	0%	25	46%	0	0%
7,500 (3,077)	2	20 (earliest)	Forgone Harvest	10,883	78%	6,060	100%	211	91%	896	36%	209	76%	229	51%	3,277	74%
			Chinook Savings	725	32%	349	100%	17	97%	141	11%	7	100%	34	62%	177	30%
		48 (latest)	Forgone Harvest	66	0%	0	0%	0	0%	44	2%	0	0%	22	5%	0	0%
			Chinook Savings	36	2%	0	0%	0	0%	17	1%	0	0%	19	35%	0	0%
10,000 (4,103)	1	41	Forgone Harvest	1,110	8%	5	0%	69	30%	121	5%	14	5%	136	30%	765	17%
			Chinook Savings	99	4%	0	0%	10	57%	39	3%	0	0%	32	58%	18	3%
12,500 (5,129)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**** Central GOA Catcher Vessels ****																	
5,000 (2,550)	4	11 (earliest)	Forgone Harvest	29,007	78%	9,118	100%	3,976	41%	85	67%	6,801	96%	327	84%	8,594	81%
			Chinook Savings	2,182	79%	686	100%	334	45%	19	62%	405	89%	20	26%	717	92%
		45 (latest)	Forgone Harvest	677	2%	139	2%	3	0%	14	11%	337	5%	7	2%	177	2%
			Chinook Savings	60	2%	2	0%	0	0%	3	11%	24	5%	0	0%	30	4%
7,500 (3,824)	2	29 (earliest)	Forgone Harvest	13,587	37%	3,243	36%	3,820	39%	30	23%	3,745	53%	13	3%	2,736	26%
			Chinook Savings	941	34%	109	16%	328	45%	4	11%	354	78%	0	0%	146	19%
		44 (latest)	Forgone Harvest	1,151	3%	215	2%	17	0%	14	11%	519	7%	7	2%	379	4%
			Chinook Savings	188	7%	2	0%	1	0%	3	11%	86	19%	0	0%	96	12%
10,000 (5,099)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12,500 (6,374)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**** Western GOA Catcher/Processors ****																	
5,000 (364)	5	13 (earliest)	Forgone Harvest	7,516	94%	5,596	100%	77	36%	209	82%	43	99%	272	64%	1,319	91%
			Chinook Savings	652	75%	77	100%	18	27%	33	73%	1	100%	109	63%	413	81%
		29 (latest)	Forgone Harvest	2,075	26%	1,515	27%	65	30%	120	47%	19	45%	48	11%	308	21%
			Chinook Savings	55	6%	24	31%	18	27%	4	9%	0	16%	8	5%	0	0%
7,500 (546)	4	13 (earliest)	Forgone Harvest	7,516	94%	5,596	100%	77	36%	209	82%	43	99%	272	64%	1,319	91%
			Chinook Savings	652	75%	77	100%	18	27%	33	73%	1	100%	109	63%	413	81%
		18 (latest)	Forgone Harvest	6,668	84%	5,596	100%	71	33%	144	57%	38	89%	98	23%	721	50%
			Chinook Savings	224	26%	77	100%	18	27%	10	22%	1	100%	11	6%	107	21%
10,000 (728)	4	13 (earliest)	Forgone Harvest	7,516	94%	5,596	100%	77	36%	209	82%	43	99%	272	64%	1,319	91%
			Chinook Savings	652	75%	77	100%	18	27%	33	73%	1	100%	109	63%	413	81%
		18 (latest)	Forgone Harvest	6,668	84%	5,596	100%	71	33%	144	57%	38	89%	98	23%	721	50%
			Chinook Savings	224	26%	77	100%	18	27%	10	22%	1	100%	11	6%	107	21%
12,500 (910)	4	14 (earliest)	Forgone Harvest	7,374	92%	5,596	100%	77	36%	198	78%	43	99%	192	45%	1,268	87%
			Chinook Savings	500	57%	77	100%	18	27%	33	73%	1	100%	29	17%	342	67%
		28 (latest)	Forgone Harvest	4,118	52%	3,552	63%	65	30%	126	50%	19	45%	48	11%	308	21%
			Chinook Savings	96	11%	65	84%	18	27%	4	9%	0	16%	8	5%	0	0%
**** Western GOA Catcher Vessels ****																	
5,000 (35)	5	6 (earliest)	Forgone Harvest	2,656	89%	39	100%	2,600	89%	0	0%	5	100%	10	100%	2	100%
			Chinook Savings	54	76%	0	100%	46	72%	0	0%	0	100%	2	100%	6	100%
		14 (latest)	Forgone Harvest	63	2%	39	100%	11	0%	0	0%	3	51%	10	100%	0	0%
			Chinook Savings	2	3%	0	100%	0	0%	0	0%	0	100%	2	100%	0	0%
7,500 (52)	5	6 (earliest)	Forgone Harvest	2,656	89%	39	100%	2,600	89%	0	0%	5	100%	10	100%	2	100%
			Chinook Savings	54	76%	0	100%	46	72%	0	0%	0	100%	2	100%	6	100%
		14 (latest)	Forgone Harvest	63	2%	39	100%	11	0%	0	0%	3	51%	10	100%	0	0%
			Chinook Savings	2	3%	0	100%	0	0%	0	0%	0	100%	2	100%	0	0%
10,000 (69)	4	6 (earliest)	Forgone Harvest	2,656	89%	39	100%	2,600	89%	0	0%	5	100%	10	100%	2	100%
			Chinook Savings	54	76%	0	100%	46	72%	0	0%	0	100%	2	100%	6	100%
		10 (latest)	Forgone Harvest	118	4%	39	100%	64	2%	0	0%	3	51%	10	100%	2	100%
			Chinook Savings	9	12%	0	100%	0	1%	0	0%	0	100%	2	100%	6	100%
12,500 (86)	4	6 (earliest)	Forgone Harvest	2,656	89%	39	100%	2,600	89%	0	0%	5	100%	10	100%	2	100%
			Chinook Savings	54	76%	0	100%	46	72%	0	0%	0	100%	2	100%	6	100%
		10 (latest)	Forgone Harvest	118	4%	39	100%	64	2%	0	0%	3	51%	10	100%	2	100%
			Chinook Savings	9	12%	0	100%	0	1%	0	0%	0	100%	2	100%	6	100%

Table 4-57 Options 1 & 2 - PSC closure impacts by regulatory area and operational type (10-year basis period): historical simulated closures (2003 to 2011) applied to harvest and Chinook salmon PSC in a characteristic year

Total GOA PSC Limit (allocation)	# Years with PSC closure	Week of Closure	Impact	Sector Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water Flatfish		Flathead Sole		Arrowtooth	
				mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved	mt, # fish	% Lost, Saved
**** Central GOA Catcher/Processors ****																	
5,000 (1,917)	6	16 (earliest)	Forgone Harvest	12,219	88%	6,060	100%	211	91%	1,505	60%	235	85%	339	75%	3,867	87%
			Chinook Savings	1,396	61%	349	100%	17	97%	667	53%	7	100%	36	66%	219	54%
		42 (latest)	Forgone Harvest	748	5%	1	0%	61	27%	114	5%	13	5%	117	26%	441	10%
			Chinook Savings	88	4%	0	0%	10	57%	36	3%	0	0%	24	46%	17	3%
7,500 (2,876)	2	20 (earliest)	Forgone Harvest	10,882	78%	6,060	100%	211	91%	896	36%	209	76%	229	51%	3,277	74%
			Chinook Savings	725	32%	349	100%	17	97%	141	11%	7	100%	34	62%	177	30%
		38 (latest)	Forgone Harvest	1,938	14%	53	1%	76	33%	214	9%	36	13%	136	30%	1,422	32%
			Chinook Savings	186	8%	0	0%	10	57%	75	6%	6	93%	32	58%	63	11%
10,000 (3,834)	1	21	Forgone Harvest	10,748	77%	6,060	100%	211	91%	861	35%	186	67%	219	49%	3,211	72%
			Chinook Savings	621	27%	349	100%	17	97%	129	10%	7	100%	34	62%	84	14%
12,500 (4,793)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**** Central GOA Catcher Vessels ****																	
5,000 (2,200)	7	7 (earliest)	Forgone Harvest	31,242	84%	9,118	100%	4,591	47%	111	87%	6,937	98%	377	97%	9,918	94%
			Chinook Savings	2,367	86%	686	100%	391	53%	27	86%	451	99%	77	100%	735	94%
		45 (latest)	Forgone Harvest	677	2%	139	2%	3	0%	14	11%	337	5%	7	2%	177	2%
			Chinook Savings	60	2%	2	0%	0	0%	3	11%	24	5%	0	0%	30	4%
7,500 (3,299)	3	28 (earliest)	Forgone Harvest	15,526	42%	4,972	55%	3,820	39%	30	23%	3,954	56%	14	4%	2,736	26%
			Chinook Savings	1,010	37%	178	26%	328	45%	4	11%	354	78%	0	0%	146	19%
		42 (latest)	Forgone Harvest	2,131	6%	382	4%	28	0%	14	11%	1,026	15%	7	2%	674	6%
			Chinook Savings	379	14%	2	0%	0	0%	3	11%	229	51%	0	0%	143	18%
10,000 (4,399)	2	38 (earliest)	Forgone Harvest	4,925	13%	658	7%	944	10%	17	13%	1,766	25%	8	2%	1,533	15%
			Chinook Savings	611	22%	3	0%	135	18%	3	11%	325	72%	0	0%	144	18%
		45 (latest)	Forgone Harvest	677	2%	139	2%	3	0%	14	11%	337	5%	7	2%	177	2%
			Chinook Savings	60	2%	2	0%	0	0%	3	11%	24	5%	0	0%	30	4%
12,500 (5,499)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
**** Western GOA Catcher/Processors ****																	
5,000 (642)	4	13 (earliest)	Forgone Harvest	7,516	94%	5,596	100%	77	36%	209	82%	43	99%	272	64%	1,319	91%
			Chinook Savings	652	75%	77	100%	18	27%	33	73%	1	100%	109	63%	413	81%
		18 (latest)	Forgone Harvest	6,668	84%	5,596	100%	71	33%	144	57%	38	89%	98	23%	721	50%
			Chinook Savings	224	26%	77	100%	18	27%	10	22%	1	100%	11	6%	107	21%
7,500 (963)	4	14 (earliest)	Forgone Harvest	7,374	92%	5,596	100%	77	36%	198	78%	43	99%	192	45%	1,268	87%
			Chinook Savings	500	57%	77	100%	18	27%	33	73%	1	100%	29	17%	342	67%
		28 (latest)	Forgone Harvest	4,118	52%	3,552	63%	65	30%	126	50%	19	45%	48	11%	308	21%
			Chinook Savings	96	11%	65	84%	18	27%	4	9%	0	16%	8	5%	0	0%
10,000 (1,284)	3	14 (earliest)	Forgone Harvest	7,374	92%	5,596	100%	77	36%	198	78%	43	99%	192	45%	1,268	87%
			Chinook Savings	500	57%	77	100%	18	27%	33	73%	1	100%	29	17%	342	67%
		20 (latest)	Forgone Harvest	6,355	80%	5,596	100%	65	30%	128	51%	27	62%	66	16%	474	33%
			Chinook Savings	182	21%	77	100%	18	27%	4	9%	1	100%	8	5%	73	14%
12,500 (1,605)	3	18 (earliest)	Forgone Harvest	6,668	84%	5,596	100%	71	33%	144	57%	38	89%	98	23%	721	50%
			Chinook Savings	224	26%	77	100%	18	27%	10	22%	1	100%	11	6%	107	21%
		21 (latest)	Forgone Harvest	6,173	77%	5,596	100%	65	30%	126	50%	24	56%	53	13%	309	21%
			Chinook Savings	108	12%	77	100%	18	27%	4	9%	0	32%	8	5%	0	0%
**** Western GOA Catcher Vessels ****																	
5,000 (243)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7,500 (364)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10,000 (485)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12,500 (606)	0	None	Forgone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-

4.7.1.2 12,500 Chinook salmon PSC limit

Table 4-58 Number of years that GOA non-pollock groundfish fisheries would have been closed, during a given month, under a 12,500 Chinook salmon PSC limit (2003 to 2011)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Gulf-wide	-	-	-	-	-	-	-	-	-	-	-	-
Option 1	Central GOA	-	-	-	-	-	-	-	-	-	-	-	-
	Western GOA	-	-	2 (0)	3 (0)	3 (0)	3 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)
Option 2	Catcher/Processor	-	-	-	-	-	-	-	-	-	1 (0)	1 (0)	1 (0)
	Catcher Vessel	-	-	-	-	-	-	-	-	-	-	-	-
Options 1 & 2	CGOA CP	-	-	-	-	-	-	-	-	-	-	-	-
	CGOA CV	-	-	-	-	-	-	-	-	-	-	-	-
	WGOA CP	-	-	2 (0)	3 (2)	3	3	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)
	WGOA CV		3 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)

Note: For cells containing two numbers, the number on the left denotes the number of years that a PSC closure would have been in effect under a 5-year apportionment basis, and the number in parentheses denotes closures under a 10-year apportionment basis; cells containing only one number indicate that 5- and 10-year PSC apportionment result in the same number of years with a closure.

A 12,500 Chinook salmon PSC limit shared across all GOA harvest sectors would not have triggered any non-pollock groundfish fishery closures during the 2003 to 2011 period. Whether this limit would prompt some participants to change fishing behavior, however, is uncertain. Participants may take action to avoid Chinook PSC as the fleet approaches the PSC limit. If a Gulf-wide 12,500 Chinook PSC limit were to trigger a closure, it is likely to occur late in the year. Attempts to coordinate Chinook avoidance across vessels may be more successful in late-year fisheries when fewer vessels are active (Table 4-1). A limit that only affects the small subset of participants who are active late in the year could be viewed as inequitable. On the other hand, Chinook PSC rates tend to be relatively high later in the year, so creating an incentive for these vessels to give more attention to Chinook PSC may have a larger effect on PSC usage. Potential behavior changes under a Chinook PSC limit are further discussed in Section 4.7.3.

If divided between Central and Western GOA harvesters (Option 1), a 12,500 PSC limit would only have triggered closures in the Western GOA, and then only if PSC were apportioned according to a 5-year history of Chinook salmon PSC. The resulting Western GOA closures would have occurred between late-March and July (Table 4-58). Applying the earliest simulated closures to historical average annual harvest and PSC provides a maximum potential impact estimate of 7,437 mt of forgone harvest and 502 avoided Chinook PSC, or 68% of average annual Western GOA harvest and 53% of average annual Western GOA PSC (Table 4-52). Such a closure would significantly reduce harvest of all target species except for Pacific cod, and would completely preclude Western GOA rockfish harvest. The Western GOA rockfish fishery averaged 5,635 mt per year; this forgone harvest would almost entirely accrue to the CP sector, as the Western GOA CV sector mainly harvests Pacific cod.

If divided between the CP and CV harvest sectors (Option 2), a 12,500 PSC limit would only have triggered a closure in the CP sector during the highest observed PSC year (2003), and then only if PSC were apportioned according to a 5-year PSC history (Table 4-58). The resulting CP closure would have occurred in mid-October. Applying this simulated closure date to historical average annual harvest and PSC provides a maximum potential impact estimate of 1,222 mt of forgone harvest and 113 avoided Chinook PSC, or 6% of average CP harvest and 4% of average CP PSC (Table 4-54). This lone closure for a 12,500 PSC limit under Option 2 does not significantly impact the key rockfish CP fishery, and only precludes 14% of average annual arrowtooth CP harvest.

As a general note regarding operational type harvest sectors, GOA CPs recorded higher annual Chinook salmon PSC rates than CVs (Table 4-35). During the five most recent analyzed years, the PSC rates of CPs in the Western GOA were lower than those of CPs in the Central GOA. For CP vessels with trawl endorsements in both areas (Table 4-7), a limit that jointly apportions PSC to the Central and Western

GOA could induce a race to harvest Central GOA groundfish ahead of a closure. Alternatively, CP harvesters may redirect fishing activity to the Western GOA in order to fish where PSC rates are lower, preserving the later months of the Central GOA CP harvest, but creating an early season derby in the west. Participants may be able to address this, and other, potentially negative behavioral incentives through voluntary agreements on the timing of fishing activity; many of these trawl participants are currently members of Amendment 80 harvest cooperatives.

Further dividing a 12,500 PSC limit between each operational type sector within each regulatory area (Options 1 & 2) would only have triggered Western GOA closures (Table 4-58). Moreover, the Western GOA CV sector would only have experienced closures if PSC apportionment was made according to a 5-year history. These closures would have occurred from mid-February to early-March. The vast majority of Western GOA CV trawling targets A-season Pacific cod, so there is a large difference in impact between the simulated February and March closures. In the average year, a mid-February closure would preclude 2,600 mt of Pacific cod harvest (89% of average Western GOA CV harvest) and 46 Chinook PSC (72% of average Western GOA CV PSC), while a March closure would only preclude only 2% of the sector's average Pacific cod harvest (Table 4-56). By contrast, the Western GOA CP sector would have experienced closures under either a 5- or 10-year PSC apportionment basis period. These closures would have occurred three to four weeks earlier under the 5-year basis; in addition to the earlier closures, a 5-year apportionment differs from the 10-year basis by triggering a Western GOA CP closure in 2010 – the only simulated closure for this sector to occur in the Western GOA after 2005. Rockfish and arrowtooth trips constitute 70% and 18% of Western GOA CP harvest, respectively. Under either apportionment basis, maximum potential impacts include the total loss of rockfish harvest and at least a 50% loss of arrowtooth harvest (Table 4-56). The earlier Western GOA CP closures occurring under a 5-year apportionment increased salmon savings by 31% of the average annual sector PSC, with the marginal difference realized by trips targeting arrowtooth.

4.7.1.3 10,000 Chinook salmon PSC limit

Table 4-59 Number of years that GOA non-pollock groundfish fisheries would have been closed, during a given month, under a 10,000 Chinook salmon PSC limit (2003 to 2011)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Gulf-wide	-	-	-	-	-	-	-	-	1	1	1	1
Option 1	Central GOA	-	-	-	-	-	-	-	-	0 (1)	0 (1)	0 (1)	0 (2)
	Western GOA	-	-	2 (0)	4 (0)	4 (1)	4 (1)	4 (1)	4 (1)	4 (2)	4 (2)	4 (2)	4 (2)
Option 2	Catcher/Processor	-	-	-	-	1	1	1	1	1	1	1	1
	Catcher Vessel	-	-	-	-	-	-	-	-	-	-	0 (1)	0 (1)
Options 1 & 2	CGOA CP	-	-	-	-	0 (1)	0 (1)	0 (1)	0 (1)	0 (1)	1	1	1
	CGOA CV	-	-	-	-	-	-	-	-	0 (1)	0 (2)	0 (2)	0 (2)
	WGOA CP	-	-	2	4 (2)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)
	WGOA CV	-	3 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)

Note: For cells containing two numbers, the number on the left denotes the number of years that a PSC closure would have been in effect under a 5-year apporitonment basis, and the number in parentheses denotes closures under a 10-year apportionment basis; cells containing only one number indicate that 5- and 10-year PSC apportionment result in the same number of years with a closure.

A 10,000 Chinook salmon PSC limit shared across all GOA harvest sectors would only have triggered a non-pollock trawl fishery closure in the highest PSC year (2003). This closure would have occurred in early-September, just at the start of the Pacific cod B-season (Table 4-59). In the characteristic year, such a closure would have generated 11,181 mt of forgone harvest (18% of average GOA harvest) and 1,057 avoided Chinook PSC (18% of average GOA PSC). Harvest losses accrued mainly to trips targeting Pacific cod, arrowtooth, and shallow water flatfish, which together accounted for 60% of average annual GOA harvest. Harvest in the highest volume fishery, rockfish, would not have been affected (Table 4-51).

A 10,000 PSC limit apportioned by regulatory area (Option 1) would only have triggered Central GOA closures if PSC were apportioned by a 10-year PSC history. The two simulated Central GOA closures occurred later in the year (mid-September and December). In the characteristic year, a mid-September closure would generate 8,339 mt of forgone harvest (16% of average Central GOA harvest) and 904 avoided Chinook PSC (18% of average Central GOA PSC). Such a closure would leave only one or two weeks of B-season Pacific cod available for harvesting; that B-season accounts for 40% of Central GOA Pacific cod harvest and 8% of total Central GOA harvest (Table 4-53). Loss of Pacific cod harvest is an impact that mainly affects CVs. Both the greatest forgone harvest and salmon savings in the Central GOA would have been realized in the shallow water flatfish fishery, which is the latest of the key target fisheries to occur; in the Central GOA, shallow water flatfish are primarily targeted by CVs. In the Western GOA, using a 5-year history to apportion PSC triggers closures in more years and in earlier months than apportionment by a 10-year historical basis (Table 4-59). The earliest observed Western GOA closures occurred in late-March instead of May. In either case, the rockfish season would not open, causing a loss of all catch from that fishery. The 5-year PSC apportionment, compared to a 10-year apportionment basis, significantly increased the maximum potential impact on arrowtooth harvest, from 21% to 87% of average Western GOA arrowtooth harvest lost. The other key Western GOA species, Pacific cod, was relatively unaffected because the area's fleet does not historically prosecute the B-season. Because these Western GOA impacts do not curtail the A-season Pacific cod, it can generally be assumed that the direct regional effects accrue only to the CP sector. Relative to a 10-year PSC apportionment basis, using a 5-year basis decreases Western GOA harvest by an additional 9% of the annual average. However, the 5-year basis does generate marginal salmon savings of an additional 42% (394 Chinook salmon) of average Western GOA PSC (Table 4-52).

If divided between the CP and CV harvest sectors (Option 2), a 10,000 PSC limit would have impacted the CP sector in the same way, regardless of the selected apportionment basis period. This limit would have triggered a lone CP closure in late-May of the highest PSC year (2003) (Table 4-59). In the characteristic year, such a closure would generate 16,921 mt of forgone harvest (77% of average CP harvest) and 729 avoided Chinook PSC (23% of average CP PSC) (Table 4-54 and Table 4-55). The relatively small realized PSC reduction is a reflection of high early-year PSC in the Western GOA arrowtooth and Central GOA rex sole fisheries, combining to account for 77% of average annual CP PSC. By contrast, the CV sector would only experience a closure if PSC were apportioned by a 10-year basis period. The only such closure would occur in mid-November, generating negligible harvest and PSC impacts (Table 4-55).

Dividing a 10,000 PSC limit between each operational type sector within each regulatory area (Options 1 & 2) would have triggered at least one closure for all sectors except the Central GOA CV sector, using a 5-year apportionment basis period. Using a 10-year apportionment basis period, combining Options 1 and 2 would have triggered at least one closure for all sectors but the Western GOA CV sector (Table 4-59). The Central GOA CP sector experienced one simulated closure year (2003) under either basis period; apportioning by a 10-year history would move this closure up by 20 weeks, increasing the impact from a relatively small 8% harvest loss (affecting mainly arrowtooth and providing only 4% PSC reduction) to a 77% total sector harvest loss that closes the entire rockfish fishery as well as 72% of the arrowtooth harvest. As with a 12,500 total PSC limit, using a 10-year basis to apportion the Western GOA CP cap reduces the maximum potential impact in the characteristic year, but only slightly. 92% of average Western GOA CP harvest is forgone (compared to 94% under a 5-year basis), but avoided PSC is reduced by 18% of the sector's average PSC amount. Western GOA CP rockfish trips still experience 100% closure, while forgone arrowtooth harvest remains near 90%. The earliest Central GOA CV closures, which only occur under a 10-year apportionment basis, are triggered in mid-September; late-year Pacific cod and arrowtooth fisheries would lose 15% or less of average annual harvest, and would realize Chinook salmon savings of 18% (Table 4-57). As with all of the considered PSC limits, Western GOA CVs only experienced closures under a 5-year apportionment basis. The maximum potential impact is

defined by a mid-February closure, which would reduce the sector's average harvest by 89% regardless of the selected total PSC cap. Full harvest and Chinook salmon savings impacts in the characteristic year are detailed in Table 4-56 and Table 4-57.

4.7.1.4 7,500 Chinook salmon PSC limit

Table 4-60 Number of years that GOA non-pollock groundfish fisheries would have been closed, during a given month, under a 7,500 Chinook salmon PSC limit (2003 to 2011)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Gulf-wide	-	-	-	-	1	1	1	1	2	2	2	2
Option 1	Central GOA	-	-	-	-	1	1	1	1	1 (2)	2	2 (3)	2 (3)
	Western GOA	-	-	2	4 (2)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)	4 (3)
Option 2	Catcher/Processor	-	-	-	-	1	1	2	2	2	2	2	2
	Catcher Vessel	-	-	-	-	-	-	1	1	1	3	3	3
Options 1 & 2	CGOA CP	-	-	-	-	1	1	1	1	1 (2)	1 (2)	2	2
	CGOA CV	-	-	-	-	-	-	1	1	1 (2)	2 (3)	2 (3)	2 (3)
	WGOA CP	-	-	2	4 (2)	4 (3)	4 (3)	4	4	4	4	4	4
	WGOA CV	-	3 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)

Note: For cells containing two numbers, the number on the left denotes the number of years that a PSC closure would have been in effect under a 5-year apportionment basis, and the number in parentheses denotes closures under a 10-year apportionment basis; cells containing only one number indicate that 5- and 10-year PSC apportionment result in the same number of years with a closure.

A 7,500 Chinook salmon PSC limit shared across all GOA harvest sectors would have triggered a non-pollock trawl fishery closure in the highest PSC years (2003 and 2010). The earliest closure occurred in mid-May, and the later closure occurred in mid-September. The May closure would generate a 38,351 mt harvest loss (62% of average annual harvest), while reducing Chinook PSC by 40% of the average annual amount. This total PSC limit level marks a large jump in forgone harvest from the higher Gulf-wide limits described in Sections 4.7.1.2 and 4.7.1.3. The largest marginal increase in forgone harvest occurred in the rockfish fishery; forgone rockfish harvest reaches 99% of the average annual rockfish total under a 7,500 PSC limit, compared to 5% under a 10,000 PSC limit and 0% under a 12,500 PSC limit. Pacific cod trips experienced roughly the same one-third harvest loss as they do under a 10,000 PSC limit (Table 4-51). The observed September closure would not have significantly affected rockfish or Pacific cod, but would still have generated notable harvest losses (up to 22%) for flatfish.

A 7,500 PSC limit apportioned by regulatory area (Option 1) would have triggered Central GOA closures in two years under either apportionment basis period. Central GOA closures occurred slightly earlier under a 10-year apportionment basis (Table 4-60), and the maximum expected potential impact was defined by a mid-May closure generating a 63% harvest loss and 44% PSC reduction. Central GOA rockfish harvest would be reduced by 98% of the average area total, affecting both CPs and CVs. Pacific cod and shallow water flatfish harvest would be reduced by 42% and 76%, respectively; these losses would largely accrue to the CV sector. Central GOA rex sole harvest, which makes up only 4% of GOA non-pollock catch, is mainly taken by CPs and would be reduced by 35% (Table 4-53). In the Western GOA, simulated closures occurred slightly earlier under a 5-year apportionment basis, and the maximum potential impact was defined by a late-March closure generating a 69% harvest loss and 70% PSC reduction. This closure would have a negligible effect on Pacific cod, since the Western GOA B-season is typically not prosecuted. The Western GOA rockfish season would be prevented from opening, while forgone flatfish harvest ranges from 34% to 73% of the area's average annual target harvest. Harvest impacts in the Western GOA would fall almost entirely on the CP sector (Table 4-52). Using a 5-year apportionment basis period would increase the impact on the Western GOA arrowtooth and flathead sole fisheries.

When dividing between the CP and CV harvest sectors (Option 2), a 7,500 PSC limit generated similar impacts under either apportionment basis period. A 5-year basis period (when compared to the 10-year

basis period) would have triggered closures only very slightly earlier in the CP sector, and one to three weeks later in the CV sector. The maximum potential CV impact was defined by a mid-July closure that generated a 34% loss of average annual harvest and a 33% PSC reduction (Table 4-55). Of the key CV species, trips targeting shallow water flatfish would have forgone 53% of average harvest (with a 78% reduction in the fishery's average PSC), while rockfish, Pacific cod and arrowtooth would have lost around one-third of average harvest. The maximum potential CP impact was defined by mid-May closures under either apportionment basis period option. Realized impacts were very similar to those under a 10,000 total PSC limit. Approximately 79% of average annual harvest would have been forgone, and PSC would have been reduced by 29%. The rockfish fishery would not have opened, while rex sole and arrowtooth fisheries would have lost 37% and 64% of harvest, respectively (Table 4-54).

Dividing a 7,500 PSC limit between each operational type sector within each regulatory area (Options 1 & 2) and apportioning area-specific PSC limits by a 5-year history would have triggered multiple closure years in every sector (Table 4-60). Maximum potential impacts were the greatest in the Western GOA CP and CV sectors; the impact of the earliest simulated closures in the characteristic year – occurring in March and February, respectively – were the same as the ones described in Section 4.7.1.3 for a 10,000 total PSC limit. The maximum potential impact in the Central GOA CP sector, triggered by a May closure, generated 78% harvest loss and 32% PSC reduction, including a total rockfish closure, a 74% harvest loss in the arrowtooth fishery, and a 36% reduction in the rex sole fishery. The maximum potential impact in the Central GOA CV sector, triggered by a July closure, generated 37% harvest loss and 34% PSC reduction, with ~40% forgone harvest in the key rockfish and Pacific cod fisheries, and a 53% harvest reduction in shallow water flatfish. Using a 10-year apportionment basis, Western GOA CVs would not have experienced any closures, and Western GOA CP closures would have occurred one week later. A 10-year basis period would have moved the earliest observed Central GOA CV closure up by one week, while leaving the earliest Central GOA CP closure unchanged from the 5-year apportionment basis scenario.

4.7.1.5 5,000 Chinook salmon PSC limit

Table 4-61 Number of years that GOA non-pollock groundfish fisheries would have been closed, during a given month, under a 5,000 Chinook salmon PSC limit (2003 to 2011)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Gulf-wide	-	-	-	2	2	3	3	3	3	5	5	6
Option 1	Central GOA	-	-	-	1 (3)	3	3 (4)	4	4	4 (5)	5 (6)	6	6
	Western GOA	-	-	2	4	4	4	5 (4)	5 (4)	5 (4)	5 (4)	5 (4)	5 (4)
Option 2	Catcher/Processor	-	-	-	2	2	2	5	5	6	6	6	6
	Catcher Vessel	-	1	1	1 (2)	2	3	3	3	3	4 (5)	4 (5)	4 (5)
Options 1 & 2	CGOA CP	-	-	-	3	3	3	4 (5)	4 (5)	5	5 (6)	6	6
	CGOA CV	-	0 (1)	1	1 (2)	2 (3)	3	3	3	3 (4)	4 (7)	4 (7)	4 (7)
	WGOA CP	-	-	2	4	4	4	5 (4)	5 (4)	5 (4)	5 (4)	5 (4)	5 (4)
	WGOA CV	-	3 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)

Note: For cells containing two numbers, the number on the left denotes the number of years that a PSC closure would have been in effect under a 5-year apportionment basis, and the number in parentheses denotes closures under a 10-year apportionment basis; cells containing only one number indicate that 5- and 10-year PSC apportionment result in the same number of years with a closure.

A 5,000 Chinook salmon PSC limit shared across all GOA harvest sectors would have triggered non-pollock trawl fishery closures in six of nine analyzed years. Maximum potential Gulf-wide impacts are based on a late-April closure. In the characteristic year, this closure would generate 42,208 mt of forgone harvest (68% of average annual harvest) and 3,361 avoided Chinook PSC (56% of average PSC). Compared to the 7,500 total PSC limit, these impacts represent a 6-point increase in the percentage of total forgone harvest, and a 16-point increase in the percentage of total avoided PSC. The vast majority of the marginal impact occurred in the flatfish fisheries. There was no marginal change in Pacific cod harvest, as the entire B-season would be precluded under either cap (Table 4-51).

A 5,000 PSC limit apportioned by regulatory area (Option 1) would have triggered Central GOA closures in six years under either apportionment basis period. Central GOA closures would have occurred at the same time or two to five weeks earlier under a 10-year apportionment basis. The maximum potential impact was defined by a late-April closure generating 69% harvest loss and 58% PSC reduction (Table 4-53). An April closure would preclude the entire rockfish season, the Pacific cod B-season (42% of average annual Central GOA Pacific cod harvest), and between 50% and 86% of average annual flatfish target harvests (Table 4-52 and Table 4-53). Pacific cod and shallow water flatfish impacts would accrue mainly to the Central GOA CV sector, while rex sole impacts are mainly experienced by Central GOA CPs. Forgone rockfish harvest significantly impact to both harvest sectors in the Central GOA, where the CV fleet takes 60% of rockfish and the CP fleet takes 40%. The maximum potential impact was the same under either a 5- or 10-year apportionment basis period. In the Western GOA, simulated closures occurred at the same time or one week earlier under a 5-year apportionment basis, and the maximum potential impact was defined by a late-March closure generating 69% harvest loss and 70% PSC reduction (Table 4-52). The Western GOA Pacific cod fishery would be largely unaffected by a late-March closure, meaning the forgone harvest would principally accrue to CPs.

When dividing between the CP and CV harvest sectors (Option 2), a 5,000 PSC limit generated nearly identical CP sector impacts under either apportionment basis period; only one of the six simulated closures occurred two weeks earlier under a 5-year basis period (Table 4-61). The maximum potential CP impact was defined by a late-April closure that, when applied to the characteristic year, generated an 85% loss in average annual CP harvest and a 49% reduction in average annual CP PSC (Table 4-54). Rockfish harvest was completely forgone, while arrowtooth and rex sole fisheries experienced over 50% harvest loss; 77% of the forgone CP arrowtooth harvest and 89% of forgone CP rex sole harvest occurred in the Central GOA. Average CP rockfish harvest is almost evenly divided between the two regulatory areas. Compared to a 5-year basis period, using a 10-year apportionment basis triggered CV closures in the same week or one to two weeks earlier. The maximum potential CV impact was defined by a late-February closure, though the timing of simulated closures varied widely across the analyzed years and occurred as late as November. In the characteristic year, the February closure generated 80% harvest loss and an 83% PSC reduction (Table 4-55); under such a closure, only the Pacific cod fishery maintained half of its average annual CV harvest, losing out on only two weeks of the A-season. 60% of the forgone CV Pacific cod harvest came out of the Central GOA CV sector, but the Western GOA CVs lost a higher percentage of their average annual Pacific cod harvest (53%, compared to 44% in the Central GOA). A February closure would preclude the entire CV rockfish harvest, and 79% to 97% of average annual flatfish target harvests; these losses accrue almost entirely to the Central GOA CV sector.

Dividing a 5,000 PSC limit between each operational type sector within each regulatory area (Options 1 & 2) and apportioning PSC by a 5-year history would have triggered multiple closure years in every area-sector (Table 4-61). Maximum potential impacts were the greatest in the Western GOA CV sector, and were identical to the February closure that occurred under higher total GOA PSC limits (described in Sections 4.7.1.2 through 4.7.1.4). Maximum potential impacts in the Western GOA CP sector were identical to the March closure described in the previous sections for 10,000 and 7,500 total PSC limits (4.7.1.3 and 4.7.1.4). The earliest simulated closure in the Central GOA CV sector occurs much earlier under this total PSC limit compared to the higher ones, owing to high PSC encounter in March and April of the characteristic year (largely recorded by trips targeting arrowtooth). Maximum Central GOA CV impacts are defined by a mid-March closure that generated 78% average harvest loss and 79% average PSC reduction. The Central GOA CV rockfish fishery would not open, nor would the Pacific cod B-season; forgone harvest in the significant arrowtooth and shallow water flatfish fisheries would range from 81% to 96% (Table 4-56). Maximum Central GOA CP impacts are defined by a late-April closure that generated 83% average harvest loss and 49% average PSC reduction. The Central GOA CP rockfish fishery would not open, while forgone harvest in the significant rex sole and arrowtooth fisheries would

range from 52% to 79% (Table 4-56). Using a 10-year apportionment basis period would mean that no closures occurred in the Western GOA CV sector. Impacts in the Western GOA CP sector are the same, irrespective of the selected apportionment basis period. In the Central GOA CV sector, a 10-year basis period causes three additional closures and causes the 5-year basis closures to occur from two to four weeks earlier (Table 4-61). Under a 10-year basis, the maximum Central GOA CV impact is defined by a mid-February closure that generates 84% harvest loss and 86% PSC reduction, with 87% to 100% harvest reductions to all target harvests except for Pacific cod, which lost 47% of average annual Central GOA CV harvest (Table 4-57). A 10-year apportionment basis also causes Central GOA CP closures to occur earlier, but moves up the earliest observed closure by only one week.

4.7.2 Impacts on Chinook Salmon Users

As a "prohibited species," retention of a Chinook salmon may never be authorized in a GOA groundfish fishery and, by law, its capture must be avoided. Notwithstanding this prohibition, experience demonstrates that 100% avoidance is not practicable at a cost society is willing to incur. In recognition of this trade-off, an allowance is made to absorb some PSC loss, with the expectation that trawl operators will seek to minimize these losses to the extent practicable (Section 4.7.2 addresses the question of whether a hard cap incentivizes PSC minimization, or merely compliance). A PSC limit would fix the maximum number of Chinook salmon removals that will be tolerated without remedial management action. Reaching a PSC limit would result in non-pollock groundfish fishery closures.

The primary impact of the GOA non-pollock groundfish fishery on Chinook salmon is through direct PSC mortality. Groundfish trawlers also incidentally catch salmon prey species including squid, capelin, eulachon, and herring. The catches of these prey species are small relative to overall species populations, and there is no available evidence that the incidental trawl catch of these prey species has a measureable impact on food availability for Chinook salmon.

In the Bering Sea Chinook salmon PSC analysis (NMFS 2009b), an adult equivalent (AEQ) model was used to estimate (a) how many of the PSC salmon were likely to have returned to their streams as adults, and (b) to which river system or region they would likely have returned. As a result, the Bering Sea analysis could include a quantitative impact analysis of Chinook savings on salmon fisheries or user-communities. This analysis was not without controversy, since the underlying data were obtained from relatively small sample sizes and collected opportunistically. For this GOA Chinook salmon PSC analysis, sufficient data to develop an AEQ model are not available (see further discussion in Section 3.3). The non-pollock groundfish fishery is intercepting Chinook salmon that originate from Alaska, Asia, and the Pacific Northwest, as Chinook salmon from all these areas are present for extended periods of their life-cycle in the North Pacific and Eastern Bering Sea. It is, however, not possible at this time to estimate the proportion of Chinook salmon removals that impact each specific stock. Therefore, our ability to quantitatively assess the impacts of reducing Chinook salmon PSC on salmon populations is limited. Reducing Chinook salmon mortality in the GOA trawl fishery would have beneficial impacts on Chinook salmon stocks, no matter their source-of-origin, and would benefit harvesters (e.g., commercial, tribal, subsistence, hatchery) and consumers of Chinook salmon, relative to the status quo.

With available information, neither the total cost of Chinook salmon PSC taken in the Central and Western GOA, nor the total value of Chinook salmon savings can be estimated for the various user groups. The estimated annual savings (reported in Section 4.7.1) may represent a cost to groundfish trawl harvesters, processors, and consumers that is realized as a reduction in the harvested amount of groundfish. Information on lost GOA groundfish harvest was provided with the caveat that historical behavior of these user groups does not reflect any response to an action that limits Chinook salmon PSC. Additional cost data are needed to more fully describe these impacts, but those data are not available. Remedial management action to prevent the exceeding of Chinook PSC limits could negatively impact

the communities where groundfish fishing operations are based, crew on the vessels, and suppliers of fishing materials (see Sections 4.7.2 and 4.7.4). However, data necessary to quantitatively estimate the costs incurred by these groups from forgone groundfish harvest, should the PSC limit be reached, are not available.

The Chinook salmon PSC taken in non-pollock target fisheries also has value to the commercial Chinook salmon harvesters, sport fishermen, subsistence users, species that prey upon salmon, and salmon stocks that are protected under the ESA and prioritized for conservation and recovery. However, the analysts cannot estimate the change in the number of Chinook salmon that would accrue to each user group as a result of this action. The potential salmon savings that are estimated in this analysis do not translate directly into adult salmon that would otherwise have survived and returned to its spawning stream. Salmon caught as PSC in the GOA non-pollock trawl fisheries are generally immature (Section 3.3.2.1). Some proportion of the Chinook salmon caught as PSC would have been consumed as prey by other marine creatures, or been affected by some other source of natural or fishing mortality. Increasing the number of Chinook salmon available as prey has a positive, but unquantifiable impact on species that rely on them.

Because of data limitations, it is beyond the scope of this analysis to monetize or even quantify the benefits of reducing Chinook PSC. Therefore, the estimated value of Chinook salmon PSC savings to each user group, which would allow the reader to rank the costs and benefits to each group, cannot be generated. Chinook salmon are, arguably, the most prized of the five Pacific salmon species present off the west coast of North America. Chinook salmon contribute cultural, commercial, recreational, societal, subsistence, and ecological value in many forms, to many users. Society, through the public sector, has invested heavily in their protection, recovery, and enhancement, devoting expenditures to fish passageway, habitat recovery, migration assistance, and Chinook salmon hatcheries; all clear demonstrations of the value society places on these fish.

Groundfish trawl stakeholders have outlined potential negative impacts on their industry, which include reduced revenue, increased operating cost, and a reduced ability to use voluntary agreements to manage PSC under a hard cap. At the same time, proponents of the private-sector Chinook salmon user groups have indicated that they feel the benefit of reducing PSC outweighs the cost to the trawl industry. Many of the benefits generated by these Chinook salmon user groups do not involve a market transaction. The lack of a market price makes comparing the value accruing to various users more difficult, but nonetheless important. As a result, value judgments are often based on the utility that individuals derive from Chinook salmon remaining in the ecosystem or being taken by a particular user group (e.g., Native Americans, subsistence-users, recreational fishermen), and not simply the "cost" of a fish.

Even with the lack of information on the stock composition of Chinook salmon taken as PSC, Chinook salmon that are taken from ESA-listed runs[39] pose a high cost to the nation. ESA-listed evolutionary significant unit (ESU) Chinook salmon runs have been harmed by decades of built development in and around the freshwater habitat in many of these areas. This development has often simplified and truncated the diverse habitats that support Chinook salmon populations (Lindley 2009). Reducing the number of fish that return to these rivers has greatly increased the value of the individual fish that do return. As a result, efforts to recover Chinook salmon populations have imposed substantial costs on the hydroelectric, agricultural, irrigation, forestry, land development, and recreational fishing industries in the Pacific Northwest, Northern California, parts of Alaska, and British Columbia. Limitations have also been imposed on the subsistence users of these resources. The United States has longstanding treaty obligations

[39] California coastal, Central Valley spring-run, Lower Columbia River, Upper Columbia River spring-run, Puget Sound, Sacramento River winter-run, Snake River fall-run, Snake River Spring/Summer-run, and Upper Willamette River.

to Canada, as well as Native American tribes, committing the nation to the protection of Chinook runs for escapement and use by treaty signatories.

Chinook salmon from nine of the ESA-listed ESUs are known to be present in the GOA during some stages of their life-cycle. Any of these fish that are being intercepted by the GOA groundfish trawl fleet as PSC are highly valued in a National context due to their scarcity. Fish that are the subject of treaties, as described above, may also have a higher value in the national context. Additionally, Chinook salmon bound for Alaska drainages that are not meeting their escapement goals are more highly valued by society than Chinook salmon from rivers that are meeting their escapement goals or receiving inputs from hatcheries.

Individual user groups may value Chinook salmon differently. For example, it is unlikely that a sea lion cares if the Chinook salmon it consumes is from one of the nine ESA-listed ESU runs or from a hatchery in Asia. In much the same way, a PSC-limited groundfish industry only has one Chinook debited against the allowed limit, regardless of whether the fish was from a hatchery in Southeast Alaska or the endangered Sacramento River winter-run. However, the Nation has placed a much higher value on the nine ESA-listed ESU stocks, and so it does differentiate among trawl-caught Chinook salmon based on their source of origin. This difference in value highlights the importance of developing a better understanding of the origin of Chinook salmon taken as PSC.

4.7.3 Other Impacts on Groundfish Trawl Harvesters

The preceding impact assessment describes outcomes that would have been realized if the proposed action were in place during the analyzed years. This sort of retrospective analysis does not consider the behavior modifications that may occur in the presence of a potentially constraining Chinook salmon PSC limit. In addition to behavior, this section addresses potential changes in harvesters' operating cost structures, competition incentives, and ability to manage PSC through existing or future programmatic or voluntary agreements.

Setting an upper limit on Chinook salmon PSC may have little effect on the number of salmon that are caught, so long as harvesters perceive little potential for the total to exceed the cap. In other words, if a harvester has a reasonable expectation that the apportioned PSC limit in his or her sector will not be constraining, he or she would have no economic rationale for incurring additional costs to decrease PSC or PSC rates. Moreover, if in-season PSC levels are well below the annual allowance, a harvester operating near the end of fishing season may be rational in prosecuting the fishery in a manner that maximizes TAC utilization with little or no additional effort to avoid PSC. If a PSC cap appears to be constraining, harvesters could incur additional costs, prior to fishery closure, by relocating to low-PSC areas that may be farther away or less productive.

Annual PSC limits may relatively advantage harvesters who derive most or all of their revenue from fisheries that occur early in the fishing year. Section 4.4.2.1 illustrated that the GOA trawl fleet is made up of some fishers who fish early in the year and others who do not make their first landing until mid- or late-year; this is especially evident in the CV sector. Fishers who rely upon late-year harvest (principally in flatfish, though B-season Pacific cod is an important source of revenue to the Central GOA CV sector[40]) are more likely to lose revenue to PSC closures. One should note that the historically observed time-distribution of fishing activity reflects behavior in the absence of an annual PSC limit. One might expect the harvesters who rely upon late-year catch to exert greater effort to avoid Chinook PSC than those who only fish early in the year. This effect could, in turn, allow those who only prosecute GOA

[40] On average, the Pacific cod B-season generated $5.25 million per year in the Central GOA CV sector from 2003 through 2011. This figure captures trips targeting Pacific cod that occurred in Weeks 35 to 41 (typically covering September and most of October).

non-pollock groundfish early in the year to increase their catch at the expense of late-year participants who are already actively avoiding Chinook PSC in a way that may reduce their target catch rate.

Just as harvesters may reallocate fishing effort across time, a PSC limit apportioned by regulatory area may also create an incentive for GOA trawlers to redistribute fishing behavior spatially. Harvesters with groundfish endorsements in both the Central and Western GOA may alter their historical fishing pattern to focus effort in the regulatory area that is expected to reach its PSC limit earlier. Harvesters may compete to generate as much revenue as possible in that area before the closure, which in turn makes the perceived closure risk all the more real. Such competition could trigger the negative impacts that are typically associated with a race to fish – over capitalization, shortened derby-style fishing seasons, increased propensity to fish in poor weather conditions, and increased incentive to make illegal discards on unobserved trips (see also Section 5.2.3). To the extent that harvesters do redirect effort to other areas, area-based PSC limits could relatively advantage entities with endorsements in both of the regulated GOA areas.

If a PSC limit is not apportioned by regulatory area, harvesters with multiple area endorsements may still choose to redirect fishing effort. Harvesters may have an incentive to fish more in areas that generate lower PSC rates, in an attempt to prevent or forestall a season closure. While this sort of PSC avoidance may be desirable, altered fishing patterns may increase costs for harvesters who travel greater distances to fish; this could also affect fishing opportunities for those who have historically prosecuted the fisheries that experience an influx of effort.

Many harvesters, however, may have limited ability to alter their temporal and spatial fishing behavior. These harvesters may be limited by seasonal TAC allocations (specifically in regards to Pacific cod), halibut PSC restrictions, plans to participate in limited access fisheries outside of the scope of this action, seasonal product market demand, and access to processor operations or processor capacity. Harvesters often develop a relationship with the processors to whom they historically deliver catch. This relationship is important in coordinating the timing of deliveries, minimizing fishing time lost to waiting in port, and associated additional costs. Uncertainty about fitting into a new processor's delivery rotation may mitigate harvesters' incentive to fish outside of their home area. Current regulations prohibit Western GOA tender vessels from moving east of the 157 degree longitude line, so, absent access to Central GOA processor operations, Western GOA CVs may be less likely to increase effort in reporting area 630. The interaction of the proposed Chinook PSC limit with the existing halibut PSC limit could have important effects on fishermen's motivation to avoid Chinook salmon. Halibut PSC constraints have been a major concern of groundfish fishermen, and have been reduced in recent years. If halibut PSC closures are perceived as more imminent, vessels may focus primarily on avoiding halibut and fish in ways that increase the likelihood of high Chinook PSC events.

It should be noted that harvesters' available range of responses to a looming PSC cap is not limited to offensive or defensive strategies, such as redirecting effort into more tightly constrained areas or racing to fish. Harvesters may react to the possibility of PSC closures by taking in-season measures to control their PSC rate, in lieu of – or in addition to – timing and area shifts.

GOA CP harvesters may experience less pressure to exhibit defensive behavior than CVs, if the total Chinook salmon PSC limit is apportioned separately by operational type under Option 2 of this Alternative. All CP vessels will be in the full observer coverage category under the restructured observer program beginning in 2013 (see Section 5.1.1), so PSC accountability will be greater. Also, many of the CPs that participate in GOA non-pollock groundfish fisheries are members of cooperatives – either associated with the Central GOA Rockfish Program or cooperatives associated with BSAI harvest. In general, these cooperative associations provide a foundation for the development of additional agreements to limit use of Chinook PSC.

As discussed in Section 5, it is common for a time lag to exist between the time that Chinook salmon are caught and when they are offloaded and counted. NMFS in-season management of a hard cap may require non-pollock fisheries to be closed and then re-opened in order to maximize TAC utilization without exceeding Chinook salmon PSC limits. Temporary closures could force harvesters to suspend fishing in an area and then return to fishing once the closure is lifted. Additional transit time would likely increase variable fishing costs (such as fuel) and opportunity costs to crew-members who would take more trips to earn their groundfish income and have less time available to work elsewhere.

Given the current context of speculation on future GOA rationalization measures, a Chinook salmon PSC limit may only have the effect of intensifying whatever race for target catch history may be occurring. Moreover, to the extent that harvest cooperative members and limited access fishers find themselves competing for the same target catch history under a shared PSC cap, an intensified race to fish could hinder cooperative management strategies designed to reduce PSC rates. Harvesters who suspend fishing activity during high PSC events may lose opportunities to fishers who are not a party to such an agreement and choose not to abide by the standdown. A hard cap measure that exacerbates competition would likely reduce the instances of voluntary bycatch coordination.

Central GOA Rockfish Program cooperatives are an example of stakeholder groups whose PSC management efforts could either be undermined, or whose members could be placed at a competitive disadvantage. This action, as it is currently proposed, does not consider a direct allocation of Chinook salmon PSC to Rockfish Program participants. The Council may wish to consider whether forcing Rockfish Program cooperative members to share Chinook salmon PSC allowances with non-members lessens the cooperative's ability to avoid PSC without putting harvest opportunities at risk. Aside from their ability to manage Chinook salmon PSC inseason, Central GOA CPs that target rockfish may feel it necessary to move their typical start date (historically in June) up to May – when the CVs start – in order to avoid losing harvest to a PSC closure. This move would appear to conflict with the Council's purpose in this action, since Chinook PSC rates have tended to be higher in May than in June. In general, one can assume that the historical timing of target harvest reflects the best available strategy to maximize revenue under current regulations, so a seasonal shift caused by Chinook salmon PSC limitation is likely to make these rockfish CPs less well-off. In addition, the action could result in additional Chinook PSC, if the historical trend of higher Chinook PSC rates in May continues in the future.

4.7.4 Other Impacts on Groundfish Processors

This section describes impacts that may accrue to the processing sector if GOA Chinook salmon PSC limits are constraining. These potential impacts are additional to direct revenue losses associated with the reduced harvest described in Section 4.7.1. The issues addressed include: ability to anticipate the need for and utilization of labor, fixed processing costs per unit of production, loss of input supply products to processors in other regions, and fulfillment of output supply contracts.

Before the fishing season begins, processors estimate the number of workers that are needed to process expected deliveries. Because of the remote locations and the relatively small communities in which some processors operate, those processors are required to bring in labor from outside the local community. Processors with less diverse operations may experience greater impacts from Chinook salmon closures, as they have fewer alternative activities to which labor can be redirected during groundfish down time. Processors that take more deliveries from fishers prosecuting state-managed fisheries may be relatively less exposed to federal groundfish closures, depending on the timing of the closures. Processors in King Cove and Sand Point tend to have larger numbers of non-resident employees, and may incur a greater cost from closures, if they need to retain underutilized labor at their plants for an extended period of time between fisheries. By comparison, Kodiak plants tend to have a more resident work force. While these

plants may incur fewer expenses related to housing and feeding employees, they may incur costs associated with keeping quality employees on the job and maintaining workforce morale.

In addition to their employed work force, some Western GOA processors use tender vessels to support their operations. The tenders are typically paid for their services on a daily basis. Both processors and tender operators are likely to bear added costs associated with deploying tenders if fishery closures suspend operations.

PSC limits that constrain harvest are likely to impact processors' unit production costs. Processors may wish to reduce employment at the time of PSC closure; however, the results reported in Section 4.7.1 indicate that variability in the time-distribution of PSC from year to year makes it difficult to anticipate closure dates. Moreover, to manage PSC limits, NMFS may be compelled to use short openings or re-open groundfish fisheries after a closure to allow vessels to use PSC up to the limit, but not exceed the limit. These short opening and re-openings will require processors to balance the added cost of maintaining their workforces during down times against the need for additional labor when the fisheries reopen.

Decreasing the amount of groundfish harvested increases fixed capital costs per unit of production. Fixed costs are those that are incurred regardless of production volume, such as frozen storage capacity and amortized facility or equipment costs. Processors sell to a wholesale market where prices are determined by many outside factors, including retail market demand, import product prices, and substitute product prices. Processors cannot simply set the wholesale price at a level that ensures the coverage of total production costs. Decreasing production may lower variable costs, but processors will still incur a loss if fixed unit production costs exceed market wholesale revenue. Because cost structure data for processing facilities are not available, the analysts cannot estimate the amount of groundfish deliveries required to break even on amortized fixed costs and per unit variable costs at historic production levels and first wholesale prices. Therefore, it is not possible to estimate the impact of a given Chinook salmon PSC allowance on processor profitability.

To the extent that PSC caps apportion separately to Western and Central GOA harvesters (Alternative 2, Option 1), processors may see a portion of their historical input supply delivered to processors in another region. Harvesters and processors often maintain a working relationship that aids in managing delivery capacity. PSC closure in one GOA regulatory area (or even slowing effort in an attempt to control PSC in an area) could result in harvesters redirecting effort into an open area, but delivering catch to their home port. This scenario could be aided by processors using tender vessels to receive deliveries across regulatory areas. The extraction of processor input supply (deliveries) from one GOA region could exacerbate the previously described impacts on labor force management and increased per unit production costs.

Any alteration of delivery patterns throughout the fishing year can impact processor revenues, even if total deliveries are not reduced. An approaching PSC cap may create incentive for fishers who historically rely upon harvest from that area to intensify local fishing effort. As deliveries become concentrated into earlier parts of the year, processors may be forced to employ additional staff.

Processors typically estimate the amount of groundfish product that they will produce and begin marketing that product before the fishing season. An early fishery closure could result in a processor being unable to fulfill their output supply contracts. Such an outcome could result in the loss of future contracts and market share. Processors may experience a reduction in pre-contracted sales in future years, thereby reducing revenue predictability and stability in their operations.

In addition to direct impacts on processing businesses, changes in the volume or flow of processing activity can impact the larger community in which a processing business is located (see Section 4.4.2.3 for more information on the processing communities located in the action area). As mentioned above, some processing communities are more remote than others, meaning that some rely more heavily on non-resident labor (the extent to which the migrant labor force spends money locally also varies by community). The total volume of processed product affects the amount of money spent in the community. The length of the processing season also affects the amount of time over which wage earnings might be spent in the community. Each dollar spent circulates throughout community businesses. The number of times a dollar is spent and re-spent in the community – known as the velocity of money – can increase the total size of the local economy, and have a positive downstream economic impact on entities within and beyond the entities directly related to fishing.

4.7.5 Impacts on Communities

This section provides a brief summary of community impacts arising from Alternative 2. In general, impacts on communities that are realized through trawl vessel operations will be distributed in proportion to the scale of trawl vessel operations in each community. Confidentiality data limit the extent to which these data can be disaggregated by target fishery, but they provide a general basis for understanding the distribution of impacts. Kodiak and Sand Point are each home to in excess of 10 vessels, with Kodiak vessels generating slightly less than 75 percent of the ex-vessel revenues of Gulf trawl vessels in Alaska. Sand Point vessels have generated slightly more than 20 percent of the Gulf trawl ex vessel revenues of Alaska based vessels, while King Cove vessels have generated almost 7percent of the Gulf trawl ex vessel revenues of Alaska based vessels. In general, the effects of alternatives that constrain fishing in the Central Gulf will primarily affect Kodiak based vessels, while alternatives that constrain Western Gulf fishing will primarily affect Sand Point and King Cove based vessels.

Table 4-62 Alaska communities with annual average number of locally owned GOA groundfish trawl vessels equal to or greater than 1, 2003 to 2010

	Number of Vessels	Percent of Alaska Total	Percent of Grand Total
Kodiak	15.9	48.8%	17.5%
Sand Point	10.6	32.5%	11.7%
King Cove	3.5	10.7%	3.9%
Anchorage	1.3	4.0%	1.4%
Petersburg	1.0	3.1%	1.1%
Homer	0.4	1.2%	0.4%
All Other Alaska	0.0	0.0%	0.0%
Alaska Total	32.6	100.0%	36.0%
Oregon Total	16.5	na	18.2%
Washington Total	39.1	na	43.2%
All Other States Total	2.4	na	2.6%
All Geographies Total	90.6	na	100.0%

Table 4-63 GOA groundfish trawl vessels annual average ex-vessel gross revenues, by Alaska community of ownership, 2003 to 2010

Community*	Millions (dollars)	Percent of Alaska Total	Percent of Grand Total
Kodiak	$11.3	72.8%	18.3%
Sand Point	$3.1	20.2%	5.1%
All Other Alaska	$1.1	6.9%	1.7%
Alaska Total	$15.5	100.0%	25.1%
Washington Total	$33.5	na	54.4%
All Other States Total	$12.6	na	20.5%
All Geographies Total	$61.5	na	100.0%

*Table displays all Alaska communities with at least 4 or more vessels present each year (minimum to allow data disclosure for each individual year).

In general, it is not possible to quantitatively differentiate potential impacts of the different Chinook PSC reduction alternatives on an individual community basis. Qualitatively, however, it is possible to anticipate the communities where adverse impacts, if any, would most likely accrue, along with the nature, direction, and at least rough order of magnitude of those impacts. Adverse impacts could be felt at the individual operation level for at least a few vessels in a number of Alaska communities, if either limits are perceived as constraining and those vessels choose to change fishing practices to reduce Chinook PSC or if a season-ending closure occurs. Additionally, recent community and social impact assessments for North Pacific fishery management actions suggest that, as locally operating vessels experience adverse impacts, indirect impacts are also soon felt by at least some local support service providers, to the extent that fishery participants reduce their purchase from those suppliers because of the closure.

The three communities where community-level impacts are most likely are King Cove, Sand Point, and Kodiak, (based on the relative involvement with the trawl fleet and processing of that fleet's landings in those communities). The magnitude of any effects will depend on the timing of any closures of fisheries and the foregone harvests because of those closures. Kodiak is substantially engaged in a wide range of Gulf groundfish trawl fisheries through both its local fleet and processors. Kodiak processing operations form the core of Central Gulf groundfish shore-based processing. Kodiak would be especially likely to experience adverse impacts from closures of Central Gulf non-pollock groundfish trawl fisheries. Important activity occurs in the rockfish fishery from May through July, in the Pacific cod fisheries in late summer and early fall, and in the flatfish fisheries (including both shallow-water flatfish and arrowtooth flounder) late in the year. These fisheries fill important gaps in activity for both the fleet harvesting these species and processing plants that receive deliveries. A potential mitigating factor for adverse community-level impacts in Kodiak is that the community is substantially engaged in and dependent upon a wide range of fisheries, beyond the Gulf groundfish fisheries, and multiple gear types within the Gulf groundfish fisheries. For the local Gulf groundfish fleet, ex-vessel gross revenues are roughly comparable for the fixed gear and trawl segments of the fleet. For processing operations, a closure of the flatfish late in the year, in particular, could create a range of challenges with respect to continuity of operations and processing labor. For Kodiak shore-based processors, flatfish (year-round) accounted for roughly 10 percent of combined flatfish and other groundfish first wholesale gross revenues on an annual average basis in recent years, and roughly 5 percent of first wholesale gross revenues for all species combined.

Although non-pollock groundfish fisheries serve an important role in King Cove and Sand Point economies, those communities are likely to be largely unaffected by any closure that occurs after the Pacific cod A season, as the catcher vessel sector has little involvement in any other Western Gulf non-pollock trawl fisheries. As a consequence, the impacts of any Chinook PSC limit, except for the most constraining limits, to King Cove and Sand Point are likely to be minimal. In most other Alaska communities, the scope of overall impacts anticipated to result from any of the management alternatives

assessed for the proposed Chinook PSC limits, however, community-level impacts would likely not be discernible for most of the engaged communities.

In general, adverse community-level impacts are not likely to be significant for any of the involved communities, and the sustained participation of these communities in fishing would not generally be put at risk by this action; however, some individual operations in the Kodiak trawl fleet and the Kodiak processing sector that are substantially dependent upon Gulf groundfish trawl fisheries, adverse impacts occur, especially under the more constraining Chinook PSC limits.

Table 4-64 Shore-based processors annual average first wholesale gross revenues from deliveries of GOA groundfish by gear type and by Alaska community of operation, 2003 to 2010

Community*	First Wholesale Gross Revenues by Gear Sector (Millions of Dollars)			Percentage of Combined Total
	Trawl	Hook-and-Line	Combined	
Kodiak	$75.6	$8.5	$84.1	75.6%
All Other Geographies	$25.5	$1.6	$27.1	24.4%
Total	$101.1	$10.1	$111.2	100.0%

*Table displays all Alaska communities with at least 4 or more processors present each year (minimum to allow data disclosure for each individual year).

4.7.6 Impacts on Tax Revenue

In addition to impacts on community economies, if groundfish fisheries are constrained by Chinook PSC limits, fisheries tax revenues on groundfish harvests will be lost to both the State of Alaska and the communities. The State will lose fishery business tax revenues equal to 3 percent of the ex-vessel revenues of any shore plant deliveries (and 5 percent of any floating processor deliveries) that are lost because the limit constrains harvests. In addition, the State of Alaska would lose fishery landing taxes on groundfish processed outside of the 3 mile limit that are first landed in Alaska, most of which is harvested and processed by catcher/processors. The tax is generally 3 percent of the unprocessed value of the harvested resource. Consequently, the lost revenues would be those groundfish that are unharvested because of the limit on Chinook PSC. In addition, a seafood marketing assessment is levied at a rate of 0.5 percent on the value of processed seafood products that are first landed in or exported from Alaska.

Some municipalities also levy raw fish taxes on fish first landed at processing plants located in their communities. These tax revenues would also be lost, if any Chinook PSC limit causes a closure. Municipalities that charged a raw fish tax on GOA groundfish deliveries in 2010 are shown in Section 4.4.13.2. Also reported in the table is each municipality's population, raw fish tax rates, 2010 reported raw fish tax revenue, and estimated average annual tax revenue from GOA non-pollock groundfish fisheries from 2003 to 2011.

Municipalities that charged a raw fish tax on GOA groundfish deliveries set the tax rate at 2% of ex vessel revenue. King Cove was the only municipality to charge a Fisheries Impact Tax and it is set at a flat rate of $100,000. The Fisheries Impact Tax is levied against the local processor, to help pay for city resources used by the plant. The cities of King Cove, False Pass, and Sand Point impose a 2% fish tax in addition to the 2% fish tax imposed by the Aleutians East Borough. Chignik imposes a 2% fish tax on vessels and a 1% fish tax on processors. Unalaska imposes a 2% fish tax. Estimates of the municipal fish taxes cannot be reported, because fewer than three groundfish processors are located in each community.

Instead of a raw fish tax, the Kodiak Borough imposed a severance tax of 1.05% on harvested natural resources, including fish. In June 2011, Kodiak lawmakers increased the Borough's severance tax rate to 1.25%. In general, the reductions in raw fish taxes assessed by municipalities would, potentially, have the

greatest impact on the community of Kodiak. Under the proposed action, their groundfish tax revenues would be reduced when the Chinook PSC limits cause closures of the Central GOA non-pollock groundfish fisheries, reducing harvests from those fisheries.

4.8 Analysis of Impacts: Alternative 3, Full Retention of Chinook Salmon PSC

Alternative 3 would require full retention of Chinook salmon by all non-pollock trawl vessels. This provision would require a regulatory change to existing requirements prohibiting salmon retention in the GOA non-pollock fisheries. Current regulations require vessel operators to discard salmon when an observer is not aboard. When an observer is aboard, they are required to allow for sampling by an observer before discarding prohibited species.

Analysis of Alternative 3 is qualitative, and directly relates to the management and enforcement analysis in Section 5.3. Beginning in 2013, under the restructured observer program, most CP vessels will be in the full coverage category, and will carry always have an observer onboard (see full description in Section 5.1.1). In the case of CVs, requiring Chinook salmon to be brought to shore, when an observer is not present on board, is not expected to impact deck operations, or to be onerous in terms of utilizing hold space.

Requiring full Chinook salmon retention on unobserved trips could, at some point in the future, increase the amount of biological sampling that occurs on Chinook salmon, potentially including genetic samples. Increased biological sampling and data collection are likely to aid in addressing the knowledge gaps identified in Section 4.7.2. As stated in that section, the best available data do not yet distinguish between trawl-caught Chinook salmon of local origin, or trawl-caught Chinook salmon from biologically threatened runs. Understanding the stock origin of Chinook salmon taken as PSC will improve managers' ability to assess both impacts on Chinook salmon users and net benefits to the nation.

However, as described in Section 5.1.2, implementation of this alternative would not modify observer sampling procedures. Under the agency's current procedure for genetic sampling of Chinook salmon, the implementation of this alternative without effective monitoring tools would not allow NMFS to verify that full retention of salmon has occurred aboard unobserved vessels. If Alternative 3 is implemented in conjunction with a PSC limit as considered under Alternative 2, incentives may be high to under report salmon PSC. Consequently, NMFS would not have in place the requisite conditions for conducting an offload census of retained salmon, as is used in the pollock fishery, to improve estimates of Chinook salmon PSC for catch accounting purposes, nor would it be able to take systematic genetic samples of retained salmon in accordance with the Pella and Geiger (2009) approach, as is used in the Bering Sea and GOA pollock fisheries. In Section 5.3, the agency notes that a different sampling methodology could perhaps be considered for these fisheries, but such an approach has yet to be investigated.

5 Management and Enforcement Considerations

5.1 Status Quo

NMFS estimates Chinook salmon prohibited species catch (PSC) for the Gulf of Alaska (GOA) trawl fisheries based on data from the North Pacific Groundfish Observer Program (Observer Program) and mandatory fishing industry reports. This section describes observer coverage, observer sampling, catch estimation, and inseason management in the GOA trawl fisheries. In some sub-sections, descriptions of pollock and non-pollock fisheries are provided order to compare the methods that are currently being used for PSC limits in the GOA pollock fishery and the status quo in other of the GOA trawl fisheries.

5.1.1 Observer Coverage under Restructure

In October 2010, the North Pacific Fishery Management Council (Council) took final action on Amendment 76 to the GOA Groundfish FMP to restructure the Observer Program for vessels and processors (NPFMC 2010c). The final rule to implement the restructured program is expected to be effective for the beginning of the 2013 fishing year.

The new Observer Program will make important changes to how observers are deployed, how observer coverage is funded, and the vessels and processors that must have some or all of their operations observed. These changes will reduce sources of bias that currently jeopardize the statistical reliability of catch, bycatch, and PSC data collected by the program, address cost inequality among fishery participants, and expand observer coverage to previously unobserved fisheries.

All sectors of the groundfish fishery, including vessels less than 60 feet length overall (LOA) and the commercial halibut sector, will be included in the new Observer Program. Coverage levels will no longer be based on vessel length and processing volume; rather, NMFS will have the flexibility to decide when and where to deploy observers based on a scientifically defensible deployment plan. The new Observer Program places all vessels and processors in the groundfish and halibut fisheries off Alaska into one of two observer coverage categories: (1) a full coverage category, and (2) a partial coverage category.

Under observer restructuring, regardless of length, all GOA CPs are included in the full coverage category.[41] In addition, all GOA CVs while participating in the Central GOA Rockfish Program are included in the full coverage category.

The 2013 Annual Deployment Plan, developed by NMFS, describes the methodology to deploy observers on vessels in the partial coverage category. NMFS will implement the partial coverage program by placing vessels in two pools with differing requirements:

- *Vessel Selection*: This category applies to CVs fishing with hook-and-line and pot gear that are less than 57.5 feet LOA. A sub-set of these vessels will be required to take observers for every groundfish or halibut fishing trip that occurs during a specified 2-month period. Vessels fishing jig gear and those less than 40 feet LOA will have zero probability of selection.
- *Trip Selection*: This category applies to all CVs of any length fishing with trawl gear, and to hook-and-line and pot gear vessels that are greater than or equal to 57.5 feet LOA. Vessel owners or operators whose vessel is in the trip selection pool will be required to log each fishing trip into the Observer Declare and Deploy System (ODDS) and each trip has a probability of being selected for observer coverage.

All GOA trawl CVs, as well as CPs that are exempted from the full coverage category, are included in the trip selection pool. At the October 2012 Council meeting, NMFS presented the 2013 Annual Deployment Plan. The plan specified a selection rate of 13% for both the vessel and trip pools. However, the Council recommended that NMFS increase the selection rate for the trip pool because many of these vessels are managed under prohibited species catch (PSC) limits. An increase in the rate of selection for the trip pools would result in a corresponding decrease in the selection rate for the vessel pool due to finite level of funding for observer coverage in 2013. At the December 2012 Council meeting, NMFS will present a scientific analysis and recommendation regarding a change in the deployment rate.

[41] The following CPs may be included in the partial observer coverage category: (1) CPs less than 60 ft. LOA with a history of CP and CV activity in a single year from January 1, 2003, through January 1, 2010; (2) any CP with an average daily groundfish production of less than 5,000 pounds round weight equivalent in the most recent full calendar year of operation from January 1, 2003, to January 1, 2010; or (3) CPs that processed no more than one metric ton round weight of groundfish on any day (up to a maximum of 365 mt per year) in the previous calendar year.

Under the restructured Observer Program, all shoreside processing facilities in the GOA are under the partial coverage category. However, in the first year of the program, all observer coverage in shoreside processing facilities will occur during deliveries of pollock.

5.1.2 Observer Sampling

5.1.2.1 Sampling on Catcher Vessels Delivering to Shoreside Processors

When an observer is deployed on a catcher vessel (CV), they are responsible for assessing the fishing activities and determining how to sample the unsorted catch for species composition and biological information using methodologies described in the Observer Program Sampling Manual (AFSC 2013). In the GOA trawl CV fisheries, observers are instructed to sample every haul for composition and biological data. In rare cases, an observer is unable to sample all the hauls during a trip. This is usually a result of observer injury, or rough weather preventing the observer from completing their duties. For each sampled haul, observers are instructed to collect a random species composition sample of the total catch. Observers are trained and encouraged to use a systematic sample whenever it is logistically feasible, and they strive to take multiple, equal sized samples from throughout the haul to obtain the largest sample size possible. However gear handling methods in different fisheries, vessel layout, and the associated safety concerns, can restrict an observer's access to unsorted catch at sea. Therefore there are differences in the catch sampling in the GOA trawl fisheries. Descriptions of the sampling differences between pollock and non-pollock fisheries are provided in order to compare the data that are currently being used for PSC limits in the pollock fishery and what is available in other GOA trawl fisheries.

Sampling in GOA trawl pollock CVs

Catch of CVs fishing for pollock is generally either dropped or mechanically pumped from a codend (i.e., the end of the trawl net where catch accumulates) directly into Refrigerated Seawater (RSW) tanks. Because of the size of the codends, opportunities for sorting of any species, including salmon PSC, are extremely low. Observers attempt to obtain random, species composition samples by collecting small amounts of catch as it flows from the codend to the RSW tanks. Therefore, in the GOA pollock fishery, observer samples are often obtained opportunistically and sample fractions vary. For uncommon species such as salmon, a larger sample size is desired and large sample sizes are generally not logistically possible on pollock CVs. For this reason, whenever possible, estimates of salmon PSC by CVs are based on counts of the salmon PSC that occur during offload at the shoreside processor.

Sampling in GOA trawl non-pollock CVs

Unlike CVs in pollock fisheries, vessels in other GOA trawl fisheries sort their catch extensively at sea because of a larger amount of unmarketable bycatch. Vessels with a sorting conveyor on board sort and discard unwanted species along with PSC while at sea. Other vessels do not have a sorting conveyor and sort directly from the trawl alley. Observers collect species composition samples prior to any sorting occurring. Because a large amount of sorting occurs at sea and the observers are unable to monitor this sorting while engaged in other sampling duties, it is extremely difficult to verify that no salmon PSC have been discarded at sea. Unlike the CV pollock vessels, there is a high likelihood that salmon PSC has been sorted from the catch prior to delivery. Offload counts of salmon PSC are not possible in these fisheries because of the amount of sorting that occurs in these fisheries. Therefore, PSC estimates from CVs in other GOA trawl fisheries are all derived from at-sea samples.

Sampling on Central GOA Rockfish Program CVs

Observer sampling aboard CVs in the Central GOA (CGOA) Rockfish Program is the same as other trawl fisheries besides pollock. However, 100% observer coverage aboard CVs in a cooperative is required so

that the vessels in the cooperative may obtain a vessel specific halibut PSC rate. Additionally, since the majority of species caught in these fisheries are allocated to the cooperative, sorting at sea is limited to PSC and other prohibited species such as lingcod during certain times of the year. Like pollock, these codends tend to be larger and at sea sorting is limited to PSC, including salmon and halibut, that is required to be discarded but are difficult to sort from large codends as they are being dumped directly into RSW tanks.

5.1.2.2 Sampling for Salmon at Shoreside Processors

As is described in the previous section, gear handling methods differ between trawl fisheries and among vessels and these factors impact observer's access to unsorted catch at sea. These factors also result in differences in the catch sampling that occurs in shoreside processing facilities in the GOA trawl fisheries. Sampling at shoreside processors for the pollock and non-pollock deliveries are described in order to compare the methods that are being used for PSC limits in pollock fishery and what data are available in other GOA trawl fisheries.

Shoreside sampling of GOA pollock deliveries

Shoreside processors in the GOA are not required to sort and weigh all catch by species prior to the offload entering the factory. Therefore, several GOA shoreside processors do not have a dedicated sorting operation and the vessel observer is frequently the only person sorting out the salmon from a delivery.

For some processors, the majority of the sorting of PSC from a pollock delivery occurs inside the processing area of the shoreside processor. This is very different from Bering Sea/Aleutian Islands (BSAI) shoreside processors, which are required by regulations to provide NMFS with a Catch Monitoring and Control Plan that details how the processor will ensure that all species are sorted and weighed within view of the observer. Catch Monitoring and Control Plans require the processor to identify a designated sorting area that precedes the fish holding bins and processing equipment and allows an observer to monitor all locations where catch could be sorted. Under a Catch Monitoring and Control Plan, no other species besides pollock are allowed to enter the processing area without first being sorted and weighed.

In the GOA, salmon that are missed during sorting end up in the shoreside processor, which requires special treatment by the shoreside processor and the observers to ensure they are counted. These "after-scale" salmon (so called because they were initially weighed along with pollock) create tracking difficulties for the shoreside processor and the observer. Although after-scale salmon are required to be given to an observer, there is no direct observation of salmon once they are moved past the observer and into the shoreside processor. Vessel observers currently record after-scale salmon as if they had collected them. However, after-scale salmon can better be characterized as shoreside processor reported information. The vessel observer will generally only receive this after-scale salmon information from the plant observer if the plant observer was present. Further complications in shoreside processor salmon accounting occur when multiple CVs are delivering simultaneously, making it difficult or impossible to determine to which CV's trip these salmon should be assigned. Shoreside processor personnel may not be saving after-scale salmon for observers at this stage of sampling; therefore, after-scale salmon numbers are difficult to quantify and verify for each delivery.

In the GOA pollock fishery, vessel observers are instructed to collect biological data from randomly selected salmon found at sea and at the shoreside processor. The biological data include sex/length, FMA identification scales, sex/length/weight, genetics, and coded-wire tags (CWT). All salmon species contribute to sex/length, FMA identification scales, and CWT data, but currently genetics and sex/length/weight data are only collected from chum and Chinook salmon. Using a similar method in the

BSAI pollock CV fishery, observers are instructed to follow a random systematic sample design to collect data for chum and Chinook salmon. These fish could be found at-sea within the observers' at-sea composition samples, as part of the at-sea discard of salmon sorted from the catch by the crew that is not included in the composition samples, or during the offload at the shoreside processor.

Shoreside sampling of non-pollock deliveries

In all CV trawl fisheries other than pollock, biological data are only collected from those fish encountered within the at-sea composition samples. Biological data are not collected at sea or shoreside from fish outside of the observers' composition samples.

Shoreside sampling of CGOA Rockfish Program deliveries

Shoreside processors in the CGOA are required to operate under a Catch Monitoring and Control Plan (CMCP) which requires the processor to detail how they will ensure that all catch delivered is sorted and weighed to species within view of a CMCP specialist. This CMCP specialist is a NMFS employee who monitors portions of these offloads to ensure that the processor is following their CMCP and provides feedback to the plants to improve sorting and weighing of all species delivered. Observers do not collect biological data from salmon from CGOA Rockfish Program deliveries.

5.1.2.3 Sampling on Trawl Catcher/Processors

Sampling methods used on catcher/processors (CPs) allow observers to collect larger samples under more controlled conditions than CVs because the observer is able to collect samples downstream of the fish holding tanks, just prior to the catch sorting area that precedes the fish processing equipment. Crew sorting of catch is done under more controlled conditions than aboard CVs and almost all CPs have at least one observer aboard. Additionally, on many CPs that are in the CGOA Rockfish and Amendment 80 Programs, the observer has access to catch weighing scales and an observer sampling station. Many CPs that participate in these cooperatives also have the use of flow scales which enhance an observer's ability to collect larger samples. Although these flow scales and observer sample stations are not required outside the CGOA Rockfish or Amendment 80 Programs, most vessels continue to use the flow scale and allow the observer access to the sampling station in other fisheries in the GOA.

5.1.3 Prohibited Species Catch Estimation

NMFS determines the number of Chinook salmon PSC in the GOA groundfish fisheries using the catch accounting system (CAS) and details of the catch, bycatch, and PSC estimation methods are described in detail in a NOAA Technical Memorandum (Cahalan et al. 2010). The CAS was developed to receive catch reports from multiple sources, evaluate data for duplication and errors, and estimate total catch by species (or species group). The catch estimates are specific to species and fisheries to allow effective monitoring of the allocations in the Federal regulations and annual harvest specifications. In general, the degree to which a seasonal or annual allocation requires NMFS management is often inversely related to the size of the allocation. Often, the smaller the catch limit, the more intensive the management that is required to ensure that it is not exceeded.

Industry reports of landings and production are generated for all fishing activity in federal groundfish fisheries through a web-based interface, eLandings. Each industry report submitted via eLandings undergoes error checking. Data are then stored in a database and made available to the three collaborating agencies: NMFS, Alaska Department of Fish and Game, and the International Pacific Halibut Commission. There are two basic eLandings report types used for catch estimation:

- Production Reports: At-sea production reports are mandatory for CPs and motherships that are issued a Federal Fishing Permit. At-sea production reports include information about the gear

type used, area fished, and product weights (post-processed) by species. As of 2009, the at-sea processors have submitted these reports daily (prior to 2009, at-sea processor reports were submitted weekly). Shorebased plants also complete production reports, but these are not used for PSC estimation.

- Landing Reports: when a CV makes a delivery to a shoreside processor or a mothership a landing report is required. On making a landing, a representative of the shoreside processor or mothership submits the landing report into eLandings and a paper "fish ticket" is printed for both the processor and the CV representative. The collection period for a landing report is a trip for shoreside processors and a delivery for each CV that delivers to a mothership. A trip for CVs delivering to a shoreside processor is defined as the time period between when fishing gear is first deployed and the day the vessel offloads groundfish (50 CFR 679.2). Landing reports are mandatory for all processors required to have a federal processing permit, including motherships who receive groundfish from federally permitted CVs.

PSC estimation in GOA pollock trawl fisheries

For each vessel trip, observer sampling for salmon on pollock CVs in the GOA is conducted as follows: (1) samples are taken from each tow while the vessel is at sea, and (2) the entire observed offload is followed into the shoreside processor as the catch is delivered and a count of delivered salmon is completed by the vessel observer. The onboard vessel observers assess any PSC that is discarded at sea and the total amount of PSC discarded is added to the salmon counted at offload to obtain the total amount of species-specific PSC for the trip. NMFS uses the total discard information (salmon counted at offload plus estimated salmon discard at sea) to create PSC rates that are applied to unobserved vessels and hauls. There are rare circumstances where the offload count is not completed, for example if a vessel observer was ill and could not monitor offload, and a plant observer was not available to assist with the offload sampling. If the offload data are not available, then NMFS uses the at-sea samples and extrapolates that sample to the entire delivery of groundfish. Spatial information is obtained by apportioning the total estimate of salmon for an observed trip (at sea estimate plus offload count) to a haul based on the amount of haul-specific groundfish.

In the CAS, the observer data are used to create PSC rates (a ratio of the estimated PSC to the estimated total catch in sampled hauls). The observed information from both at-sea samples and offload counts is used to create PSC rates that are applied to unobserved vessels for GOA pollock vessels. For trips that are unobserved, the PSC rates are applied to industry supplied landings of retained catch. Depending on the observer data that are available, the extrapolation from observed vessels to unobserved vessels is based on varying levels of aggregated data (post-stratification). Data are matched based on processing sector (e.g., CVs), week, fishery (e.g., Pacific cod), gear (e.g., non-pelagic trawl), and federal reporting area. Further detail on the estimation procedure, including levels of post-stratification is available in Cahalan et al. (2010).

PSC estimation in GOA non-pollock trawl fisheries

Chinook salmon PSC estimates from trawl CP and non-pollock trawl CV fisheries in the GOA are based on at-sea sampling for salmon. NMFS uses the at-sea samples on observed trips and extrapolates the sample to the week (CP) or trip (CV). These estimates are used to create PSC rates that are applied to unobserved vessels. As described in the observer sampling section, observers use a systematic sample and they strive to take multiple, equal sized samples from throughout the haul to obtain the largest sample size possible. However, even with large sample sizes that reduce detectability issues, Chinook salmon is a relatively uncommon species and is characterized by an over-dispersed data distribution. This distribution is characterized by many small and zero counts (i.e., right skewed distribution) with occasional large counts. There is a relationship between the abundance of given species in a haul, sample size, and the level of precision in the resulting estimate of species catch from sampling. In general, we can have very

high precision in the catch estimate for common (target species) with very small samples of the haul. Conversely, even extremely large samples of a haul provide relatively imprecise estimates of catch for very rare species.

In estimating PSC, the Chinook estimates on observed trips are specific to the observed vessels' data, while unobserved vessels receive PSC rates that may be averaged across multiple vessels and trips. As a consequence, the occasional higher PSC rates result in large PSC estimates that are specific to a vessel and maybe averaged into PSC rates used for multiple unobserved vessels. In addition, from an inseason management perspective, the PSC rates change as additional observer information is obtained. This creates temporal variation in Chinook salmon PSC estimates, resulting in a high degree of uncertainty associated with inseason management of Chinook salmon PSC limits.

The catch estimation methods are designed to provide an estimate of catch, bycatch, and PSC as quickly as possible so that inseason managers have information to make decisions. The CAS makes use of observer data as soon as they are available, but the estimates are updated and refined as more observer data becomes available. For trawl CVs in the GOA, it may take anywhere from a few days to over a week for NMFS to receive preliminary observer data. After deployment in the field, which maybe as long as three months, observers review their data with FMA Division staff and ensure that data were collected following NMFS protocols. It is normal for there to be many data modifications during this "debriefing" and quality control process. For all of these reasons, PSC estimates change on a regular basis, and there can be large variations in the estimates until well after the fishery is closed and smaller variations as the observer data are finalized in late February to early March of the year following the fishery.

5.1.4 Inseason Management of GOA Trawl Fisheries

The GOA non-pollock fisheries can be high-pulsed fisheries due to the amount of seasonal or annual allocations and the fleet's catch rates. A fishery may open for only a few days, and NMFS may announce the closure date of non-pollock fisheries before the fishery actually opens. High-pulsed fisheries are challenging to manage, and a brief explanation of the challenges for these fisheries is provided.

Prior to the fishery opening, for high-pulsed fisheries the CPs and/or shoreside processors that have historically participated in the fisheries are contacted and the amount of expected effort is calculated. NMFS then queries historical catch rates based on that effort and projects a range of possible catch rates. To account for uncertainty and to be conservative, estimated catch is calculated using historical maximum catch rates and the most recent information. NMFS then projects a closure date and makes a decision whether to announce a closure prior to the opening of the season or to manage inseason. Managing inseason is defined as allowing the fishery to open with no closure date announced, collecting information while the fishery is ongoing, and using that information to project a closure date.

The decision to manage inseason is made if the allocation is large enough to allow NMFS the time to assess the catch and close the fishery before the allocation is exceeded. The weekday that the fishery opens must also be taken into account. To close a fishery, NMFS processes the required paperwork at least one working day before the closure. A federal closure notice is required to be published in the *Federal Register* which is open Monday through Friday; therefore, closures for Friday, Saturday, or Sunday have to be decided before Friday.

There is a risk that the fleet will not harvest the entire allocation in which case the fishery may need to reopen. To reopen the fishery, NMFS has to ensure that all catch information has been reported and that there is enough remaining allocation to reopen the fishery. NMFS usually has enough information to make a decision approximately three to five days after the closure. NMFS will then calculate catch rates, determine why the allocation was not fully harvested, and examine other factors (such as weather,

participation) before determining if a fishery needs to reopen. If a fishery reopens then NMFS must then go through the same protocol and associated timeline discussed above for issuing a closure. To ensure the fleet has prior notice and is available to participate, NMFS usually will reopen a fishery about three days after the day it is announced. There is usually about a week between the closure and the subsequent reopening.

In the CGOA Rockfish Program, for the CV sector participants, the cooperatives require hotspot reporting on Chinook salmon rates from the fishing grounds. This information can be helpful; however, there is a lot of variance between vessels, times of day, and locations. Some vessels have tried salmon excluder devices designed for the pollock fisheries, but the current design does not appear to function well in the rockfish fishery. The fleet will need to invest in new technologies to develop a functional excluder device for the rockfish fishery. The cooperatives have built awareness of the importance of avoiding Chinook salmon, but actual tools need to be developed as the fleet continues to learn with experience.

In 2008, Amendment 80 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (Amendment 80) established a limited access privilege program for the non-AFA trawl CP sector. Since 2011, the Amendment 80 CPs, except the F/V GOLDEN FLEECE, formed two cooperatives, Alaska Seafood Cooperative and Alaska Groundfish Cooperative. These cooperatives were formed to manage Amendment 80 species in the BSAI, but the cooperatives also are used to manage fisheries they pursue in the GOA. Cooperatives provide tools for more precise and efficient management of allocations than NMFS inseason management. However, PSC limits shared by two cooperatives would require management by NMFS unless the two cooperatives developed an inter-cooperative agreement. An inter-cooperative agreement could be voluntary or regulated by NMFS. The inter-cooperative agreement would have to include all non-AFA trawl CPs including the F/V GOLDEN FLEECE since they would not be exempt from the Chinook salmon PSC limits and are not a member of an Amendment 80 cooperative.

The Amendment 80 Program established groundfish and halibut PSC sideboard limits to limit the ability of Amendment 80 Program participants to expand their harvest efforts in the GOA. In the Western and Central GOA, these sideboard limits include pollock and Pacific cod, and in the Western GOA include Pacific ocean perch, dusky rockfish, and northern rockfish. The F/V GOLDEN FLEECE is exempt from these sideboard limits; however, it is prohibited from directed fishing for pollock, Pacific cod, Pacific ocean perch, pelagic shelf rockfish, and northern rockfish in the GOA. The Amendment 80 vessels use the cooperative structure to help NMFS inseason management manage their GOA sideboard limits.

5.1.4.1 Western and Central Non-pollock Trawl Fishery

Table 5-1 shows that, from 2007 through 2012, an average of 3 shoreside processors, 21 CVs, and 13 CPs participated in the Western GOA non-pollock fisheries (Area 610). In the Central GOA (Areas 620 and 630), an average of 11 shoreside processors, 40 CVs, and 10 CPs participated in non-pollock fisheries over the same time period. In 2012, however, there was an increase in the number of catcher vessels in the Central GOA, to 48.

Table 5-1 Number of shoreside processors (SP), catcher vessels (CV), and catcher/processors (CP) in the Western and Central non-pollock fisheries, by year, 2007 to 2012.

Area	2007			2008			2009			2010			2011			2012			Average 2007 to 2012		
	SP	CV	CP	SP	CV	CP	SP	CV	CP	SP	CV	CP	SP	CV	CP	SP	CV	CP	SP	CV	CP
Western	4	28	13	2	23	11	2	25	14	4	15	13	3	12	14	4	24	15	3	21	13
Central	11	37	9	11	41	10	9	34	12	10	38	10	13	42	8	10	48	8	11	40	10

Source: NMFS Catch Accounting System.

5.2 Alternative 2: PSC Limit

5.2.1 Observer Sampling under a PSC limit

Observer sampling protocols would not be expected to change under this option. Observers would continue to use the species composition samples for obtaining non-pollock Chinook salmon PSC estimates. Offload counts at shoreside processing plants would not occur under this option for non-pollock trawl CVs.

Note that AGDB, PSMFC and the observer program are working on a NPRB Project (no. 1017), funded through January 2013 that is evaluating two alternative methods of sampling catch that will be discarded at-sea with the overall goal of improving precision in catch estimates derived from observer data. The project may result in changes in the sampling methodology used on CVs in the future.

5.2.2 Prohibited Species Catch Estimation under a PSC limit

This action will require modifications to the CAS to accommodate PSC limit allocations by federal reporting area and/or operation type (CP or CV). Simple PSC limits by area and operation type are not hugely complicated and will not require a large programming effort. This assessment is based on the assumption that this action will not implement the type of total census catch accounting that was put in place under Amendment 91 in the Bering Sea.

On unobserved trips, NMFS estimates of PSC are derived from PSC rates on observed trips that are applied to the unobserved trips landings data. For trips that are unobserved, the PSC rates are applied to industry supplied landings of retained catch. The CAS makes use of all observer data available and if observer data are not available, the CAS aggregates (post-stratifies) the data until an appropriate PSC rate can be matched with the landings data. Under the restructured observer program, the randomization of observer coverage by trip throughout the GOA will mitigate the impact of the current program, where observer data are only available for the PSC estimates when vessels chose to take an observer. However, it is still possible that in a given week and target there may be minimal observer data available within an area for a PSC estimate. Therefore if a Chinook salmon PSC limit is put in place and the cap is allocated between areas, there is a possibility that the observer data from one area will contribute to the PSC rates used in the other area.

As described under the status quo, PSC estimates change on a regular basis and there can be large variations in the estimates as more observer data becomes available, quality controls are performed, and the observer data are finalized. Changes in the PSC estimates that result from the data quality controls may make it difficult to manage a PSC limit, especially if the GOA trawl fisheries are fast, pulse fisheries.

For a PSC limit to be effective, estimation of PSC needs to be credible to create incentives at the vessel level for Chinook salmon and other PSC avoidance. For CVs, this action will not incorporate sophisticated management and enforcement protocols such as those implemented under Amendment 91 in the Bering Sea since the catch monitoring infrastructure does not exist in the GOA to the same degree that it did in the Bering Sea when Amendment 91 was being developed. Additionally, as described in the status quo, almost all of the catch in non-pollock fisheries is sorted at-sea and the offload sampling of salmon PSC used in the GOA pollock trawl fishery is not a viable option for vessels in the non-pollock CV trawl fisheries. Thus, the PSC estimates for CVs will be based on at sea samples. For CPs it could be possible to incorporate a suite of monitoring requirements under this action to enable PSC census sampling. However, unlike Amendment 91, the basic monitoring requirements are not in place for CPs across the entire GOA. The monitoring that would be required to implement a census on CPs would include: flow scales, 200% observer coverage, observer sampling stations, video monitoring, salmon

storage container, reporting of salmon PSC in electronic logbook, and census counting. These monitoring requirements would impose large costs on the industry without the benefit and management infrastructure of a catch share program. Even under Amendment 91, NMFS has concerns with the adequacy of the monitoring and the enforceability of the program, especially in years of high PSC. In an open access fishery, there would be very little incentive to reduce PSC, and high incentive to bias PSC accounting.

In summary, for both CPs and CVs, this action attempts to implement a high-precision management tool in fisheries with very little monitoring infrastructure to support precise PSC estimates and is highly susceptible to introduction of intentional bias into salmon PSC estimation.

5.2.3 Inseason Management of Hard Caps

As was described under the status quo, the decision to manage a fishery inseason is made if the allocation is large enough and the data are available to allow NMFS the time to assess the catch and close the fishery before the allocation is exceeded. NMFS' ability to manage Chinook salmon PSC limits in the GOA non-pollock fisheries is likely to be difficult for several reasons:

1. high variance in the Chinook salmon PSC estimates which are derived from at-sea samples that are extrapolated to the haul level on the observed vessel and then all hauls extrapolated to the unobserved trips;
2. non-pollock trawl fisheries can be high-pulsed fisheries; however, there is a time-delay in getting the data needed to derived PSC estimates and the observer data can change substantially throughout the fishery and debriefing process;
3. depending on which option was selected, the PSC limits could be very small and the smaller the catch limit, the more intensive the management that is required to ensure that it is not exceeded.

As such, NMFS would likely need to take a conservative inseason management approach and there is likely to be constraints on the ability of the fleet to fully harvest target species, especially in fast-paced fisheries and in years of high PSC.

In addition to posing risk for inseason management, the PSC limit may be ineffective in reducing salmon PSC in the non-pollock fisheries. The salmon PSC limits proposed under this alternative may prevent harvesters from being able to fully prosecute the target fisheries and this increases incentives for vessels to misreport or under report the amount of salmon caught. Additionally, without the management structure of a catch share program, vessels do not have the incentives to move from an area of higher salmon PSC if the race for fish still exists, particularly in high-paced fisheries. In other catch share programs with PSC limits, the programs can provide the affected vessel with the tools and incentives necessary to reduce PSC while improving efficiency. Under a catch share program, the flexibility of new adaptive internal management measures may ease the burdens associated with complying with the monitoring measures and potential harvest constraints imposed by a PSC limit. Without these catch share tools, PSC limit management may be ineffective in reducing salmon PSC. In addition, in years where catch is near the PSC limit, estimate imprecision may impose costs on industry through constraints on target species catch and the inability for fishers to realize efficiency gains created through catch share programs, particularly in a race-for-fish situation.

An example of a fleet that may be able to institute the PSC limits that could be effective and enforceable would be the CGOA Rockfish Program. Many of the tools necessary to manage the PSC limit already exist under the Rockfish Program. This catch share program increased the incentive of participants to misreport and high grade catch, while at the same time increasing the burden on managers to provide highly defensible estimates of catch, especially when those estimates directly impact quota holders. NMFS dealt with these issues by clearly articulating goals for the management of catch share programs and imposing new and more stringent monitoring and observer requirements as these programs have been

developed. Some of the tools that exist in the CGOA Rockfish Program for CVs that might assist with monitoring the salmon PSC limit include: 100% observer coverage to estimate vessel-specific halibut PSC at-sea; CMCPs to ensure accurate sorting, weighing and reporting of all allocated species; and near real time reporting of observer data. Tools also exist in the CGOA Rockfish Program for CPs that could assist with monitoring salmon PSC limits: every haul sampled by an observer (200% coverage); the use of flow scales; and the availability of an observer sampling station. In the non-rockfish other fisheries, these tools do not exist.

Interaction between Hard Caps and the CGOA Rockfish Program

One of the non-pollock trawl fisheries with Chinook salmon PSC is CGOA rockfish fisheries. The current alternatives do not include an option to apportion Chinook salmon PSC limits by non-pollock targets or between the CGOA Rockfish Program and the rest of the non-pollock fisheries. The Central GOA rockfish directed fisheries are managed under the Rockfish Program, a catch share, and participants in cooperatives have tools to reduce Chinook salmon PSC that are not available for vessels not in cooperatives. A Chinook salmon PSC limit for the aggregate non-pollock fisheries could close the Rockfish Program directed fisheries, and this would undermine the Rockfish Program.

5.3 Alternative 3: Full retention of salmon

Current regulations differentiate when retention of salmon is required based on whether an observer is onboard. If an observer is aboard, vessel operators are prohibited from discarding salmon at sea until the number of salmon has been determined and the collection of any scientific data or biological samples has been completed by the vessel observer. Retention of salmon is not required in the GOA groundfish fisheries, other than pollock, if an observer is not aboard. In the pollock fishery, it is very common for vessel operators to retain all salmon, regardless of whether an observer is aboard, because of operational characteristics where large volumes of pollock are brought aboard and rapidly stowed in below-deck tanks. Detecting salmon as the pollock are brought aboard and stowed is not practical, and is considered generally unsafe due to deck space limitations and stability concerns. In non-pollock CV trawl fisheries, such as flatfish or Pacific cod fisheries, sorting at sea is very common and frequently vessels have conveyor systems on deck to facilitate this sorting. Unlike the pollock fishery, the likelihood that full retention of salmon PSC would occur in the non-pollock trawl fisheries aboard vessels without an observer is highly unlikely given the incentives to under-report salmon PSC, described in Section 5.2.3. NMFS will have no way of verifying that full retention of salmon has occurred aboard unobserved vessels and will have no way to enforce this requirement given the current monitoring tools.

The full retention of salmon PSC requirement may be more effective aboard vessels that are required to carry an observer at all times and have some of the monitoring tools (increased observer coverage, flow scales, CMCPs, observer sampling stations) necessary to monitor and enforce a full retention requirement, such as CGOA Rockfish Program CVs and CPs. However, even in these programs, all the tools do not exist to ensure full retention of salmon PSC is occurring. Additionally, CPs in the GOA will be required to carry at least one observer. With only one observer aboard, there will be times when the observer is sampling, sleeping, or completing paperwork and sorting of salmon when the observer is not present may still occur.

It is important to note that, at this time, regulations for full retention would not modify the observer duties or the method by which NMFS calculates fleet-wide Chinook salmon PSC estimates. NMFS will have no way of verifying that full retention of salmon has occurred aboard unobserved vessels. Therefore, as described in Section 5.2.1, NMFS would not be modifying the observer sampling protocols. NMFS would continue to calculate Chinook salmon PSC numbers and manage a PSC cap for Chinook salmon using the existing system of extrapolating PSC rates from observed vessels to the unobserved portion of the fleet.

The operational characteristics of the pollock fishery allow full retention of salmon and thus collection of genetic samples following sampling methods developed for the Bering Sea (Pella and Geiger 2009). However, this sampling method as applied to pollock does not lend itself to the operational characteristics and current monitoring protocols of non-pollock CV fisheries in the GOA, with the potential exception of the Rockfish Program. The Rockfish Program requires 100% observer coverage, and deliveries are monitored by NMFS staff, which would allow observers to verify full retention and NMFS staff could collect genetic samples at offload.

Starting in 2013, all trawl CPs operating in the GOA will have full observer coverage, which may create opportunity for genetic sampling. However, the current sampling protocol (Pella & Geiger 2009) requires a census approach, which is not reliable under the current monitoring program. However, as was raised in the SSC comments during its October 2009 meeting, alternatives to a constant sample rate across all samples, and a non-census approach, using the current observer sampling methods, could be investigated.

6 Initial Regulatory Flexibility Analysis

6.1 Introduction

This Initial Regulatory Flexibility Analysis (IRFA) addresses the statutory requirements of the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (5 U.S.C. 601-612). This IRFA evaluates the potential adverse economic impacts on small entities directly regulated by the proposed action.

The RFA, first enacted in 1980, was designed to place the burden on the government to review all regulations to ensure that, while accomplishing their intended purposes, they do not unduly inhibit the ability of small entities to compete. The RFA recognizes that the size of a business, unit of government, or nonprofit organization frequently has a bearing on its ability to comply with a federal regulation. Major goals of the RFA are: (1) to increase agency awareness and understanding of the impact of their regulations on small business, (2) to require that agencies communicate and explain their findings to the public, and (3) to encourage agencies to use flexibility and to provide regulatory relief to small entities.

The RFA emphasizes predicting significant adverse economic impacts on small entities as a group distinct from other entities, and on the consideration of alternatives that may minimize adverse economic impacts, while still achieving the stated objective of the action. When an agency publishes a proposed rule, it must either 'certify' that the action will not have a significant adverse economic impact on a substantial number of small entities, and support that certification with the 'factual basis' upon which the decision is based; or it must prepare and make available for public review an IRFA. When an agency publishes a final rule, it must prepare a Final Regulatory Flexibility Analysis.

In determining the scope, or 'universe,' of the entities to be considered in an IRFA, NMFS generally includes only those entities that are directly regulated by the proposed action. If the effects of the rule fall primarily on a distinct segment, or portion thereof, of the industry (e.g., user group, gear type, geographic area), that segment would be considered the universe for the purpose of this analysis.

6.2 IRFA requirements

Until the North Pacific Fishery Management Council (Council) makes a final decision on a preferred alternative, a definitive assessment of the proposed management alternatives cannot be conducted. In order to allow the agency to make a certification decision, or to satisfy the requirements of an IRFA of the

preferred alternative, this section addresses the requirements for an IRFA. Under 5 U.S.C., section 603(b) of the RFA, each IRFA is required to contain:

- A description of the reasons why action by the agency is being considered;
- A succinct statement of the objectives of, and the legal basis for, the proposed rule;
- A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply (including a profile of the industry divided into industry segments, if appropriate);
- A description of the projected reporting, record keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
- An identification, to the extent practicable, of all relevant federal rules that may duplicate, overlap, or conflict with the proposed rule;
- A description of any significant alternatives to the proposed rule that accomplish the stated objectives of the proposed action, consistent with applicable statutes, and that would minimize any significant economic impact of the proposed rule on small entities. Consistent with the stated objectives of applicable statutes, the analysis shall discuss significant alternatives, such as:

    1. The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;
    2. The clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;
    3. The use of performance rather than design standards;
    4. An exemption from coverage of the rule, or any part thereof, for such small entities.

In preparing an IRFA, an agency may provide either a quantifiable or numerical description of the effects of a proposed action (and alternatives to the proposed action), or more general descriptive statements, if quantification is not practicable or reliable.

6.3 Definition of a small entity

The RFA recognizes and defines three kinds of small entities: (1) small businesses, (2) small non-profit organizations, and (3) small government jurisdictions.

Small businesses. Section 601(3) of the RFA defines a 'small business' as having the same meaning as 'small business concern', which is defined under Section 3 of the Small Business Act (SBA). 'Small business' or 'small business concern' includes any firm that is independently owned and operated and not dominant in its field of operation. The SBA has further defined a "small business concern" as one "organized for profit, with a place of business located in the United States, and which operates primarily within the United States or which makes a significant contribution to the U.S. economy through payment of taxes or use of American products, materials or labor…A small business concern may be in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the firm is a joint venture there can be no more than 49 percent participation by foreign business entities in the joint venture."

The SBA has established size criteria for all major industry sectors in the United States, including fish harvesting and fish processing businesses. Effective January 5, 2006, a business involved in fish harvesting is a small business if it is independently owned and operated, not dominant in its field of operation (including its affiliates), and if it has combined annual gross receipts not in excess of $4.0

million for all its affiliated operations worldwide.[42] A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $4.0 million criterion for fish harvesting operations. Finally, a wholesale business servicing the fishing industry is a small business if it employs 100 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide.

The SBA has established "principles of affiliation" to determine whether a business concern is "independently owned and operated." In general, business concerns are affiliates of each other when one concern controls or has the power to control the other, or when a third party controls or has the power to control both. The SBA considers factors such as ownership, management, previous relationships with or ties to another concern, and contractual relationships, in determining whether affiliation exists. Individuals or firms that have identical or substantially identical business or economic interests, such as family members, persons with common investments, or firms that are economically dependent through contractual or other relationships, are treated as one party with such interests aggregated when measuring the size of the concern in question. The SBA counts the receipts or employees of the concern whose size is at issue and those of all its domestic and foreign affiliates, regardless of whether the affiliates are organized for profit, in determining the concern's size. However, business concerns owned and controlled by Indian Tribes, Alaska Regional or Village Corporations organized pursuant to the Alaska Native Claims Settlement Act (43 U.S.C. 1601), Native Hawaiian Organizations, or Community Development Corporations authorized by 42 U.S.C. 9805 are not considered affiliates of such entities, or with other concerns owned by these entities solely because of their common ownership.

Affiliation may be based on stock ownership when (1) a person is an affiliate of a concern if the person owns or controls, or has the power to control 50 percent or more of its voting stock, or a block of stock which affords control because it is large compared to other outstanding blocks of stock, or (2) if two or more persons each owns, controls or has the power to control less than 50 percent of the voting stock of a concern, with minority holdings that are equal or approximately equal in size, but the aggregate of these minority holdings is large as compared with any other stock holding, each such person is presumed to be an affiliate of the concern.

Affiliation may be based on common management or joint venture arrangements. Affiliation arises where one or more officers, directors, or general partners, controls the board of directors and/or the management of another concern. Parties to a joint venture also may be affiliates. A contractor and subcontractor are treated as joint ventures if the ostensible subcontractor will perform primary and vital requirements of a contract or if the prime contractor is unusually reliant upon the ostensible subcontractor. All requirements of the contract are considered in reviewing such relationship, including contract management, technical responsibilities, and the percentage of subcontracted work.

Small organizations. The RFA defines "small organizations" as any not-for-profit enterprise that is independently owned and operated, and is not dominant in its field.

Small governmental jurisdictions. The RFA defines "small governmental jurisdictions" as governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of fewer than 50,000.

[42] Effective January 6, 2006, SBA updated the Gross Annual Receipts thresholds for determining "small entity" status under the RFA. This is a periodic action to account for the impact of economic inflation. The revised threshold for "commercial fishing" operations (which, at present, has been determined by NMFS to include catcher/processors, as well as catcher vessels) changed from $3.5 million to $4.0 million in annual gross receipts, from all its economic activities and affiliated operations, worldwide.

6.4 Reason for considering the proposed action

The Council has identified the following problem statement regarding the affected areas and sectors for the proposed action. Further background information and detail on the intent of the proposed action is provided in Section 1.1.

> *Magnuson-Stevens Act National Standards require balancing achieving optimum yield with minimizing bycatch, while minimizing adverse impacts on fishing dependent communities. Chinook salmon prohibited species catch (PSC) taken incidentally in GOA trawl fisheries is a concern, and incidental take is limited in the Biological Opinion for ESA-listed Chinook salmon stocks. The Council recently adopted a PSC limit of 25,000 Chinook salmon for the Western and Central GOA pollock trawl fisheries, while also indicating an intent to evaluate Chinook salmon bycatch in the non-pollock GOA trawl fisheries, which currently do not have a Chinook salmon bycatch control measure.*

6.5 Objectives of proposed action and its legal basis

Under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the Secretary of Commerce (NMFS Alaska Regional Office) and the North Pacific Fishery Management Council have the responsibility to prepare fishery management plans and associated regulations for the marine resources found to require conservation and management. NMFS is charged with carrying out the federal mandates of the Department of Commerce with regard to marine fish, including the publication of federal regulations. The Alaska Regional Office of NMFS and the Alaska Fisheries Science Center research, draft, and support the management actions recommended by the Council. The Gulf of Alaska (GOA) groundfish fisheries are managed under the Fishery Management Plan for Groundfish of the Gulf of Alaska. The proposed action represents amendments to the GOA groundfish fishery management plan, as well as amendments to associated federal regulations. Two principal objectives of the FMP amendment and proposed regulations are to reduce Chinook salmon PSC in the Central and Western GOA non-pollock groundfish trawl fisheries to the minimal practicable level, consistent with National Standard 9 of the Magnuson-Stevens Act, and to enable GOA groundfish harvests to contribute to the achievement of optimum yield on a continuing basis, consistent with National Standard 1 of the Magnuson-Stevens Act.

6.6 Number and description of directly regulated small entities

[TO BE PROVIDED]

6.7 Recordkeeping and reporting requirements

[TO BE PROVIDED]

6.8 Federal rules that may duplicate, overlap, or conflict with proposed action

[TO BE PROVIDED]

6.9 Impacts of the action on small entities

[TO BE PROVIDED]

6.10 Description of significant alternatives to the proposed action

[TO BE PROVIDED]

7 FMP and Magnuson-Stevens Act Considerations

7.1 Magnuson-Stevens Act National Standards

Below are the 10 National Standards as contained in the Magnuson-Stevens Fishery and Conservation Act (Magnuson-Stevens Act), and a brief discussion of the consistency of the proposed alternatives with those National Standards, where applicable.

National Standard 1 — Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery

The proposed action would impose a prohibited species catch (PSC) limit on the Western/ Central Gulf of Alaska (GOA) non-pollock trawl fisheries. Under some levels and apportionments, the PSC limits identified in Alternative 2 may prevent the non-pollock trawl fisheries from achieving total allowable catches (TACs) in some years, unless fishermen can find other methods to avoid Chinook salmon PSC. The groundfish stocks are not currently in danger of overfishing and are considered stable. The FMP establishes optimum yield for the GOA groundfish fishery as a whole. This action is not expected to interfere with the achievement of optimum yield in the groundfish fishery on a continuing basis. The proposed action would likely reduce the PSC of Chinook salmon species in years of high PSC, either by closing the non-pollock trawl fisheries early, or by encouraging fishermen to pursue ways to reduce Chinook salmon PSC. Although the direct relationship between Chinook salmon removals in the groundfish fisheries and the availability of Chinook salmon to the directed fisheries is not understood, a reduction in PSC of Chinook salmon species may result in an increase in yield from the directed salmon fisheries. In terms of achieving "optimum yield" from a fishery, the Act defines "optimum", with respect to yield from the fishery, as the amount of fish which—

(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduce by any relevant economic, social, or ecological factor; and
(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

With information that is currently available, neither the total "cost" of Chinook salmon PSC, taken in the Central and Western GOA non-pollock trawl fisheries, nor the total "value" of Chinook salmon savings can be estimated for the various user groups. The estimated annual savings of Chinook salmon may represent a cost to the non-pollock trawl fishery harvesters, processors, and consumers that is realized as a reduction in the amount of groundfish that is harvested. To the extent possible, the value of these fish to the non-pollock trawl fishery harvesters and processors was described for each alternative and option in the RIR. Chinook salmon PSC in the non-pollock trawl fisheries also has value to the commercial harvesters of Chinook salmon, sport fishermen, subsistence users, as prey for other species, and as stocks that are protected under the Endangered Species Act (ESA) and identified as needing to be conserved and recovered. A general description of each of these user groups was also

provided in the Regulatory Impact Review/Environmental Assessment (RIR/EA). However, we cannot estimate the change in the number of Chinook salmon that would accrue to each use as a result of this action. The potential salmon savings that are estimated in this analysis do not translate directly into adult salmon that would otherwise have survived to return to its spawning stream.

The North Pacific Fishery Management Council (Council) has heard testimony and been provided additional information by representatives of most groups that utilize the Chinook salmon resource, demonstrating the breadth and variety of values associate with this species. Many of the benefits generated by these user groups do not involve a market transaction. The lack of a market price makes comparing the value derived from various users more difficult, but none the less important. Even with the lack of information on the stock composition of Chinook salmon taken as PSC in the GOA non-pollock trawl fisheries, if any Chinook salmon taken in the non-pollock trawl fisheries are from runs that are listed in the ESA,[43] their value to the Nation is high.

National Standard 2 — Conservation and management measures shall be based upon the best scientific information available.

Information in this analysis represents the most current, comprehensive set of information available to the Council, recognizing that some information (such as operational costs) is unavailable. Information previously developed on the GOA non-pollock trawl fisheries, as well as the most recent information available, has been incorporated into this analysis. It represents the best scientific information available.

National Standard 3 — To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The annual TACs are set for GOA groundfish according to the Council and NMFS' harvest specification process. NMFS conducts the stock assessments for this species and makes allowable biological catch recommendations to the Council. The Council sets the TACs for these species based on the most recent stock assessment and survey information. GOA groundfish will continue to be managed either as single stocks or stock complexes, or where appropriate, in conjunction with BSAI groundfish stocks, under the alternatives in this analysis.

National Standard 4 — Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fishermen, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Nothing in the alternatives considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and states of the Pacific Northwest, participate in the major sectors affected by these allocations. No discriminations are made among fishermen based on residency or any other criteria.

National Standard 5 — Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.

[43] California coastal, Central Valley spring-run, Lower Columbia River, Upper Columbia River spring-run, Puget Sound, Sacramento River Winter-run, Snake River fall-run, Snake River Spring/Summer-run, and Upper Willamette River.

Efficiency in the context of this change refers to economic efficiency. The analysis presents information relative to the relative importance of economic efficiency versus other considerations and provides information on the economic risks associated with the proposed PSC reduction measures.

National Standard 6 — Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

All of the alternatives under consideration in the proposed action appear to be consistent with this standard.

National Standard 7 — Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

All of the alternatives under consideration appear to be consistent with this standard.

National Standard 8 — Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

Many of the coastal communities in the Central and Western GOA, as well as coastal communities elsewhere in Alaska and the Pacific Northwest, participate in the GOA non-pollock trawl fisheries in one way or another, such as homeport to participating vessels, the location of processing activities, the location of support businesses, the home of employees in the various sectors, or as the base of ownership or operations of various participating entities. A summary of the level of fishery engagement in communities and dependence of vessels affected by the proposed action is provided in the RIR.

National Standard 9 — Conservation and management measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The alternatives are specifically crafted to address Chinook salmon PSC in the non-pollock trawl fisheries. The practicability of PSC reduction is discussed in the analysis of the impacts of the various alternatives and options.

National Standard 10 — Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The alternatives under consideration appear to be consistent with this standard. None of the alternatives or options proposed would change safety requirements for fishing vessels. No safety issues have been identified relevant to the proposed action.

7.2 Section 303(a)(9) Fisheries Impact Statement

Section 303(a)(9) of the Magnuson-Stevens Act requires that any plan or amendment include a fishery impact statement which shall assess and describe the likely effects, if any, of the conservation and management measures on (a) participants in the fisheries and fishing communities affected by the plan or amendment; and (b) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants taking into account potential impacts on the participants in the fisheries, as well as participants in adjacent fisheries.

The alternative actions considered in this analysis are described in Section 1.6. The impacts of these actions on participants in the fisheries and fishing communities are the topic of the RIR and Initial Regulatory Flexibility Analysis (Sections 3 and 6).

Fishery Participants

The proposed actions directly impact participants in the GOA non-pollock trawl fisheries occurring in the Western and Central GOA. From 2003 through 2011, there have been a total of 122 different vessels participating in the directed fisheries (100 catcher vessels and 22 catcher/processors).

Fishing Communities

The fishing communities that are expected to be potentially directly impacted by the proposed action are those communities which serve as homeports to the vessels potentially affected by the area closures, where they offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. Information on the residence of the vessel crew and processing crew that work aboard the potentially affected vessels is not readily available; however, generally companies operating vessels in the Central GOA groundfish sector tend to recruit crew from many locations. A summary of the level of fishery engagement in communities and dependence of vessels affected by the proposed action is provided in the RIR.

Detailed information on the range of fishing communities relevant to the proposed action may be found in a number of other documents, including the *Alaska Groundfish Fisheries Final Programmatic Supplemental EIS* (NMFS 2004a), *Sector and Regional Profiles of the North Pacific Groundfish Fishery* (Northern Economics and EDAW 2001), and in a technical paper (Downs 2003) supporting the *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005b) as well as that environmental impact statement itself. These sources also include specific characterizations of the degree of individual community and regional engagement in, and dependency upon, the North Pacific groundfish fishery. Additionally, a summary of information on particular communities affected by this action may be found in the RIR.

Participants in Fisheries in Adjacent Areas

The alternatives considered in this action would not significantly affect participants in the fisheries conducted in adjacent areas under the authority of another Council.

7.3 GOA FMP — Groundfish Management Policy Priorities

The alternatives discussed in this action accord with the management policy of the Fishery Management Plan for Groundfish of the GOA. The Council's management policy (NPFMC 2011) includes the following objectives:

- Control the removal of prohibited species through PSC limits or other appropriate measures.
- Continue and improve current incidental catch, prohibited species catch, and bycatch management program.
- Continue to manage incidental catch, prohibited species catch, and bycatch through seasonal distribution of total allowable catch and geographical gear restrictions.
- Continue program to reduce discards by developing management measures that encourage the use of gear and fishing techniques that reduce groundfish bycatch, which includes economic discards.

The alternatives considered in this analysis to control Chinook salmon PSC in the GOA non-pollock trawl fisheries are consistent with the Council's longstanding management policy.

8 NEPA Summary

One of the purposes of an environmental assessment is to provide the evidence and analysis necessary to decide whether an agency must prepare an environmental impact statement (EIS). The Finding of No Significant Impact (FONSI) is the decision maker's determination that the action will not result in significant impacts to the human environment, and therefore, further analysis in an EIS is not needed. The Council on Environmental Quality regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." An action must be evaluated at different spatial scales and settings to determine the context of the action. Intensity is evaluated with respect to the nature of impacts and the resources or environmental components affected by the action. NOAA Administrative Order (NAO) 216-6 provides guidance on the National Environmental Policy Act (NEPA) specifically to line agencies within NOAA. It specifies the definition of significance in the fishery management context by listing criteria that should be used to test the significance of fishery management actions (NAO 216-6 §§ 6.01 and 6.02). These factors form the basis of the analysis presented in this Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis. The results of that analysis are summarized here for those criteria.

Context: For this action, the setting is the Western and Central Gulf of Alaska (GOA) pollock fishery. Any effects of this action are limited to these regulatory areas. The effects of this action on society are on individuals directly and indirectly participating in these fisheries and on those who use the ocean resources. Because this action concerns the use of a present and future resource, this action may have impacts on society as a whole or regionally.

Intensity: Considerations to determine intensity of the impacts are set forth in 40 CFR 1508.27(b) and in the NAO 216-6, Section 6. Each consideration is addressed below in order as it appears in the NMFS Instruction 30-124-1 dated July 22, 2005, Guidelines for Preparation of a FONSI. The sections of the EA that address the considerations are identified.

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

No. No significant adverse impacts on target species were identified for the alternatives. Under Alternative 2, the implementation of a lower hard cap may result in the non-pollock trawl fisheries closing before the TACs are reached, while a higher hard cap would allow for non-pollock trawl fishing at current levels with no change from the status quo. Target species are managed under harvest specifications that prevent overfishing. Therefore, no impacts on the sustainability of any target species are expected.

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

No. Alternative 2 considers PSC limits for Chinook salmon in the Central and Western GOA. To the extent that Chinook salmon prohibited species catch is controlled or reduced as a result of this action, it will likely have beneficial impacts on Chinook salmon stocks relative to the status quo. Effects cannot be measured at the individual stock level because data are not available at this scale. Potential effects of Alternative 2 on other non-target and prohibited species are expected to be insignificant and similar to status quo, as fishing pressure is unlikely to increase. The alternatives are not expected to jeopardize the sustainability of any ecosystem component or prohibited species.

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 the fishery management plans (FMPs)?

No. No significant adverse impacts were identified for Alternative 2 on ocean or coastal habitats or EFH. The impact of the GOA non-pollock trawl fisheries on benthic habitat is unlikely to change substantially as a result of the alternative. The implementation of a lower hard cap may result in the non-pollock trawl fisheries closing before the TACs are reached, which would reduce overall impact on benthic habitat.

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

No. Public health and safety will not be affected in any way not evaluated under previous actions or disproportionately as a result of the proposed action. The action under Alternative 2 will not change fishing methods (including gear types).

5) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?

The analysis in the EA shows that the impacts of Alternative 2 on ESA-listed species (marine mammals, seabirds, and salmon), designated critical habitat, or marine mammals are likely insignificant. The only critical habitat designated for an ESA-listed species in the GOA is for Steller sea lions and Cook Inlet beluga whale. Alternative 2 would not change the Steller sea lion protection measures, ensuring the action is not likely to result in adverse effects not already considered under previous ESA consultations for Steller sea lions and their critical habitat. The fisheries are not being changed under either alternative that would result in effects beyond those already analyzed in the 2010 Biological Opinion for the authorization of the Alaska groundfish fisheries. This consultation covered all ESA-listed marine mammals occurring in the action area except Cook Inlet Beluga Whales and Southern Resident Killer whales. ESA consultations are being conducted with the Protected Resources Divisions, Alaska Region and Northwest Region, on the potential effects of this action on Cook Inlet beluga whales, Southern Resident killer whales, and ESA-listed Chinook salmon. NMFS Sustainable Fisheries Division Alaska Region has determined that the groundfish fisheries as managed under this action may affect these species and their designated critical habitat, but these effects are likely not measurable or *de minimus*; and therefore, this action is not likely to adversely affect ESA listed species or their designated critical habitat. For ESA-listed Chinook salmon, implementing a PSC limit would increase the likelihood that the GOA groundfish fisheries will remain below the threshold identified in the incidental take statement. This action also would limit the amount of Chinook salmon taken in the non-pollock trawl fisheries which would reduce the likelihood of affecting prey for Cook Inlet Beluga whales, Southern Resident Killer whales and of affecting the primary constituent elements of designated critical habitat.

6) 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.)?

No significant adverse impacts on biodiversity or ecosystem function were identified for Alternative 2. No significant effects are expected on biodiversity, the ecosystem, marine mammals, or seabirds, as overall the GOA non-pollock trawl fleet is constrained in the location and timing of the fishery by regulatory constraints (e.g., seasonal allocations of TAC and halibut PSC).

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

Socioeconomic impacts of this action result from the potential that the non-pollock trawl fisheries will be closed before the TACs are achieved, or additional costs associated with voluntary efforts of the fleet to avoid areas with high prohibited species catch rates. These impacts are a direct result of the action of imposing PSC limits on the fisheries. These impacts are independent of the natural or physical effects of

imposing PSC limits on the fisheries and are not expected to be significant. Beneficial but insignificant social impacts may occur for those who depend on directed fisheries for Chinook salmon, however there is insufficient information to determine how specific Chinook stocks will be impacted by this proposed action.

8) Are the effects on the quality of the human environment likely to be highly controversial?
This action directly affects the GOA non-pollock trawl fisheries in the Western and Central GOA, which includes fisheries of value to the groundfish fleet. There is uncertainty associated with the estimates of Chinook salmon prohibited species catch for the unobserved portion of the groundfish fleet, and uncertainty surrounding the origin of Chinook stocks caught as prohibited species catch in the fishery. However, development of the proposed action has involved participants from the scientific and fishing communities and the potential impacts on the human environment are understood; therefore, this action is considered high-interest but not highly controversial as far as understanding the impacts of this action on the human environment.

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 or ecologically critical areas?
No. This action would not affect any categories of areas on shore. This action takes place in the geographic area of the Central and Western GOA. The land adjacent to this marine area may contain archeological sites. This action would occur in adjacent marine waters so no impacts on these cultural sites are expected. The marine waters where the fisheries occur contain ecologically critical areas. Effects on the unique characteristics of these areas are not anticipated to occur with this action because the amount of fish removed by vessels are within the specified TAC harvest levels and the alternatives provide protection to EFH and ecologically critical nearshore areas.

10) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?
No. The potential effects of the action are understood because of the fish species, harvest methods involved, and area of the activity. For marine mammals and seabirds, enough research has been conducted to know about the animals' abundance, distribution, and feeding behavior to determine that this action is not likely to result in population effects. The potential impacts of different gear types on habitat also are well understood, as described in the EFH EIS (NMFS 2005b). Alternative 2 may reduce Chinook salmon PSC but effects cannot be measured at the individual stock level because data are not available at this scale.

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?
No. Beyond the cumulative impact analyses in the Groundfish Harvest Specifications EIS (NMFS 2007a), the Central Gulf of Alaska Rockfish Program EA (NMFS 2011c), and the EA/RIR/IRFA to Revise GOA Halibut PSC Limits (NPFMC 2012), no other additional past or present cumulative impact issues were identified. The combination of effects from the cumulative effects of past, present, and reasonably foreseeable future actions and this proposed action are not likely to result in significant effects for any of the environmental component analyzed and are therefore not significant.

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?
No. This action will have no effect on districts, sites, highways, structures, or objects listed or eligible for listing in the National Register of Historic Places, nor cause loss or destruction of significant scientific, cultural, or historical resources.

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

No. This action poses no risk of the introduction or spread of nonindigenous species into the GOA beyond those previously identified because it does not change fishing, processing, or shipping practices that may lead to the introduction of nonindigenous species.

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?

No. Alternative 2 considers a PSC limit to control the risk of high Chinook salmon prohibited species catch occurring in the GOA non-pollock trawl fisheries. This action does not establish a precedent for future action because PSC control measures have been frequently used as a management tool for the protection of marine resources in the Alaska groundfish fisheries. Pursuant to NEPA, for all future actions, appropriate environmental analysis documents (EA or EIS) will be prepared to inform the decision makers of potential impacts to the human environment and to implement mitigation measures to avoid significant adverse impacts.

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?

No. This action poses no known risk of violation of federal, state, or local laws or requirements for the protection of the environment.

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?

No. The effects on target and non-targeted species from the alternatives are not significantly adverse as the overall harvest of these species will not be affected. No cumulative effects were identified that, added to the direct and indirect effects on target and non-targeted species, would result in significant effects.

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10 Preparers and Persons Consulted

Preparers and Contributors

North Pacific Fishery Management Council:	Sam Cunningham Diana Evans Mark Fina, Ph.D. Steve Maclean
Alaska Fisheries Information Network:	Mike Fey
National Marine Fisheries Service, Alaska Region Office:	Mary Furuness Jason Gasper Jennifer Mondragon Jennifer Watson
NMFS Alaska Fisheries Science Center, North Pacific Groundfish Observer Program:	Elizabeth Chilton Martin Loefflad
NMFS Alaska Fisheries Science Center, Auke Bay Laboratory:	Adrian Celewycz Chuck Guthrie Jeff Guyon, Ph.D. Phil Mundy, Ph.D.
Alaska Department of Fish and Game:	Karla Busch Ruth Christiansen Nicole Kimball

Persons Consulted

Julie Bonney

Appendices

Appendix 1 Harvest and Chinook salmon PSC impacts under Alternative 2 – Complete record of retrospectively simulated Chinook PSC closures from 2003 to 2011

The following tables report the harvest and Chinook salmon PSC impacts that would have occurred if the PSC limits, as apportioned by the options of Alternative 2, had been in place from 2003 to 2011. A separate table is presented for each combination of total GOA non-pollock groundfish trawl fishery Chinook salmon PSC limit and apportionment scenario. 68 tables are included.

Each table includes the week of the calendar year (from 1 to 53) that the PSC closure would have occurred. The listed week corresponds to the week *following* the week in which the historical PSC record of that year surpassed the apportioned Chinook salmon PSC allowance under consideration. Blank records indicate that a Chinook PSC closure would not have occurred in that year.

For each year in which a closure would have occurred, harvest and Chinook salmon impacts are reported for each GOA non-pollock trip target and the apportioned GOA fishery as a whole (Gulf-wide, by regulatory area, by operational type, or by operational type within a regulatory area). Metric tons of forgone harvest could not be reported due to confidentiality limitations. Instead, harvest impacts are reported as the number of vessels that fished from the week of the Chinook PSC closure to the end of the year. The percentage value reported in harvest impacts denotes the proportion of the year's total harvest in that fishery that was taken after the PSC closure would have occurred. Reported Chinook savings indicate the number of Chinook salmon that were recorded from the week of the Chinook PSC closure to the end of the year. The percentage value denotes the proportion of the total Chinook salmon PSC recorded in that year that would not have occurred if the fishery closed.

12,500 Chinook salmon PSC limit

1. Gulf-wide PSC limit of 12,500 Chinook salmon

	Week of Simulated Closure	Impact	GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Harvest														
		Chinook Savings														
2004		Harvest														
		Chinook Savings														
2005		Harvest														
		Chinook Savings														
2006		Harvest														
		Chinook Savings														
2007		Harvest														
		Chinook Savings														
2008		Harvest														
		Chinook Savings														
2009		Harvest														
		Chinook Savings														
2010		Harvest														
		Chinook Savings														
2011		Harvest														
		Chinook Savings														

2. Option 1 – PSC limit of 12,500 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
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2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

3. Option 1 – PSC limit of 12,500 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
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2008		Forgone Harvest														
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2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

4. Option 1 – PSC limit of 12,500 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	16	68%	6	100%	3	24%	7	59%	1	78%	2	24%	8	72%
		Chinook Savings	1,018	48%	0	0%	72	33%	27	100%	1	100%	0	0%	917	49%
2004	14	Forgone Harvest	15	69%	8	100%	3	11%	2	100%	1	100%	4	37%	2	58%
		Chinook Savings	483	26%	0	0%	92	97%	127	100%	4	100%	128	9%	133	48%
2005	14	Forgone Harvest	11	40%	6	100%	1	0%	2	87%	1	100%	3	6%	1	7%
		Chinook Savings	140	9%	0	0%	0	0%	116	68%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	28	Forgone Harvest	1	41%	9	52%	0	0%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	261	20%	185	63%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

5. Option 1 – PSC limit of 12,500 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

6. Option 2 - PSC limit of 12,500 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	41	Forgone Harvest	7	9%	1	3%	2	54%	0	0%	0	0%	1	13%	3	12%
		Chinook Savings	89	1%	0	0%	89	55%	0	0%	0	0%	0	0%	0	0%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

7. Option 2 - PSC limit of 12,500 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

8. Option 2 - PSC limit of 12,500 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

9. Option 2 - PSC limit of 12,500 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

10. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

11. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
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2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

12. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

13. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

14. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	15	77%	6	100%	3	93%	7	59%	1	100%	2	27%	8	72%
		Chinook Savings	1,018	51%	0	0%	72	100%	27	100%	1	100%	0	0%	917	49%
2004	14	Forgone Harvest	14	86%	8	100%	4	67%	2	100%	1	100%	3	33%	3	58%
		Chinook Savings	466	25%	0	0%	92	33%	127	46%	2	1%	113	41%	133	48%
2005	14	Forgone Harvest	11	70%	6	100%	1	100%	2	87%	1	100%	3	6%	2	7%
		Chinook Savings	140	9%	0	0%	0	0%	116	68%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	28	Forgone Harvest	10	51%	9	52%	0	0%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	261	20%	185	63%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

15. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	21	Forgone Harvest	14	48%	6	100%	3	93%	4	48%	1	100%	2	24%	6	25%
		Chinook Savings	73	4%	0	0%	72	100%	0	0%	1	100%	0	0%	0	0%
2004	18	Forgone Harvest	14	76%	8	100%	3	67%	1	61%	1	100%	2	0%	1	18%
		Chinook Savings	129	7%	0	0%	92	100%	35	28%	2	100%	0	0%	0	0%
2005	18	Forgone Harvest	11	67%	6	100%	1	100%	1	3289%	1	100%	2	0%	2	7%
		Chinook Savings	49	3%	0	0%	0	0%	25	14%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

16. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	8	Forgone Harvest	3	27%	0	0%	2	24%	0	0%	1	100%	1	100%	0	0%
		Chinook Savings	26	18%	0	0%	26	18%	0	0%	0	0%	0	0%	0	0%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006	6	Forgone Harvest	25	85%	0	0%	25	85%	0	0%	1	100%	0	0%	0	0%
		Chinook Savings	83	41%	0	0%	83	41%	0	0%	0	0%	0	0%	0	0%
2007		Forgone Harvest														
		Chinook Savings														
2008	10	Forgone Harvest	1	6%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011	9	Forgone Harvest	1	1%	0	0%	1	1%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

17. Options 1 & 2 - PSC limit of 12,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

10,000 Chinook salmon PSC limit

18. Gulf-wide PSC limit of 10,000 Chinook salmon

	Week of Simulated Closure	Impact	GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	36	Harvest	33	19%	1	1%	5	34%	4	3%	13	19%	1	6%	13	36%
		Chinook Savings	752	7%	0	0%	367	12%	0	0%	90	78%	0	0%	295	9%
2004		Harvest														
		Chinook Savings														
2005		Harvest														
		Chinook Savings														
2006		Harvest														
		Chinook Savings														
2007		Harvest														
		Chinook Savings														
2008		Harvest														
		Chinook Savings														
2009		Harvest														
		Chinook Savings														
2010		Harvest														
		Chinook Savings														
2011		Harvest														
		Chinook Savings														

19. Option 1 – PSC limit of 10,000 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

20. Option 1 – PSC limit of 10,000 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	37	Forgone Harvest	20	13%	0	0%	2	4%	1	2%	5	16%	0	0%	13	60%
		Chinook Savings	449	5%	0	0%	89	3%	0	0%	65	57%	0	0%	295	20%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	50	Forgone Harvest	3	0%	0	0%	0	0%	0	0%	1	0%	1	4%	1	0%
		Chinook Savings	155	2%	0	0%	0	0%	0	0%	0	0%	149	42%	7	0%
2011		Forgone Harvest														
		Chinook Savings														

21. Option 1 – PSC limit of 10,000 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	16	68%	6	100%	3	24%	7	59%	1	78%	2	24%	8	72%
		Chinook Savings	1,018	48%	0	0%	72	33%	27	100%	1	100%	0	0%	917	49%
2004	14	Forgone Harvest	15	69%	8	100%	3	11%	2	100%	1	100%	4	37%	2	58%
		Chinook Savings	483	26%	0	0%	92	97%	127	100%	4	100%	128	9%	133	48%
2005	14	Forgone Harvest	11	40%	6	100%	1	0%	2	87%	1	100%	3	6%	1	7%
		Chinook Savings	140	9%	0	0%	0	0%	116	68%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	76%	9	100%	1	1%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

22. Option 1 – PSC limit of 10,000 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	21	Forgone Harvest	15	43%	6	100%	4	24%	4	48%	1	78%	2	22%	6	25%
		Chinook Savings	73	3%	0	0%	72	33%	0	0%	1	100%	0	0%	0	0%
2004	38	Forgone Harvest	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

23. Option 2 - PSC limit of 10,000 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	21	Forgone Harvest	19	62%	9	100%	4	97%	5	22%	1	56%	2	31%	11	47%
		Chinook Savings	464	7%	0	100%	161	100%	0	0%	1	100%	10	91%	291	9%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

24. Option 2 - PSC limit of 10,000 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	21	Forgone Harvest	19	62%	9	100%	6	97%	5	22%	1	56%	3	31%	12	47%
		Chinook Savings	464	7%	0	100%	161	100%	0	0%	1	100%	10	91%	291	9%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

25. Option 2 - PSC limit of 10,000 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

26. Option 2 - PSC limit of 10,000 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	46	Forgone Harvest	6	1%	1	1%	0	0%	0	0%	4	2%	0	0%	2	3%
		Chinook Savings	53	1%	0	0%	0	0%	0	0%	3	0%	0	0%	50	2%
2011		Forgone Harvest														
		Chinook Savings														

27. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	41	Forgone Harvest	5	12%	0	0%	2	84%	0	0%	0	0%	0	0%	3	21%
		Chinook Savings	89	2%	0	0%	89	100%	0	0%	0	0%	0	0%	0	0%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

28. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	21	Forgone Harvest	14	69%	6	100%	2	100%	1	17%	1	0%	1	81%	11	65%
		Chinook Savings	390	9%	0	100%	89	100%	0	0%	0	0%	10	91%	291	21%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

29. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

30. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	38	Forgone Harvest	7	1%	0	0%	0	0%	0	0%	5	6%	0	0%	2	17%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	45	Forgone Harvest	7	2%	1	1%	0	0%	0	0%	5	2%	0	0%	2	6%
		Chinook Savings	222	4%	0	0%	0	0%	0	0%	3	0%	0	0%	219	8%
2011		Forgone Harvest														
		Chinook Savings														

31. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	15	77%	6	100%	3	93%	7	59%	1	100%	2	27%	8	72%
		Chinook Savings	1,018	51%	0	0%	72	100%	27	100%	1	100%	0	0%	917	49%
2004	14	Forgone Harvest	14	86%	8	100%	4	67%	2	100%	1	100%	3	33%	3	58%
		Chinook Savings	466	25%	0	0%	92	33%	127	46%	2	1%	113	41%	133	48%
2005	13	Forgone Harvest	12	83%	6	100%	1	100%	2	87%	2	100%	4	42%	2	54%
		Chinook Savings	785	50%	0	0%	0	0%	116	68%	8	100%	16	100%	644	47%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	94%	9	100%	1	100%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

32. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Forgone Harvest	14	55%	6	100%	3	93%	4	49%	1	100%	2	24%	6	36%
		Chinook Savings	691	35%	0	0%	72	100%	0	0%	1	100%	0	0%	617	33%
2004	14	Forgone Harvest	14	86%	8	100%	4	67%	2	100%	1	100%	3	33%	3	58%
		Chinook Savings	466	25%	0	0%	92	100%	127	100%	2	100%	113	8%	133	48%
2005	14	Forgone Harvest	11	70%	6	100%	1	100%	2	87%	1	100%	3	6%	2	7%
		Chinook Savings	140	9%	0	0%	0	0%	116	68%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

33. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	8	Forgone Harvest	3	27%	0	0%	2	24%	0	0%	1	100%	1	100%	0	0%
		Chinook Savings	26	18%	0	0%	26	18%	0	0%	0	0%	0	0%	0	0%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006	6	Forgone Harvest	25	85%	0	0%	25	85%	0	0%	1	100%	0	0%	0	0%
		Chinook Savings	83	41%	0	0%	83	41%	0	0%	0	0%	0	0%	0	0%
2007		Forgone Harvest														
		Chinook Savings														
2008	10	Forgone Harvest	1	6%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011	8	Forgone Harvest	1	10%	0	0%	1	10%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	24	25%	0	0%	24	25%	0	0%	0	0%	0	0%	0	0%

34. Options 1 & 2 - PSC limit of 10,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

7,500 Chinook salmon PSC limit

35. Gulf-wide PSC limit of 7,500 Chinook salmon

	Week of Simulated Closure	Impact	GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Harvest	65	64%	36	100%	41	35%	6	28%	21	62%	3	21%	14	58%
		Chinook Savings	3,128	29%	801	100%	609	19%	66	2%	92	80%	10	2%	1,551	46%
2004		Harvest														
		Chinook Savings														
2005		Harvest														
		Chinook Savings														
2006		Harvest														
		Chinook Savings														
2007		Harvest														
		Chinook Savings														
2008		Harvest														
		Chinook Savings														
2009		Harvest														
		Chinook Savings														
2010	39	Harvest	28	14%	8	10%	0	0%	2	15%	18	28%	2	29%	13	27%
		Chinook Savings	2,099	22%	2	0%	0	0%	64	3%	549	54%	361	73%	1,122	28%
2011		Harvest														
		Chinook Savings														

36. Option 1 – PSC limit of 7,500 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	21	Forgone Harvest	59	65%	33	100%	37	37%	2	17%	18	59%	1	21%	13	66%
		Chinook Savings	1,743	20%	801	100%	537	18%	0	0%	90	79%	10	2%	305	20%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	44	Forgone Harvest	14	6%	1	2%	0	0%	2	15%	6	3%	2	10%	6	15%
		Chinook Savings	1,089	13%	0	0%	0	0%	64	3%	5	0%	229	65%	792	26%
2011		Forgone Harvest														
		Chinook Savings														

37. Option 1 – PSC limit of 7,500 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Forgone Harvest	59	67%	39	100%	38	37%	2	24%	20	62%	3	21%	13	73%
		Chinook Savings	2,438	28%	801	100%	537	18%	66	2%	90	79%	10	2%	934	62%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	38	Forgone Harvest	29	17%	9	13%	3	1%	2	20%	20	33%	2	22%	14	28%
		Chinook Savings	2,140	25%	2	0%	25	6%	64	3%	642	63%	285	81%	1,122	36%
2011	46	Forgone Harvest	4	2%	1	1%	0	0%	0	0%	0	0%	0	0%	4	4%
		Chinook Savings	144	2%	0	0%	0	0%	0	0%	0	0%	0	0%	144	5%

38. Option 1 – PSC limit of 7,500 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	16	68%	6	100%	3	24%	7	59%	1	78%	2	24%	8	72%
		Chinook Savings	1,018	48%	0	0%	72	33%	27	100%	1	100%	0	0%	917	49%
2004	13	Forgone Harvest	16	73%	8	100%	3	11%	2	100%	1	100%	6	71%	2	58%
		Chinook Savings	1,137	61%	0	0%	92	97%	127	100%	4	100%	781	58%	133	48%
2005	13	Forgone Harvest	12	48%	6	100%	1	0%	2	87%	1	100%	4	42%	2	55%
		Chinook Savings	843	52%	0	0%	0	0%	116	68%	8	100%	16	100%	702	49%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	76%	9	100%	1	1%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

39. Option 1 – PSC limit of 7,500 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Forgone Harvest	15	48%	6	100%	4	24%	4	49%	1	78%	2	22%	6	36%
		Chinook Savings	691	33%	0	0%	72	33%	0	0%	1	100%	0	0%	617	33%
2004	14	Forgone Harvest	15	69%	8	100%	4	11%	2	100%	1	100%	4	37%	3	58%
		Chinook Savings	483	26%	0	0%	92	97%	127	100%	4	100%	128	9%	133	48%
2005	14	Forgone Harvest	11	40%	6	100%	1	0%	2	87%	1	100%	3	6%	2	7%
		Chinook Savings	140	9%	0	0%	0	0%	116	68%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

40. Option 2 - PSC limit of 7,500 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Forgone Harvest	19	67%	9	100%	4	97%	5	28%	1	56%	2	31%	12	56%
		Chinook Savings	1,753	28%	0	100%	161	100%	66	2%	1	100%	10	91%	1,515	46%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	28	Forgone Harvest	7	59%	5	72%	0	0%	2	37%	1	100%	2	45%	1	31%
		Chinook Savings	1,002	22%	433	80%	0	0%	152	7%	55	100%	361	73%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

41. Option 2 - PSC limit of 7,500 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Forgone Harvest	19	67%	9	100%	6	97%	5	28%	2	56%	3	31%	12	56%
		Chinook Savings	1,753	28%	0	100%	161	100%	66	2%	1	100%	10	91%	1,515	46%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	29	Forgone Harvest	6	36%	4	35%	0	0%	2	36%	1	100%	2	45%	1	31%
		Chinook Savings	559	12%	0	0%	0	0%	142	6%	55	100%	361	73%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

42. Option 2 - PSC limit of 7,500 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	29	Forgone Harvest	41	30%	17	29%	34	31%	0	0%	16	33%	0	0%	2	81%
		Chinook Savings	553	12%	0	0%	448	15%	0	0%	90	79%	0	0%	14	16%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	44	Forgone Harvest	12	6%	1	4%	0	0%	0	0%	6	3%	0	0%	6	18%
		Chinook Savings	796	16%	0	0%	0	0%	0	0%	5	1%	0	0%	792	30%
2011	45	Forgone Harvest	6	2%	1	2%	0	0%	0	0%	1	1%	0	0%	3	3%
		Chinook Savings	37	1%	0	0%	0	0%	0	0%	37	45%	0	0%	0	0%

43. Option 2 - PSC limit of 7,500 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	28	Forgone Harvest	41	40%	20	55%	35	31%	1	0%	16	33%	0	0%	2	81%
		Chinook Savings	730	16%	177	22%	448	15%	0	0%	90	79%	0	0%	14	16%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	43	Forgone Harvest	18	11%	4	11%	0	0%	0	0%	8	12%	0	0%	10	25%
		Chinook Savings	1,340	26%	0	0%	0	0%	0	0%	217	23%	0	0%	1,122	42%
2011	42	Forgone Harvest	16	5%	4	7%	3	1%	0	0%	4	6%	1	0%	10	7%
		Chinook Savings	190	5%	0	0%	6	1%	0	0%	77	93%	0	0%	107	5%

44. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Forgone Harvest	14	74%	6	100%	2	100%	1	24%	1	0%	1	81%	11	72%
		Chinook Savings	1,062	25%	0	100%	89	100%	66	2%	0	0%	10	91%	897	63%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	48	Forgone Harvest	2	2%	0	0%	0	0%	1	7%	0	0%	2	7%	0	0%
		Chinook Savings	233	7%	0	0%	0	0%	61	3%	0	0%	172	49%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

45. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	20	Forgone Harvest	14	74%	6	100%	2	100%	1	24%	1	0%	1	81%	11	72%
		Chinook Savings	1,062	25%	0	100%	89	100%	66	2%	0	0%	10	91%	897	63%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	38	Forgone Harvest	3	19%	1	6%	0	0%	2	21%	1	100%	2	37%	1	34%
		Chinook Savings	404	12%	0	0%	0	0%	64	3%	55	100%	285	82%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

46. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	29	Forgone Harvest	40	31%	17	29%	34	34%	1	0%	16	33%	0	0%	2	81%
		Chinook Savings	553	12%	0	0%	448	16%	0	0%	90	79%	0	0%	14	16%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	44	Forgone Harvest	12	6%	1	4%	0	0%	0	0%	6	3%	0	0%	6	18%
		Chinook Savings	796	16%	0	0%	0	0%	0	0%	5	1%	0	0%	792	30%
2011		Forgone Harvest														
		Chinook Savings														

47. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	28	Forgone Harvest	40	41%	20	55%	34	34%	1	0%	16	33%	0	0%	2	81%
		Chinook Savings	730	16%	177	22%	448	16%	0	0%	90	79%	0	0%	14	16%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	38	Forgone Harvest	26	16%	8	19%	3	1%	0	0%	19	30%	0	0%	13	26%
		Chinook Savings	1,736	34%	2	0%	25	6%	0	0%	587	61%	0	0%	1,122	42%
2011	42	Forgone Harvest	16	5%	4	7%	3	1%	0	0%	4	6%	1	0%	10	7%
		Chinook Savings	190	5%	0	0%	6	1%	0	0%	77	93%	0	0%	107	5%

48. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	15	77%	6	100%	3	93%	7	59%	1	100%	2	27%	8	72%
		Chinook Savings	1,018	51%	0	0%	72	100%	27	100%	1	100%	0	0%	917	49%
2004	13	Forgone Harvest	14	91%	8	100%	4	67%	2	100%	1	100%	4	69%	3	58%
		Chinook Savings	1,120	61%	0	0%	92	100%	127	100%	2	100%	766	57%	133	48%
2005	13	Forgone Harvest	12	83%	6	100%	1	100%	2	87%	2	100%	4	42%	2	54%
		Chinook Savings	785	50%	0	0%	0	0%	116	68%	8	100%	16	100%	644	47%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	94%	9	100%	1	100%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

49. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	19	Forgone Harvest	15	62%	6	100%	3	93%	6	55%	1	100%	2	24%	8	47%
		Chinook Savings	882	45%	0	0%	72	100%	27	100%	1	100%	0	0%	781	42%
2004	14	Forgone Harvest	14	86%	8	100%	4	67%	2	100%	1	100%	3	33%	3	58%
		Chinook Savings	466	25%	0	0%	92	100%	127	100%	2	100%	113	8%	133	48%
2005	14	Forgone Harvest	11	70%	6	100%	1	100%	2	87%	1	100%	3	6%	2	7%
		Chinook Savings	140	9%	0	0%	0	0%	116	68%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	28	Forgone Harvest	10	51%	9	52%	0	0%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	261	20%	185	63%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

50. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	8	Forgone Harvest	3	27%	0	0%	2	24%	0	0%	1	100%	1	100%	0	0%
		Chinook Savings	26	18%	0	0%	26	18%	0	0%	0	0%	0	0%	0	0%
2004		Forgone Harvest														
		Chinook Savings														
2005	14	Forgone Harvest	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2006	6	Forgone Harvest	25	85%	0	0%	25	85%	0	0%	1	100%	0	0%	0	0%
		Chinook Savings	83	41%	0	0%	83	41%	0	0%	0	0%	0	0%	0	0%
2007		Forgone Harvest														
		Chinook Savings														
2008	10	Forgone Harvest	1	6%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011	8	Forgone Harvest	1	10%	0	0%	1	10%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	24	25%	0	0%	24	25%	0	0%	0	0%	0	0%	0	0%

51. Options 1 & 2 - PSC limit of 7,500 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

5,000 Chinook salmon PSC limit

52. Gulf-wide PSC limit of 5,000 Chinook salmon

	Week of Simulated Closure	Impact	GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	17	Harvest	66	76%	36	100%	41	35%	10	64%	23	78%	9	50%	19	89%
		Chinook Savings	5,851	54%	801	100%	609	19%	1,543	55%	116	100%	10	2%	2,773	82%
2004		Harvest														
		Chinook Savings														
2005		Harvest														
		Chinook Savings														
2006		Harvest														
		Chinook Savings														
2007	41	Harvest	14	5%	7	4%	1	3%	1	1%	11	16%	0	0%	4	3%
		Chinook Savings	179	3%	23	1%	0	0%	21	3%	60	14%	0	0%	75	5%
2008	42	Harvest	25	7%	2	2%	1	0%	0	0%	19	31%	0	0%	6	6%
		Chinook Savings	86	2%	49	3%	0	0%	0	0%	36	17%	0	0%	0	0%
2009	50	Harvest	4	0%	0	0%	0	0%	1	2%	2	1%	0	0%	0	0%
		Chinook Savings	72	1%	0	0%	0	0%	72	4%	0	0%	0	0%	0	0%
2010	18	Harvest	50	65%	41	100%	32	43%	2	36%	23	93%	6	52%	17	33%
		Chinook Savings	4,569	47%	1,510	100%	435	100%	152	7%	971	96%	379	76%	1,122	28%
2011	25	Harvest	51	59%	28	77%	35	39%	2	24%	14	60%	4	32%	31	59%
		Chinook Savings	1,791	26%	613	62%	784	58%	0	0%	82	100%	0	0%	313	10%

53. Option 1 – PSC limit of 5,000 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	17	Forgone Harvest	60	75%	33	100%	37	37%	8	62%	22	78%	6	57%	16	87%
		Chinook Savings	4,087	47%	801	100%	537	18%	1,516	54%	114	100%	10	2%	1,110	74%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007	41	Forgone Harvest	14	7%	7	7%	1	5%	1	1%	11	16%	0	0%	4	3%
		Chinook Savings	179	4%	23	1%	0	0%	21	3%	60	14%	0	0%	75	5%
2008	31	Forgone Harvest	35	35%	8	10%	30	40%	4	24%	22	56%	2	5%	22	39%
		Chinook Savings	225	5%	0	0%	17	5%	0	0%	208	100%	0	0%	0	0%
2009	46	Forgone Harvest	9	2%	2	1%	0	0%	2	6%	7	2%	4	19%	1	0%
		Chinook Savings	257	5%	0	0%	0	0%	174	9%	84	5%	0	0%	0	0%
2010	22	Forgone Harvest	42	56%	29	86%	32	48%	2	35%	22	80%	3	32%	17	31%
		Chinook Savings	3,482	41%	810	67%	435	100%	152	7%	677	67%	285	81%	1,122	36%
2011	23	Forgone Harvest	43	60%	22	74%	35	48%	2	21%	14	63%	5	47%	30	61%
		Chinook Savings	1,630	26%	451	60%	784	78%	0	0%	82	100%	0	0%	312	10%

54. Option 1 – PSC limit of 5,000 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Central GOA**

	Week of Simulated Closure	Impact	Central GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	17	Forgone Harvest	60	75%	39	100%	38	37%	8	62%	22	78%	6	57%	16	87%
		Chinook Savings	4,087	47%	801	100%	537	18%	1,516	54%	114	100%	10	2%	1,110	74%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007	39	Forgone Harvest	27	11%	10	7%	9	7%	1	7%	19	23%	0	0%	8	8%
		Chinook Savings	542	11%	23	1%	1	0%	146	22%	185	42%	0	0%	186	13%
2008	27	Forgone Harvest	39	51%	19	61%	30	41%	4	44%	25	71%	3	5%	22	42%
		Chinook Savings	588	12%	363	19%	17	5%	0	0%	208	100%	0	0%	0	0%
2009	45	Forgone Harvest	10	3%	2	2%	0	0%	2	7%	7	5%	4	19%	1	0%
		Chinook Savings	418	8%	0	0%	0	0%	241	13%	177	10%	0	0%	0	0%
2010	18	Forgone Harvest	43	64%	34	100%	32	48%	2	36%	23	93%	6	49%	17	34%
		Chinook Savings	4,201	50%	1,217	100%	435	100%	152	7%	971	96%	303	86%	1,122	36%
2011	18	Forgone Harvest	43	69%	29	100%	35	49%	2	21%	15	90%	6	78%	30	61%
		Chinook Savings	1,954	31%	755	100%	784	78%	0	0%	82	100%	19	93%	313	10%

55. Option 1 – PSC limit of 5,000 Chinook salmon apportioned by regulatory area, according to a 5-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	16	68%	6	100%	3	24%	7	59%	1	78%	2	24%	8	72%
		Chinook Savings	1,018	48%	0	0%	72	33%	27	100%	1	100%	0	0%	917	49%
2004	13	Forgone Harvest	16	73%	8	100%	3	11%	2	100%	1	100%	6	71%	2	58%
		Chinook Savings	1,137	61%	0	0%	92	97%	127	100%	4	100%	781	58%	133	48%
2005	13	Forgone Harvest	12	48%	6	100%	1	0%	2	87%	1	100%	4	42%	2	55%
		Chinook Savings	843	52%	0	0%	0	0%	116	68%	8	100%	16	100%	702	49%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	76%	9	100%	1	1%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011	29	Forgone Harvest	3	4%	2	0%	0	0%	1	96%	0	0%	1	36%	1	15%
		Chinook Savings	53	9%	52	23%	0	0%	0	0%	0	0%	0	0%	1	100%

56. Option 1 – PSC limit of 5,000 Chinook salmon apportioned by regulatory area, according to a 10-year historical Chinook salmon PSC record – **Western GOA**

	Week of Simulated Closure	Impact	Western GOA Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	16	68%	6	100%	4	24%	7	59%	1	78%	2	24%	8	72%
		Chinook Savings	1,019	48%	0	0%	72	33%	27	100%	1	100%	0	0%	917	49%
2004	14	Forgone Harvest	15	69%	8	100%	4	11%	2	100%	1	100%	4	37%	3	58%
		Chinook Savings	483	26%	0	0%	92	97%	127	100%	4	100%	128	9%	133	48%
2005	14	Forgone Harvest	11	40%	6	100%	1	0%	2	87%	1	100%	3	6%	2	7%
		Chinook Savings	140	9%	0	0%	0	0%	116	68%	8	100%	16	100%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	76%	9	100%	1	1%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

57. Option 2 - PSC limit of 5,000 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	20	80%	9	100%	4	97%	8	58%	1	56%	3	33%	14	74%
		Chinook Savings	2,994	48%	0	100%	161	100%	949	34%	1	100%	10	91%	1,873	57%
2004		Forgone Harvest														
		Chinook Savings														
2005	29	Forgone Harvest	13	58%	7	69%	4	100%	2	15%	2	61%	0	0%	6	54%
		Chinook Savings	79	3%	79	22%	0	0%	0	0%	0	0%	0	0%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007	38	Forgone Harvest	2	7%	1	0%	0	0%	1	13%	0	0%	0	0%	2	21%
		Chinook Savings	394	13%	0	0%	0	0%	275	38%	0	0%	0	0%	120	22%
2008	30	Forgone Harvest	5	24%	3	22%	1	20%	2	27%	0	0%	0	0%	3	29%
		Chinook Savings	50	2%	49	15%	0	6%	0	0%	0	0%	0	0%	0	0%
2009		Forgone Harvest														
		Chinook Savings														
2010	17	Forgone Harvest	17	83%	12	100%	1	100%	3	44%	1	100%	2	63%	1	58%
		Chinook Savings	2,046	44%	543	100%	0	0%	233	10%	55	100%	374	76%	840	66%
2011	29	Forgone Harvest	7	52%	4	36%	0	0%	2	27%	1	41%	2	41%	4	74%
		Chinook Savings	462	16%	261	43%	0	0%	0	0%	0	0%	0	0%	201	27%

58. Option 2 - PSC limit of 5,000 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher/Processors**

	Week of Simulated Closure	Impact	GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	20	80%	9	100%	6	97%	8	58%	2	56%	3	33%	14	74%
		Chinook Savings	2,994	48%	0	100%	161	100%	949	34%	1	100%	10	91%	1,873	57%
2004		Forgone Harvest														
		Chinook Savings														
2005	29	Forgone Harvest	13	58%	7	69%	4	100%	2	15%	2	61%	0	0%	6	54%
		Chinook Savings	79	3%	79	22%	0	0%	0	0%	0	0%	0	0%	0	0%
2006		Forgone Harvest														
		Chinook Savings														
2007	38	Forgone Harvest	2	7%	1	0%	0	0%	1	13%	0	0%	0	0%	2	21%
		Chinook Savings	394	13%	0	0%	0	0%	275	38%	0	0%	0	0%	120	22%
2008	30	Forgone Harvest	5	24%	3	22%	2	20%	2	27%	0	0%	0	0%	3	29%
		Chinook Savings	50	2%	49	15%	0	6%	0	0%	0	0%	0	0%	0	0%
2009		Forgone Harvest														
		Chinook Savings														
2010	17	Forgone Harvest	17	83%	12	100%	1	100%	3	44%	1	100%	2	63%	1	58%
		Chinook Savings	2,046	44%	543	100%	0	0%	233	10%	55	100%	374	76%	840	66%
2011	31	Forgone Harvest	4	37%	2	7%	0	0%	0	0%	1	41%	2	41%	4	74%
		Chinook Savings	253	9%	52	9%	0	0%	0	0%	0	0%	0	0%	201	27%

59. Option 2 - PSC limit of 5,000 Chinook salmon apportioned by operational type, according to a 5-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	9	Forgone Harvest	49	72%	33	100%	36	31%	1	25%	27	99%	13	98%	5	99%
		Chinook Savings	1,986	43%	800	100%	448	15%	0	0%	114	100%	566	96%	58	67%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009	45	Forgone Harvest	9	2%	2	3%	0	0%	1	20%	7	5%	3	17%	1	0%
		Chinook Savings	208	7%	0	0%	0	0%	31	20%	177	10%	0	0%	0	0%
2010	24	Forgone Harvest	32	47%	20	64%	32	41%	0	0%	21	74%	1	26%	16	30%
		Chinook Savings	2,207	44%	30	3%	435	100%	0	0%	620	65%	0	0%	1,122	42%
2011	20	Forgone Harvest	36	56%	22	92%	35	41%	0	0%	14	74%	4	39%	26	48%
		Chinook Savings	1,289	33%	308	82%	784	71%	0	0%	82	100%	3	64%	113	5%

60. Option 2 - PSC limit of 5,000 Chinook salmon apportioned by operational type, according to a 10-year historical Chinook salmon PSC record – **Catcher Vessels**

	Week of Simulated Closure	Impact	GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	8	Forgone Harvest	49	72%	33	100%	37	33%	2	100%	27	99%	14	98%	6	99%
		Chinook Savings	2,019	44%	800	100%	474	16%	7	100%	114	100%	566	96%	58	67%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008	42	Forgone Harvest	48	9%	4	4%	0	0%	0	0%	19	31%	1	0%	5	7%
		Chinook Savings	36	1%	0	0%	0	0%	0	0%	36	17%	0	0%	0	0%
2009	45	Forgone Harvest	9	2%	2	3%	0	0%	1	20%	7	5%	3	17%	1	0%
		Chinook Savings	208	7%	0	0%	0	0%	31	20%	177	10%	0	0%	0	0%
2010	24	Forgone Harvest	32	47%	20	64%	32	41%	0	0%	21	74%	2	26%	16	30%
		Chinook Savings	2,207	44%	30	3%	435	100%	0	0%	620	65%	0	0%	1,122	42%
2011	18	Forgone Harvest	36	58%	24	100%	35	41%	0	0%	14	88%	5	39%	26	48%
		Chinook Savings	1,355	35%	374	100%	784	71%	0	0%	82	100%	3	64%	113	5%

61. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	14	81%	6	100%	2	100%	5	58%	1	0%	1	81%	11	75%
		Chinook Savings	1,976	46%	0	100%	89	100%	922	33%	0	0%	10	91%	956	68%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007	37	Forgone Harvest	3	25%	0	0%	0	0%	1	19%	0	0%	0	0%	3	58%
		Chinook Savings	574	21%	0	0%	0	0%	371	55%	0	0%	0	0%	203	41%
2008	17	Forgone Harvest	9	66%	4	100%	0	0%	2	43%	0	0%	1	68%	3	40%
		Chinook Savings	280	11%	280	100%	0	0%	0	0%	0	0%	0	0%	0	0%
2009	47	Forgone Harvest	1	3%	0	0%	0	0%	1	3%	0	0%	1	19%	0	0%
		Chinook Savings	88	4%	0	0%	0	0%	88	5%	0	0%	0	0%	0	0%
2010	17	Forgone Harvest	10	75%	7	100%	0	0%	3	44%	1	100%	2	61%	1	52%
		Chinook Savings	837	25%	251	100%	0	0%	233	10%	55	100%	298	86%	0	0%
2011	31	Forgone Harvest	3	48%	2	12%	0	0%	0	0%	1	41%	1	43%	3	79%
		Chinook Savings	200	8%	0	0%	0	0%	0	0%	0	0%	0	0%	200	27%

62. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CP**

	Week of Simulated Closure	Impact	Central GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	14	81%	6	100%	2	100%	5	58%	1	0%	1	81%	11	75%
		Chinook Savings	1,976	46%	0	100%	89	100%	922	33%	0	0%	10	91%	956	68%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007	29	Forgone Harvest	8	54%	2	29%	0	0%	1	37%	0	0%	0	0%	7	97%
		Chinook Savings	671	25%	0	0%	0	0%	403	60%	0	0%	0	0%	268	54%
2008	16	Forgone Harvest	9	76%	4	100%	0	0%	2	46%	0	0%	2	100%	3	61%
		Chinook Savings	489	20%	280	100%	0	0%	0	0%	0	0%	0	0%	209	10%
2009	42	Forgone Harvest	2	10%	1	0%	1	19%	1	8%	0	0%	1	72%	0	0%
		Chinook Savings	235	11%	0	0%	0	0%	235	13%	0	0%	0	0%	0	0%
2010	17	Forgone Harvest	10	75%	7	100%	0	0%	3	44%	1	100%	2	61%	1	52%
		Chinook Savings	837	25%	251	100%	0	0%	233	10%	55	100%	298	86%	0	0%
2011	28	Forgone Harvest	7	73%	5	76%	0	0%	2	23%	1	41%	1	43%	3	81%
		Chinook Savings	409	17%	209	55%	0	0%	0	0%	0	0%	0	0%	200	27%

63. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	11	Forgone Harvest	46	72%	33	100%	35	34%	1	0%	25	96%	12	83%	6	99%
		Chinook Savings	1,540	35%	800	100%	448	16%	0	0%	114	100%	119	20%	58	67%
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009	45	Forgone Harvest	9	3%	2	3%	0	0%	1	20%	7	5%	3	17%	1	0%
		Chinook Savings	208	7%	0	0%	0	0%	31	20%	177	10%	0	0%	0	0%
2010	24	Forgone Harvest	32	49%	20	64%	32	46%	0	0%	21	74%	2	26%	16	30%
		Chinook Savings	2,207	44%	30	3%	435	100%	0	0%	620	65%	0	0%	1,122	42%
2011	21	Forgone Harvest	36	56%	20	78%	35	49%	0	0%	14	73%	4	39%	26	48%
		Chinook Savings	1,190	31%	209	56%	784	78%	0	0%	82	100%	3	64%	113	5%

64. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Central GOA CV**

	Week of Simulated Closure	Impact	Central GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	7	Forgone Harvest	46	75%	33	100%	35	35%	2	100%	26	100%	13	100%	6	100%
		Chinook Savings	2,090	47%	800	100%	495	17%	7	100%	114	100%	588	100%	86	100%
2004	38	Forgone Harvest	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007	42	Forgone Harvest	12	6%	6	7%	1	0%	0	0%	11	14%	0	0%	3	3%
		Chinook Savings	95	4%	21	4%	0	0%	0	0%	17	4%	0	0%	57	6%
2008	41	Forgone Harvest	24	11%	4	4%	0	0%	0	0%	21	35%	1	2%	6	7%
		Chinook Savings	154	6%	0	0%	0	0%	0	0%	154	74%	0	0%	0	0%
2009	45	Forgone Harvest	9	3%	2	3%	0	0%	1	20%	7	5%	3	17%	1	0%
		Chinook Savings	208	7%	0	0%	0	0%	31	20%	177	10%	0	0%	0	0%
2010	22	Forgone Harvest	32	52%	21	75%	32	48%	0	0%	21	79%	2	26%	16	30%
		Chinook Savings	2,739	54%	559	58%	435	100%	0	0%	622	65%	0	0%	1,122	42%
2011	18	Forgone Harvest	36	61%	24	100%	35	49%	0	0%	14	88%	5	39%	26	48%
		Chinook Savings	1,355	35%	374	100%	784	78%	0	0%	82	100%	3	64%	113	5%

65. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	18	Forgone Harvest	15	77%	6	100%	3	93%	7	59%	1	100%	2	27%	8	72%
		Chinook Savings	1,018	51%	0	0%	72	100%	27	100%	1	100%	0	0%	917	49%
2004	13	Forgone Harvest	14	91%	8	100%	4	67%	2	100%	1	100%	4	69%	3	58%
		Chinook Savings	1,120	61%	0	0%	92	100%	127	100%	2	100%	766	57%	133	48%
2005	13	Forgone Harvest	12	83%	6	100%	1	100%	2	87%	2	100%	4	42%	2	54%
		Chinook Savings	785	50%	0	0%	0	0%	116	68%	8	100%	16	100%	644	47%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	94%	9	100%	1	100%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011	29	Forgone Harvest	4	5%	2	0%	0	0%	1	96%	0	0%	1	36%	2	15%
		Chinook Savings	53	11%	52	23%	0	0%	0	0%	0	0%	0	0%	1	100%

66. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CP**

	Week of Simulated Closure	Impact	Western GOA CP Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	17	Forgone Harvest	15	90%	6	100%	3	93%	7	71%	1	100%	3	27%	8	92%
		Chinook Savings	1,764	89%	0	0%	72	100%	27	100%	1	100%	0	0%	1,663	89%
2004	13	Forgone Harvest	14	91%	8	100%	3	67%	2	100%	1	100%	4	69%	3	58%
		Chinook Savings	1,120	61%	0	0%	92	100%	127	100%	2	100%	766	57%	133	48%
2005	13	Forgone Harvest	12	83%	6	100%	1	100%	2	87%	1	100%	4	42%	2	54%
		Chinook Savings	785	50%	0	0%	0	0%	116	68%	8	100%	16	100%	644	47%
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010	18	Forgone Harvest	12	94%	9	100%	1	100%	1	77%	0	0%	1	71%	0	0%
		Chinook Savings	368	29%	292	100%	0	0%	0	0%	0	0%	76	53%	0	0%
2011		Forgone Harvest														
		Chinook Savings														

67. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 5-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003	8	Forgone Harvest	3	27%	0	0%	2	24%	0	0%	1	100%	1	100%	0	0%
		Chinook Savings	26	18%	0	0%	26	18%	0	0%	0	0%	0	0%	0	0%
2004		Forgone Harvest														
		Chinook Savings														
2005	14	Forgone Harvest	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2006	6	Forgone Harvest	25	85%	0	0%	25	85%	0	0%	1	100%	0	0%	0	0%
		Chinook Savings	83	41%	0	0%	83	41%	0	0%	0	0%	0	0%	0	0%
2007		Forgone Harvest														
		Chinook Savings														
2008	10	Forgone Harvest	1	6%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011	8	Forgone Harvest	1	10%	0	0%	1	10%	0	0%	0	0%	0	0%	0	0%
		Chinook Savings	24	25%	0	0%	24	25%	0	0%	0	0%	0	0%	0	0%

68. Options 1 & 2 - PSC limit of 5,000 Chinook salmon apportioned by regulatory area and operational type, according to a 10-year historical Chinook salmon PSC record – **Western GOA CV**

	Week of Simulated Closure	Impact	Western GOA CV Total		Harvest and Chinook salmon PSC impacts by species											
					Rockfish		Pacific Cod		Rex Sole		Shallow Water		Flathead Sole		Arrowtooth	
			# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved	# Vessels affected, PSC avoided	% mt lost, PSC Saved
2003		Forgone Harvest														
		Chinook Savings														
2004		Forgone Harvest														
		Chinook Savings														
2005		Forgone Harvest														
		Chinook Savings														
2006		Forgone Harvest														
		Chinook Savings														
2007		Forgone Harvest														
		Chinook Savings														
2008		Forgone Harvest														
		Chinook Savings														
2009		Forgone Harvest														
		Chinook Savings														
2010		Forgone Harvest														
		Chinook Savings														
2011		Forgone Harvest														
		Chinook Savings														

Appendix 2 Chinook salmon escapement goals and 2003 through 2011 escapement levels, by region and system

Excerpted from Munro and Volk 2012.

Table 1.–Southeast Region Chinook salmon escapement goals and escapements, 2003 to 2011[a].

	2011 Goal Range			Year	Escapement								
System	Lower	Upper	Type	Implemented	2003	2004	2005	2006	2007	2008	2009	2010	2011
Blossom River	250	500	BEG	1997	203	333	445	339	135	257	123	180	147
Keta River	250	500	BEG	1997	322	376	497	747	311	363	172	475	223
Unuk River	1,800	3,800	BEG	2009	5,546	3,963	4,742	5,645	5,668	3,104	3,157[b]	4,854[b]	3,272[b]
Chickamin River	450	900	BEG	1997	964	798	924	1,330	893	1,111	611	1,156	853
Andrew Creek	650	1,500	BEG	1998	1,160	2,991	1,979	2,124	1,736	981	628	1,205	936
Stikine River	14,000	28,000	BEG	2000	46,824	48,900	40,501	24,405	14,560	18,352	11,086[b]	15,180[b]	14,569[b]
King Salmon River	120	240	BEG	1997	119	135	143	150	181	120	109	158	192
Taku River	19,000	36,000	BEG	2009	36,435	75,032	38,725	42,296	14,854	27,383	20,762 [b]	29,307[b]	27,523[b]
Chilkat River	1,850	3,600	Inriver[c]		5,657	3,422	3,366	3,039	1,445	2,905	4,429 [b]	1,815[b]	2,803[b]
	1,750	3,500	BEG	2003									
Klukshu (Alsek) River	1,100	2,300	BEG	1998	1,661	2,455	1,034	568	676	466	1,466	2,159	1,667[b]
Situk River	450	1,050	BEG	2003	2,163	698	595	695	677	413	902	167[d]	240

Note: NA = data not available.

[a] Goals are for large (≥660 mm MEF, or fish age 1.3 and older) Chinook salmon, except the Alsek River goal, which is germane to fish age 1.2 and older and can include fish <660 mm MEF.

[b] Preliminary data.

[c] Inriver goal accounts for inriver subsistence harvest, which averages <100 fish.

[d] Incomplete weir count due to inseason problems with weir (e.g., breach of weir).

Table 2.–Central Region (Bristol Bay, Cook Inlet, and Prince William Sound/Copper River) Chinook salmon escapement goals and escapements, 2003 to 2011.

	2011 Goal Range			Year	Escapement								
System	Lower	Upper	Type	Implemented	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bristol Bay													
Nushagak River	40,000	80,000	SEG	2007	72,420	107,591	163,506	117,364	50,960	91,653	73,379	56,134	59,728
Togiak River	9,300		lower-bound SEG	2007	NS	NS	NS	NS	NS	NS	NS	NS[a]	NS
Naknek River	5,000		lower-bound SEG	2007	6,081	12,878	NS	NS	5,498	6,559	3,305[b]	NS[a]	NS
Alagnak River	2,700		lower-bound SEG	2007	8,209	6,755	5,084	4,278	3,455	1,825	1,957	NS[a]	NS
Egegik River	450		lower-bound SEG	2007	790	579	335	196	458	162	350[c]	NS[a]	NS
Upper Cook Inlet													
Alexander Creek	2,100	6,000	SEG	2002	2,012	2,215	2,140	885	480	150	275	177	343
Campbell Creek	380		lower-bound SEG	2011	747	964	1,097	1,052	588	439	554	290	260
Chuitna River	1,200	2,900	SEG	2002	2,339	2,938	1,307	1,911	1,180	586	1,040	735	719
Chulitna River	1,800	5,100	SEG	2002	NS	2,162	2,838	2,862	5,166	2,514	2,093	1,052	1,875
Clear (Chunilna) Creek	950	3,400	SEG	2002	NS	3,417	1,924	1,520	3,310	1,795	1,205	903	512
Crooked Creek	650	1,700	SEG	2002	2,554	2,196	1,903	1,516	964	881	617	\1,088	654
Deshka River	13,000	28,000	SEG	2011	39,257	57,934	37,725	31,150	18,714	7,533	11,967	18,594	19,026
Goose Creek	250	650	SEG	2002	175	417	468	306	105	117	65	76	80
Kenai River Early Run	5,300	9,000	OEG	2005	10,097	11,855	16,387	18,428	12,504	11,732	9,771	NA[d]	NA[e]
	4,000	9,000	SEG	2011									
Kenai River Late Run	17,800	35,700	SEG	2011	23,736	40,198	26,046	24,423	32,618	24,144	17,158	NA[d]	NA[e]
Lake Creek	2,500	7,100	SEG	2002	8,153	7,598	6,345	5,300	4,081	2,004	1,394	1,617	2,563
Lewis River	250	800	SEG	2002	878	1,000	441	341	0[f]	120	111	56	92
Little Susitna River	900	1,800	SEG	2002	1,114	1,694	2,095	1,855	1,731	1,297	1,028	589	887
Little Willow Creek	450	1,800	SEG	2002	879	2,227	1,784	816	1,103	NC	776	468	713
Montana Creek	1,100	3,100	SEG	2002	2,576	2,117	2,600	1,850	1,936	1,357	1,460	755	494
Peters Creek	1,000	2,600	SEG	2002	3,998	3,757	1,508	1,114	1,225	NC	1,283	NC	1,103
Prairie Creek	3,100	9,200	SEG	2002	4,095	5,570	3,862	3,570	5,036	3,039	3,500	3,022	2,038
Sheep Creek	600	1,200	SEG	2002	NS	285	760	580	400	NC	500	NC	350
Talachulitna River	2,200	5,000	SEG	2002	9,573	8,352	4,406	6,152	3,871	2,964	2,608	1,499	1,368
Theodore River	500	1,700	SEG	2002	1,059	491	478	958	486	345	352	202	327
Willow Creek	1,600	2,800	SEG	2002	3,855	2,840	2,411	2,193	1,373	1,255	1,133	1,173	1,061
Lower Cook Inlet													
Anchor River	3,800	10,000	SEG	2011	9,238	12,016	11,156	8,945	9,622	5,806	3,455	4,449	3,547[g]
Deep Creek	350	800	SEG	2002	1,008	1,075	1,076	507	553	205	483	387	696
Ninilchik River	550	1,300	SEG	2008	517	679	1,259	1,013	543	586	528	605	668[g]
Prince William Sound													
Copper River	24,000		lower-bound SEG	2003	34,034	30,628	21,528	58,454	34,565	32,487	27,787	16,771	27.000[h]

[a] Aerial surveys for Chinook salmon were not flown in 2010 due to poor weather conditions and high water levels.

[b] In 2009, aerial surveys were only flown on Big Creek (2,834 Chinook salmon) and King Salmon River (471 Chinook salmon). Mainstem Naknek River and Paul's Creek were not surveyed in 2009.

[c] Aerial surveys were conducted in the Egegik and King Salmon River systems on August 5, 2009 to provide escapement indices for Chinook and chum salmon. Resulting counts were 350 Chinook, and 277 chum salmon. Water conditions were poor; high and turbid conditions prevented observation on most of the surveyed systems. Chinook escapement indices were well below average in streams surveyed, but should be considered minimum counts due to the poor water conditions. Based on carcass distribution and observed presence, the survey was likely conducted after peak spawning.

[d] TS-based escapement estimate deemed unreliable.

[e] TS-based escapement estimate not available.

[f] Lewis River diverged into swamp 1/2 mi. below bridge. No water in channel.

[g] Preliminary escapement estimates.

[h] The Copper River Chinook salmon spawning escapement estimate is preliminary. The estimate is generated from a mark-recapture project run by the Native Village of Eyak and LGL Consulting. The spawning escapement estimate is generated by subtracting the upper Copper River state and federal subsistence, state personal use, and sport fishery harvest estimates from the mark-recapture estimate of the inriver abundance. The estimates for the federal and state subsistence and the state personal use fishery harvests are generally not available for ~6 months after the fishery is closed. Additionally, the sport fishery harvest estimate is based on the mail-out survey and is generally available ~12 months after the fishery ends.

Table 3.–Arctic-Yukon-Kuskokwim Region Chinook salmon escapement goals and escapements, 2003 to 2011.

System	2011 Goal Range		Type	Year Imple-mented	Escapement								
	Lower	Upper			2003	2004	2005	2006	2007	2008	2009	2010	2011
Kuskokwim Area													
North (Main) Fork Goodnews River	640	3,300	SEG	2005	3,935	7,462	NS	4,159	NS	2,155	NS	NS	853
Middle Fork Goodnews River	1,500	2,900	BEG	2007	2,389	4,388	4,633	4,559	3,852	2,161	1,630	2,244	1,861
Kanektok River	3,500	8,000	SEG	2005	6,206	28,375	14,202	8,433	NS	3,659	NS	1,228	NS
Kogrukluk River	5,300	14,000	SEG	2005	11,771	19,651	22,000	19,414	13,029	9,730	9,702	5,690	6,891
Kwethluk River	6,000	11,000	SEG	2007	14,474	28,604	NA	17,618	12,927	5,275	5,744	1,669	4,076
Tuluksak River	1,000	2,100	SEG	2007	1,064	1,475	2,653	1,043	374	701	362	201	286
George River	3,100	7,900	SEG	2007	4,693	5,207	3,845	4,357	4,883	2,698	3,663	1,500	1,571
Kisaralik River	400	1,200	SEG	2005	654	5,157	2,206	4,734	692	1,074	NS	235	NS
Aniak River	1,200	2,300	SEG	2005	3,514	5,362	NS	5,639	3,984	3,222	NS	NS	NS
Salmon River (Aniak R)	330	1,200	SEG	2005	1,292	2,177	4,097	NS	1,458	589	NS	NS	79
Holitna River	970	2,100	SEG	2005	NS	4,051	1,760	1,866	NS	NS	NS	587	NS
Cheeneetnuk River (Stony R)	340	1,300	SEG	2005	810	918	1,155	1,015	NS	290	323	NS	249
Gagaryah River (Stony R)	300	830	SEG	2005	1,095	670	788	531	1,035	177	303	62	96
Salmon River (Pitka Fork)	470	1,600	SEG	2005	1,241	1,138	1,801	862	943	1,305	632	135	767
Yukon River													
East Fork Andreafsky River	2,100	4,900	SEG	2010	4,336	8,045	2,239	6,463	4,504	4,242	3,004	2,413	5,213
West Fork Andreafsky River	640	1,600	SEG	2005	1,578	1,317	1,492	824	976	262	1,678	858	1,173
Anvik River	1,100	1,700	SEG	2005	1,100	3,679	2,421	1,876	1,529	992	832	974	642
Nulato River	940	1,900	SEG	2005	NS	1,321	553	1,292	2,583	922	2,260	711	1,401
Gisasa River	420	1,100	SEG	2005	NS	731	958	843	593	487	515	264	906
Chena River	2,800	5,700	BEG	2001	11,100	9,696	4,075	2,936	3,806	3,208	5,253	2,382	
Salcha River	3,300	6,500	BEG	2001	15,500	15,761	5,988	10,679	6,425	5,415	12,774	6,135	3,537
Canada Mainstem	45,000		Agreement[a]	Annual	80,594	48,469	67,985	62,630	34,904	33,883	65,278	32,010	46,844
Norton Sound													
Fish River/Boston Creek	100		lower-bound SEG	2005	240	112	46	NS	NS	NS	67[b]	29	NS
Kwiniuk River	300	550	SEG	2005	744	663	342	195	194	237	444	135	57
North River (Unalakleet R)	1,200	2,600	SEG	2005	1,452	1,104	1,015	906	1,948	903	2,352	1,256	864
Shaktoolik River	400	800	SEG	2005	15[c]	91[c]	74[d]	150[c]	412	NS	129[b]	29	106
Unalakleet/Old Woman River	550	1,100	SEG	2005	168[c]	398[c]	510[d]	NS	821	NS	1,368	1,021[e]	1,111

Note: NA = data not available; NS = no survey.

Note: 2011 escapements are preliminary because harvest estimates are not completed until around the beginning of the following season.

[a] Canadian Yukon River Mainstem Chinook salmon IMEG (Interim Management Escapement Goal) of 42,500-55,000 was implemented for 2010 and 2011 seasons by the United States and Canada Yukon River Joint Technical Committee (JTC). Estimates from 2005-2011 represent escapement, after subtraction of Canadian harvest.

[b] 2009 aerial surveys of the Shaktoolik River and Boston Creek are rated as incomplete as they were conducted on August 9 and 12, respectively, well after peak Chinook salmon spawning. Several carcasses and moribund Chinook salmon were observed during survey.

[c] 2003, 2004 and 2006 Shaktoolik River surveys and combined Unalakleet and Old Woman rivers surveys (2003 and 2004) are not considered complete as they were conducted well before peak spawn. Surveys during these years were rated as acceptable, but the observer noted difficulty enumerating Chinook salmon due to large numbers of pink salmon.

[d] 2005 Shaktoolik and Unalakleet River drainage surveys were conducted during peak spawning periods but Chinook salmon counts are thought to be underestimated due to large numbers of pink salmon.

[e] 2010 escapement estimate for Unalakleet/Old Woman River is a weir count.

Table 4.–Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) Chinook salmon escapement goals and escapements, 2003 to 2011.

	2011 Goal Range			Year	Escapement								
System	Lower	Upper	Type	Implemented	2003	2004	2005	2006	2007	2008	2009	2010	2011
AK Peninsula													
Nelson River	2,400	4,400	BEG	2004	5,154	6,959	4,993	2,516	2,492	5,012	2,048	2,769	NA
Chignik													
Chignik River	1,300	2,700	BEG	2002	6,412	7,633	6,037	3,175	1,675	1,620	1,590	3,373[a]	NA
Kodiak													
Karluk River[a]	3,000	6,000	BEG	2011	6,986	7,228	4,684	3,673	1,697	752	1,306	2,917	3,420
Ayakulik River[b]	4,000	7,000	BEG	2011	17,106	24,425	8,175	2,937	6,232	3,071	2,615	5,291	NA

Note: NA = data not available.
[a] 2010 Chignik River Chinook salmon escapement is the weir count minus 300 fish for subsistence harvest.

Table 5.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Southeast Region.

System	2003	2004	2005	2006	2007	2008	2009	2010	2011
CHINOOK SALMON									
Blossom River	Under	Met	Met	Met	Under	Met	Under	Under	Under
Keta River	Met	Met	Met	Over	Met	Met	Under	Met[a]	Under
Unuk River	Met	Met	Met	Met	Met	Met	Met[a]	Over	Met[a]
Chickamin River	Over	Met	Over	Over	Met	Over	Met	Over	Met[a]
Andrew Creek	Met	Over	Over	Over	Over	Met	Under	Met[a]	Met[a]
Stikine River	Over	Over	Over	Met	Met	Met	Under	Met[a]	Met[a]
King Salmon River	Under	Met	Met	Met	Met	Met	Under	Met[a]	Met[a]
Taku River	Met	Over	Met	Met	Under	Under	Met[b]	Met[a]	Met[a]
Chilkat River	Over[c]	Met	Met	Met	Under	Met	Over	Met[a]	Met[a]
Klukshu (Alsek) River	Met	Over	Under	Under	Under	Under	Met	Met[a]	Met[a]
Situk River	Over[b]	Met	Met	Met	Met	Under	Met	Under	Under

Note: NA = data not available. Blank cells indicate that there was no official escapement goal for the stock in that particular year.
[a] Prior to 2009 goal was based on index count of escapements.
[b] Escapement goal reevaluated, goal range changed.

Table 6.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Central Region (Bristol Bay, Cook Inlet, and Prince William Sound/Copper River).

System	2003	2004	2005	2006	2007	2008	2009	2010	2011
Chinook salmon									
Bristol Bay									
Nushagak River	Over	Over	Over	Over	Met[a]	Over	Met	Met	Met
Togiak River	NS	NS	NS	NS	NS[b]	NS	NS	NS	NS
Naknek River	Over	Over	NS	NS	Met[b]	Met	Under	NS	NS
Alagnak River					Met	Under	Under	NS	NS
Egegik River					Met	Under	Under	NS	NS
Upper Cook Inlet									
Alexander Creek	Under	Met	Met	Under	Under	Under	Under	Under	Under
Campbell Creek	Over	Over	eliminated			Met[c]	Met	Met	Under
Chuitna River	Met	Over	Met	Met	Under	Under	Under	Under	Under
Chulitna River	NS	Met	Met	Met	Over	Met	Met	Under	Met
Clear (Chunilna) Creek	NS	Over	Met	Met	Met	Met	Met	Under	Under
Crooked Creek	Over	Over	Over	Met	Met	Met	Under	Met	Met
Deshka River	Over	Over	Over	Over	Met	Under	Under	Met	Met
Goose Creek	Under	Met	Met	Met	Under	Under	Under	Under	Under
Kenai River Early Run	Met	Met	Over[d]	Over	Over	Over	Over	NA	NA
Kenai River Late Run	Met	Over	Met	Met	Met	Met	Under	NA	NA
Lake Creek	Over	Over	Met	Met	Met	Under	Under	Under	Met
Lewis River	Over	Over	Met	Met	Under	Under	Under	Under	Under
Little Susitna River	Met	Met	Over	Over	Met	Met	Met	Under	Under
Little Willow Creek	Met	Over	Met	Met	Met	NC	Met	Met	Met
Montana Creek	Met	Met	Met	Met	Met	Met	Met	Under	Under
Peters Creek	Over	Over	Met	Met	Met	NC	Met	NC	Met
Prairie Creek	Met	Met	Met	Met	Met	Under	Met	Under	Under
Sheep Creek	NS	Under	Met	Under	Under	NC	Under	NC	Under
Talachulitna River	Over	Over	Met	Over	Met	Met	Met	Under	Under
Theodore River	Met	Under	Under	Met	Under	Under	Under	Under	Under
Willow Creek	Over	Over	Met	Met	Under	Under	Under	Under	Under
Lower Cook Inlet									
Anchor River	Under	Over	eliminated			Met[e]	Under	Under	Under[f]
Deep Creek	Over	Over	Over	Met	Met	Under	Met	Met	Met
Ninilchik River	Under	Met	Met	Met	Met	Met[g]	Under	Met	Met
Prince William Sound									
Copper River	Met	Met	Under	Met	Met	Met	Met	Under	Met

Note: NA = data not available; NC = no count; NS = no survey.
[a] Escapement goal reevaluated, point goal changed to a range.
[b] Escapement goal reevaluated, point goal changed to a lower-bound goal.
[c] Previous escapement goal reinstated.
[d] Escapement goal reevaluated, goal range changed.
[e] Escapement goal from 2001-2004 based on aerial surveys, escapement numbers in Table 2 are not comparable.
[f] Escapement goal reevaluated, lower-bound goal changed to a range.

Table 7.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Arctic-Yukon-Kuskokwim Region.

System	2003	2004	2005	2006	2007	2008	2009	2010	2011
Chinook salmon									
Kuskokwim Area									
North (Main) Fork Goodnews River	Met	Met	NS[a]	Over	NS	Met	NS	NS	Met
Middle Fork Goodnews River	Under	Met	Over[a]	Over	Over[b]	Met	Met	Met	Met
Kanektok River	Met	Met	Over[a]	Over	NS	Met	NS	Under	NS
Kogrukluk River	Met	Met	Over[a]	Over	Met	Met	Met	Met	Met
Kwethluk River	Over	Over	Over	NA	Over[c]	Under	Under	Under	Under
Tuluksak River					Under	Under	Under	Under	Under
George River					Met	Under	Met	Under	Under
Kisaralik River	Under	Met	Over[a]	Over	Met	Met	NS	Under	NS
Aniak River	Met	Met	NS[a]	Over	Over	Over	NS	NS	NS
Salmon River (Aniak R)	Met	Met	Over[a]	NS	Over	Met	NS	NS	Under
Holitna River	NS	Met	Over[a]	Over	NS	Under	NS	Under	NS
Cheeneetnuk River (Stony R)			Met	Met	NS	Under	Under	NS	Under
Gagaryah River (Stony R)			Met	Met	Over	Under	Met	Under	Under
Salmon River (Pitka Fork)	Met	Under	Over[a]	Met	Met	Met	Met	Under	Met
Yukon River									
East Fork Andreafsky River	Under	Met	Over[a]	Under	Over	Under	Under	Met[c]	Over
West Fork Andreafsky River	Met	Under	Met[a]	Met	Met	Under	Over	Met	Met
Anvik River	Under	Met	Over[a]	Over	Met	Under	Under	Under	Under
Nulato River	NS	Met	Under[a]	Met	Over	Under	Over	Under	Met
Gisasa River	NS	Met	Met[a]	Met	Met	Met	Met	eliminated	
Chena River	Over	Over	Met	Met	Met	Met	Met	Under	
Salcha River	Over	Over	Met	Over	Met	Met	Over	Met	Met
Canada Mainstem[d]	Met	Met	Met	Met	Met	Under[d]	Met	Under[d]	Met
Norton Sound									
Fish River/Boston Creek	Met	Met	Under[e]	NS	NS	NS	Under	Under	NS
Kwiniuk River	Over	Over	Met[f]	Under	Under	Under	Met	Under	Under
North River (Unalakleet R)	Met	Under	Under[b]	Under	Met	Under	Met	Met	Under
Shaktoolik River	Under	Under	Under[f]	Under	Met	NS	Under	Under	Under
Unalakleet/Old Woman River	Under	Under	Under[f]	NS	Met	NS	Over	Met	Over

Note: NA = data not available; NS =no survey; ND = not determined yet. There are no escapement goals for pink salmon in Kuskokwim Area and Yukon River and there are no escapement goals for sockeye salmon in Yukon River.

[a] Escapement goal reevaluated, lower-bound goal changed to a range.

[b] Escapement goal reevaluated, goal value changed.

[c] Previous escapement goal was based on aerial surveys, replaced with escapement goal based on weir counts. Escapements in Table 3 are weir counts.

[d] Escapement goal revised by The United States and Canada Yukon River Joint Technical Committee (JTC).

[e] Escapement goal reevaluated, goal range changed to a lower-bound goal.

[f] Escapement goal reevaluated, goal type changed but goal value remained the same.

Table 8.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas).

System	2003	2004	2005	2006	2007	2008	2009	2010	2011
Chinook salmon									
AK Peninsula									
Nelson River	Met	Over[a]	Over	Met	Met	Over	Under	Met	NA
Chignik									
Chignik River	Over	Over	Over	Over	Met	Met	Met	Over	NA
Kodiak									
Karluk River	Met	Met	Met	Met	Under	Under	Under	Under	Met[a]
Ayakulik River	Over	Over	Met	Under	Met	Under	Under	Met	NA[a]

Note: There are no coho salmon escapement goals in Chignik Area.
[a] Escapement goal reevaluated, goal range changed.

Table 9.–Southeast Region Chinook salmon escapements compared to escapement goals for the years 2003 to 2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011
CHINOOK SALMON									
Number Below	2	0	1	1	4	3	5	2	3
Number Met	5	7	7	7	6	7	5	7	8
Number Above	4	4	3	3	1	1	1	2	0
% Below	18	0	9	9	36	27	45	18	27
% Met	45	64	64	64	55	64	45	64	73
% Above	36	36	27	27	9	9	9	18	0

Table 10.–Central Region (Bristol Bay, Cook Inlet, Prince William Sound/Copper River) escapements for Chinook salmon compared to escapement goals for the years 2003 to 2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011
CHINOOK SALMON									
Number Below	4	2	2	2	7	12	16	15	14
Number Met	9	9	16	17	18	12	12	7	10
Number Above	11	16	6	5	2	2	1	0	0
% Below	17	7	8	8	26	46	55	68	58
% Met	38	33	67	71	67	46	41	32	42
% Above	46	59	25	21	7	8	3	0	0

Table 11.–Arctic-Yukon-Kuskokwim Region Chinook salmon escapements compared to escapement goals for the years 2003 to 2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011
CHINOOK SALMON									
Number Below	6	5	5	4	2	13	7	15	10
Number Met	10	14	8	8	13	10	10	7	8
Number Above	4	4	10	9	7	1	4	0	2
% Below	30	22	22	19	9	54	33	68	50
% Met	50	61	35	38	59	42	48	32	40
% Above	20	17	43	43	32	4	19	0	10

Table 12.–Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) escapements for Chinook salmon compared to escapement goals for the years 2003 to 2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011
CHINOOK SALMON									
Number Below	0	0	0	1	1	2	3	1	0
Number Met	2	1	2	2	3	1	1	2	1
Number Above	2	3	2	1	0	1	0	1	0
% Below	0	0	0	25	25	50	75	25	0
% Met	50	25	50	50	75	25	25	50	100
% Above	50	75	50	25	0	25	0	25	0

Table 17.–Summary of Chinook salmon stocks of concern in Alaska.

Region	System	Species	Year	Level of Concern	Year Last Reviewed[a]
Central	Chuitna River	Chinook	2010	Management	2010
	Theodore River	Chinook	2010	Management	2010
	Lewis River	Chinook	2010	Management	2010
	Alexander Creek	Chinook	2010	Management	2010
	Willow Creek	Chinook	2010	Yield	2010
	Goose Creek	Chinook	2010	Yield	2010
Westward AYK	Karluk River	Chinook	2010	Management	2010
	Yukon River	Chinook	2000	Yield	2009
	Norton Sound Sub-district 5 & 6	Chinook	2003	Yield	2009

[a] Indicates start of Board of Fisheries cycle in which stock of concern was designated or last reviewed (e.g. 2011/2012 BOF cycle = 2011).

Table 18.–Methods used to enumerate and develop escapement goals for Southeast Region Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Blossom River	Peak Aerial Survey[a]	SRA[b]
Keta River	Peak Aerial Survey	SRA
Unuk River	Mark-Recapture	SRA
Chickamin River	Peak Aerial Survey	SRA
Andrew Creek	Peak Aerial Survey (Expanded)	SRA
Stikine River	Mark-Recapture	SRA
King Salmon River	Peak Aerial Survey (Expanded)	SRA
Taku River	Mark-Recapture	SRA
Chilkat River	Mark-Recapture	Theoretical SRA
Klukshu (Alsek) River	Weir Count	SRA
Situk River	Weir Count	SRA

[a] One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.
[b] SRA = Spawner-recruit analysis.

Table 19.–Methods used to enumerate and develop escapement goals for Central Region (Bristol Bay, Cook Inlet, and Prince William Sound/Copper River) Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Bristol Bay		
Nushagak River	Sonar	SRA[a], Yield Analysis
Togiak River	Single Aerial Survey[b]	Risk Analysis
Naknek River	Single Aerial Survey	Risk Analysis
Alagnak River	Single Aerial Survey	Risk Analysis
Egegik River	Single Aerial Survey	Risk Analysis
Upper Cook Inlet		
Alexander Creek	Single Aerial Survey	Percentile
Campbell Creek	Single Foot Survey	Risk Analysis
Chuitna River	Single Aerial Survey	Percentile
Chulitna River	Single Aerial Survey	Percentile
Clear (Chunilna) Creek	Single Aerial Survey	Percentile
Crooked Creek	Weir Count	Percentile
Deshka River	Weir Count	SRA
Goose Creek	Single Aerial Survey	Percentile
Kenai River Early Run	Sonar	SRA
Kenai River Late Run	Sonar	SRA
Lake Creek	Single Aerial Survey	Percentile
Lewis River	Single Aerial Survey	Percentile
Little Susitna River	Single Aerial Survey	Percentile
Little Willow Creek	Single Aerial Survey	Percentile
Montana Creek	Single Aerial Survey	Percentile
Peters Creek	Single Aerial Survey	Percentile
Prairie Creek	Single Aerial Survey	Percentile
Sheep Creek	Single Aerial Survey	Percentile
Talachulitna River	Single Aerial Survey	Percentile
Theodore River	Single Aerial Survey	Percentile
Willow Creek	Single Aerial Survey	Percentile
Lower Cook Inlet		
Anchor River	Sonar, Weir Count	SRA
Deep Creek	Single Aerial Survey	Percentile
Ninilchik River	Weir Count	Percentile
Prince William Sound		
Copper River	Mark-Recapture	Empirical Observation

[a] SRA = Spawner-recruit analysis.
[b] Single survey done around time of presumed peak of the run with no expansion of counts.

Table 20.–Methods used to enumerate and develop escapement goals for Arctic-Yukon-Kuskokwim Region Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Kuskokwim Area		
North (Main) Fork Goodnews River	Single Aerial Survey[a]	Percentile
Middle Fork Goodnews River	Weir Count	SRA[b]
Kanektok River	Single Aerial Survey	Percentile
Kogrukluk River	Weir Count	Percentile
Kwethluk River	Weir Count	Percentile
Tuluksak River	Weir Count	Percentile
George River	Weir Count	Percentile
Kisaralik River	Single Aerial Survey	Percentile
Aniak River	Single Aerial Survey	Percentile
Salmon River (Aniak R)	Single Aerial Survey	Percentile
Holitna River	Single Aerial Survey	Percentile
Cheeneetnuk River (Stony R)	Single Aerial Survey	Percentile
Gagaryah River (Stony R)	Single Aerial Survey	Percentile
Salmon River (Pitka Fork)	Single Aerial Survey	Percentile
Yukon River		
East Fork Andreafsky River	Weir Count	Percentile
West Fork Andreafsky River	Peak Aerial Survey[c]	Percentile
Anvik River	Peak Aerial Survey	Percentile
Nulato River (forks combined)	Peak Aerial Survey	Percentile
Chena River	Tower, Mark-Recapture	SRA
Salcha River	Tower, Mark-Recapture	SRA
Canada Mainstem	Sonar	Agreement (U.S./Canada Joint Technical Committee
Norton Sound		
Fish River/Boston Creek	Peak Aerial Survey	Percentile
Kwiniuk River	Tower Count	SRA
North River (Unalakleet R)	Tower Count	Percentile
Shaktoolik River	Peak Aerial Survey	Theoretical SRA
Unalakleet/Old Woman River	Peak Aerial Survey	Theoretical SRA

Note: NA = data not available.

[a] Typically single survey done around time of presumed peak of the run with no expansion of counts.

[b] SRA = Spawner-recruit analysis.

[c] One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.

Table 21.–Methods used to enumerate and develop escapement goals for Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
AK Peninsula		
Nelson River	Weir, Peak Aerial Survey[a]	Spawning Habitat Model, SRA[b]
Chignik		
Chignik River	Weir Count	SRA
Kodiak		
Karluk River	Weir Count	SRA
Ayakulik River	Weir Count	SRA

[a] One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.
[b] SRA = Spawner-recruit analysis.