

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.

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 fisheries¹. Under the Magnuson-Stevens Act, the Council is required to minimize bycatch to the extent practicable, as well as to take into account the importance of fishery resources to fishing communities in order to minimize adverse economic impacts on such communities. Chinook salmon are a highly valued species for commercial, recreational, subsistence, and personal use fisheries. 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 other trawl fisheries in the GOA, which also intercept Chinook salmon. Under the regulations, it is incumbent upon fishermen to avoid catching Chinook salmon, however the Council has determined it is necessary to evaluate management measures to protect against the risk of high Chinook salmon PSC in future years.

Description of the Alternatives

The alternatives that are analyzed in this amendment package were approved by the Council in February 2012, and revised at initial review in December 2012. 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 1 and 2:

(a) Apportion proportional to historic average bycatch of Chinook salmon (5 or 10-year average);

(b) Apportion proportional to historic average non-pollock groundfish harvest (5 or 10-year average).

Option 3: No more than 50% or 66% of the annual hard cap limit can be taken before June 1.

Option 4: Separate Chinook salmon PSC limit (hard cap) to the CGOA rockfish program:

(a) 1,500

(b) 2,500

(c) 3,500

¹ Except when their retention is authorized by other applicable law for biological sampling or for programs such as the Prohibited Species Donation Program.

Suboption 1: Divide by sector (CV and CP) based on actual Chinook salmon PSC usage by sector for the rockfish catch share program years of 2007-2012.

Each LLP holder within sector will receive an allocation of Chinook salmon PSC equivalent to the license's proportion of the sector's target rockfish catch history from the program's initial allocations. Member LLP allocations will be allocated to their respective cooperative.

Suboption 2: On October 1st, rollover all but 200, 300, or 400 remaining Chinook salmon to support other fall non-pollock trawl fisheries.

Suboptions 1 and/or 2 can be selected for Option 4.

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, or Option 2 and Option 3, could be selected by the Council; Option 4 can be selected with any of the other options.

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

		Historic basis for average apportionment	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	Chinook	8%	997	797	598	399	18%	2,210	1,768	1,326	884
		Groundfish	17%	2,107	1,685	1,264	843	18%	2,263	1,810	1,358	905
	CGOA	Chinook	92%	11,503	9,202	6,902	4,601	82%	10,291	8,232	6,174	4,116
		Groundfish	83%	10,393	8,315	6,236	4,157	82%	10,237	8,190	6,142	4,095
Option 2	All GOA (W&C)	Catcher Vessels	52%	6,460	5,168	3,876	2,584	49%	6,104	4,888	3,662	2,442
		Groundfish	66%	8,260	6,608	4,956	3,304	64%	8,029	6,423	4,817	3,211
	Catcher Processors	Chinook	48%	6,039	4,831	3,623	2,416	51%	6,397	5,118	3,888	2,559
		Groundfish	34%	4,240	3,392	2,544	1,696	36%	4,471	3,577	2,683	1,789
Options 1 & 2	WGOA	Catcher Vessels	19%	236	169	125	85	5%	606	495	363	242
		Groundfish	4%	541	433	325	216	5%	643	514	386	257
		Catcher Processors	7%	910	728	546	364	13%	1,604	1,284	963	642
		Groundfish	13%	1,566	1,253	939	626	13%	1,620	1,296	972	648
	CGOA	Catcher Vessels	51%	6,374	5,099	3,824	2,549	44%	5,498	4,399	3,299	2,199
		Groundfish	62%	7,719	6,175	4,631	3,088	59%	7,386	5,909	4,431	2,954
		Catcher Processors	41%	5,129	4,103	3,077	2,052	38%	4,792	3,864	2,875	1,917
		Groundfish	21%	2,674	2,139	1,605	1,070	23%	2,851	2,281	1,711	1,140

Table ES-2 Proposed PSC limits for Central GOA rockfish program, under Alternative 2's Option 4, and Suboption 1

		6-Year Chinook salmon PSC usage (2007 to 2012)			
		%	(a) 1,500	(b) 2,500	(c) 3,500
Option 4	Separate PSC limit for CGOA rockfish program	100%	1,500	2,500	3,500
Suboption 1	Catcher Vessels	62%	937	1,561	2,186
	Catcher Processors	38%	563	939	1,314

Table ES-3 Proposed PSC limits for non-pollock trawl fisheries that are not part of the Central GOA rockfish program, under Alternative 2 with Option 4, or Alternative 2 with either Options 1 and 4, or Options 2 and 4

		Historic basis for average apportionment	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			
GOA-wide Chinook cap													
Option 4(a): 1,500 Chinook salmon set aside to CGOA rockfish program													
Non-CGOA rockfish non-pollock fisheries			%	11,000	8,500	6,000	3,500	%	11,000	8,500	6,000	3,500	
Alt. 2	All GOA (W&C)		100%	11,000	8,500	6,000	3,500	100%	11,000	8,500	6,000	3,500	
Options 1 & 4(a)	WGOA	Chinook	10%	1,112	859	606	354	20%	2,185	1,688	1,192	695	
		Groundfish	21%	2,264	1,749	1,235	720	20%	2,212	1,709	1,206	704	
	CGOA	Chinook	90%	9,888	7,641	5,394	3,146	80%	8,815	6,812	4,808	2,805	
		Groundfish	79%	8,736	6,751	4,765	2,780	80%	8,788	6,791	4,794	2,796	
Options 2 & 4(a)	All GOA (W&C)	Catcher Vessels	Chinook	49%	5,400	4,173	2,945	1,718	47%	5,201	4,019	2,837	1,655
		Groundfish	65%	7,170	5,540	3,911	2,281	64%	6,993	5,404	3,815	2,225	
	Catcher Processors	Chinook	51%	5,600	4,327	3,055	1,782	53%	5,799	4,481	3,163	1,845	
		Groundfish	35%	3,830	2,960	2,089	1,219	36%	4,007	3,096	2,185	1,275	
Option 4(b): 2,500 Chinook salmon set aside to CGOA rockfish program													
Non-CGOA rockfish non-pollock fisheries			%	10,000	7,500	5,000	2,500	%	10,000	7,500	5,000	2,500	
Alt. 2	All GOA (W&C)		100%	10,000	7,500	5,000	2,500	100%	10,000	7,500	5,000	2,500	
Options 1 & 4(b)	WGOA	Chinook	10%	1,011	758	505	253	20%	1,986	1,490	993	497	
		Groundfish	21%	2,058	1,543	1,029	514	20%	2,011	1,508	1,005	503	
	CGOA	Chinook	90%	8,989	6,742	4,495	2,247	80%	8,014	6,010	4,007	2,003	
		Groundfish	79%	7,942	5,957	3,971	1,986	80%	7,989	5,992	3,995	1,997	
Options 2 & 4(b)	All GOA (W&C)	Catcher Vessels	Chinook	49%	4,909	3,682	2,455	1,227	47%	4,728	3,546	2,364	1,182
		Groundfish	65%	6,518	4,889	3,259	1,630	64%	6,358	4,768	3,179	1,589	
	Catcher Processors	Chinook	51%	5,091	3,818	2,545	1,273	53%	5,272	3,954	2,636	1,318	
		Groundfish	35%	3,482	2,611	1,741	870	36%	3,642	2,732	1,821	911	
Option 4(c): 3,500 Chinook salmon set aside to CGOA rockfish program													
Non-CGOA rockfish non-pollock fisheries			%	9,000	6,500	4,000	1,500	%	9,000	6,500	4,000	1,500	
Alt. 2	All GOA (W&C)		100%	9,000	6,500	4,000	1,500	100%	9,000	6,500	4,000	1,500	
Options 1 & 4(c)	WGOA	Chinook	10%	909	657	404	152	20%	1,788	1,291	794	298	
		Groundfish	21%	1,852	1,338	823	309	20%	1,810	1,307	804	302	
	CGOA	Chinook	90%	8,091	5,843	3,596	1,348	80%	7,212	5,209	3,206	1,202	
		Groundfish	79%	7,148	5,162	3,177	1,191	80%	7,190	5,193	3,196	1,198	
Options 2 & 4(c)	All GOA (W&C)	Catcher Vessels	Chinook	49%	4,418	3,191	1,964	736	47%	4,255	3,073	1,891	709
		Groundfish	65%	5,866	4,237	2,607	978	64%	5,722	4,132	2,543	954	
	Catcher Processors	Chinook	51%	4,582	3,309	2,036	764	53%	4,745	3,427	2,109	791	
		Groundfish	35%	3,134	2,263	1,393	522	36%	3,278	2,368	1,457	546	

Table ES-4 Maximum amount of proposed PSC limits for non-pollock trawl fisheries that could be used before June 1st, under Alternative 2 with Option 3, or Alternative 2 with either Options 2 and 3, or Options 3 and 4

Note, for usage limits that include Option 4, a set aside to the Central GOA rockfish program, the identified limit applies only to non-pollock trawl fisheries exclusive of the rockfish program.

			Usage limit for Jan-May	Historic basis for average apportionment	5-Year Average (2007 to 2011)				10-year Average (2002-2011)				
<i>GOA-wide Chinook cap</i>						12,500	10,000	7,500	5,000	12,500	10,000	7,500	5,000
Option 3 alone, Options 2 and 3													
Alt. 2 & Option 3	All GOA (W&C)		50%		6,250	5,000	3,750	2,500	6,250	5,000	3,750	2,500	
			66%		8,250	6,600	4,950	3,300	8,250	6,600	4,950	3,300	
Options 2 & 3	All GOA (W&C)	Catcher Vessels	50%	Chinook	3,230	2,584	1,938	1,292	3,052	2,442	1,831	1,221	
			Groundfish	4,130	3,304	2,478	1,652	4,014	3,211	2,409	1,606		
		Catcher Processors	66%	Chinook	4,264	3,411	2,558	1,705	4,029	3,223	2,417	1,612	
			Groundfish	5,452	4,361	3,271	2,181	5,299	4,239	3,179	2,120		
			50%	Chinook	3,020	2,416	1,812	1,208	3,199	2,559	1,919	1,280	
			Groundfish	2,120	1,696	1,272	848	2,236	1,789	1,341	894		
66%	Chinook	3,986	3,188	2,391	1,595	4,222	3,378	2,533	1,689				
Groundfish	2,798	2,239	1,679	1,119	2,951	2,361	1,771	1,180					
Including Option 4(a) 1,500 Chinook salmon set aside to CGOA rockfish program													
Alt. 2 & Opt 3, 4a	All GOA (W&C)		50%		5,500	4,250	3,000	1,750	5,500	4,250	3,000	1,750	
			66%		7,260	5,610	3,960	2,310	7,260	5,610	3,960	2,310	
Options 2, 3 & 4(a)	All GOA (W&C)	Catcher Vessels	50%	Chinook	2,700	2,086	1,473	859	2,600	2,009	1,418	827	
			Groundfish	3,585	2,770	1,955	1,141	3,497	2,702	1,907	1,113		
		Catcher Processors	66%	Chinook	3,564	2,754	1,944	1,134	3,432	2,652	1,872	1,092	
			Groundfish	4,732	3,657	2,581	1,506	4,616	3,567	2,518	1,469		
			50%	Chinook	2,800	2,164	1,527	891	2,900	2,241	1,582	923	
			Groundfish	1,915	1,480	1,045	609	2,003	1,548	1,093	637		
66%	Chinook	3,696	2,856	2,016	1,176	3,828	2,958	2,088	1,218				
Groundfish	2,528	1,953	1,379	804	2,644	2,043	1,442	841					
Including Option 4(b) 2,500 Chinook salmon set aside to CGOA rockfish program													
Alt. 2 & Opt 3, 4b	All GOA (W&C)		50%		5,000	3,750	2,500	1,250	5,000	3,750	2,500	1,250	
			66%		6,600	4,950	3,300	1,650	6,600	4,950	3,300	1,650	
Options 2, 3 & 4(b)	All GOA (W&C)	Catcher Vessels	50%	Chinook	2,455	1,841	1,227	614	2,364	1,773	1,182	591	
			Groundfish	3,259	2,444	1,630	815	3,179	2,384	1,589	795		
		Catcher Processors	66%	Chinook	3,240	2,430	1,620	810	3,120	2,340	1,560	780	
			Groundfish	4,302	3,226	2,151	1,075	4,196	3,147	2,098	1,049		
			50%	Chinook	2,546	1,909	1,273	636	2,636	1,977	1,318	659	
			Groundfish	1,741	1,306	871	435	1,821	1,366	911	455		
66%	Chinook	3,360	2,520	1,680	840	3,480	2,610	1,740	870				
Groundfish	2,298	1,724	1,149	575	2,404	1,803	1,202	601					
Including Option 4(c) 3,500 Chinook salmon set aside to CGOA rockfish program													
Alt. 2 & Opt 3, 4c	All GOA (W&C)		50%		4,500	3,250	2,000	750	4,500	3,250	2,000	750	
			66%		5,940	4,290	2,640	990	5,940	4,290	2,640	990	
Options 2, 3 & 4(c)	All GOA (W&C)	Catcher Vessels	50%	Chinook	2,209	1,595	982	368	2,127	1,537	946	355	
			Groundfish	2,933	2,118	1,304	489	2,861	2,066	1,272	477		
		Catcher Processors	66%	Chinook	2,916	2,106	1,296	486	2,808	2,028	1,248	468	
			Groundfish	3,872	2,796	1,721	645	3,776	2,727	1,678	629		
			50%	Chinook	2,291	1,655	1,018	382	2,372	1,713	1,054	395	
			Groundfish	1,567	1,132	696	261	1,639	1,184	728	273		
66%	Chinook	3,024	2,184	1,344	504	3,132	2,262	1,392	522				
Groundfish	2,068	1,494	919	345	2,164	1,563	962	361					

Environmental Assessment

Groundfish

Under the status quo, groundfish stocks are neither 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. From 2002 to 2011, the average PSC for the non-pollock trawl fisheries was 6,176 Chinook salmon. In 2012 the non-pollock trawl fishery recorded 3,665 Chinook salmon PSC. 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 whether the groundfish fisheries' take of Chinook salmon is, or is not, 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. 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.

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 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. 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 history of either Chinook salmon PSC usage or non-pollock groundfish harvest. 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. Alternative 2 includes an option to apply a seasonal limit on Chinook PSC taken before June 1 to whatever annual limit is selected. Another option would "carve-out" a separate Chinook salmon PSC limit from the total GOA limit and use it to support the Central GOA Rockfish Program. The Chinook PSC reserved for the Rockfish Program could be divided between the operational sectors within

the program (CP and CV); another suboption would make unused Chinook salmon PSC from the Rockfish Program available to the rest of the GOA limited access fisheries on October 1.

Because historical annual Chinook PSC and groundfish harvest have varied from year to year, the selected metric and time period upon which PSC apportionment is based will influence which sector of the GOA non-pollock trawl fishery is more likely to be constrained by Chinook salmon PSC. In general, a sector that receives a smaller percentage of the total GOA PSC limit is more likely to experience a fishery closure, and closures that do occur would come earlier in the year. Table ES-5 summarizes the percentage of the hard cap apportioned to each user group, depending on which scenario and set of historical determinants the Council chooses.

Table ES-5 Percentage of annual Chinook salmon PSC limit apportioned to each trawl user group under Alternative 2 options

		PSC Usage		Groundfish Harvest	
		10 year History	5 year History	10 year History	5 year History
Option 1	CGOA	82%	92%	82%	83%
	WGOA	18%	8%	18%	17%
Option 1 + 4	CGOA	80%	90%	80%	79%
	WGOA	20%	10%	20%	21%
Option 2	CP	51%	48%	36%	34%
	CV	49%	52%	64%	66%
Option 2 + 4	CP	53%	51%	36%	35%
	CV	47%	49%	64%	65%
Option 1&2	CG CP	38%	41%	23%	21%
	CG CV	44%	51%	59%	62%
	WG CP	13%	7%	13%	13%
	WG CV	5%	1%	5%	4%
Option 1&2 + 4	CG CP	38%	42%	22%	20%
	CG CV	42%	48%	58%	60%
	WG CP	14%	9%	14%	15%
	WG CV	5%	1%	6%	5%

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 in this report 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. Similarly, impacts on Chinook salmon are defined as the amount of PSC that was recorded after a PSC closure would have occurred (avoided PSC). Foregone wholesale revenue was calculated based on 2011 average per unit wholesale values (\$/mt) for the sector in question and for the specific target species that the sector would have been targeting after the closure. Table ES-5 provides a general sense of the per unit wholesale value of each sector's catch, based on records from the 2011 fishing year.

Table ES-6 2011 gross first wholesale value per metric ton of harvest

Target	First wholesale value (\$/mt)				
	CGOA	WGOA	CP	CV	Aggregate
Rockfish	2,081	2,058	2,108	2,030	2,076
Pacific Cod	1,513	1,496	1,327	1,516	1,510
Flatfish	980	1,155	1,183	848	986
Aggregate	1,347	1,770	1,587	1,282	1,400

The Regulatory Impact Review uses a retrospective approach to assess the potential impact of a Chinook PSC limit on non-pollock groundfish trawl harvests.² Tables ES-7 through ES-18 report the number of the analyzed years in which the fishery, or a sector of the fishery that received an apportionment of the PSC limit, would have closed. Tables summarizing impacts for Alternative 2 permutations that include a carve-out for the Rockfish Program (Option 4) are only analyzed back to 2007 – the first year of that program. In those cases, the maximum number of years closed is five. All other permutations are analyzed over the period from 2003 to 2011; in those cases, the maximum number of years closed is nine. The tables also report the point during the calendar year at which the closure would have occurred. Each table is accompanied by figures that bracket the range of potential impacts (forgone harvest, forgone wholesale revenue, and avoided Chinook PSC) from the closure dates listed in the table; the range covers only the PSC limits that would have triggered a fishery closure; direct impact to salmon and harvest outcomes would be zero for permutations of the Alternative 2 options would not have triggered a closure during the analyzed period.

Table ES-7 Estimated maximum impacts under a Gulf-wide Chinook salmon PSC limit (2003 to 2011)

PSC Limit	# Years Closed	Earliest Closure Week
12,500	0	None
10,000	1	Early September
7,500	2	Mid-May
5,000	6	Late April

The impact of the earliest closure is estimated to be 42,000 mt of harvest, \$62 million in first wholesale revenue, and 3,350 avoided Chinook PSC. The impact of the latest closure is estimated to be 11,000 mt of harvest, \$14 million in first wholesale revenue, and 1,050 avoided Chinook PSC.

Table ES-8 Estimated maximum impacts under a Gulf-wide PSC limit with a seasonal limit prior to June 1, Option 3 (2003 to 2011)

Annual PSC Limit	50/50			66/34		
	Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure
12,500	6,250	1	Late April	8,250	1	Mid May
10,000	5,000	2	Late April	6,600	1	Late April
7,500	3,750	4	Early April	4,950	3	Mid April
5,000	2,500	7	Mid Feb	3,300	4	Early March

The impact of the earliest closure is estimated to be 19,000 mt of harvest, \$27 million in first wholesale revenue, and 3,500 avoided Chinook PSC. The impact of the latest closure is estimated to be 2,400 mt of harvest, \$3.5 million in first wholesale revenue, and 430 avoided Chinook PSC.

² Due to confidentiality restrictions and analytical design, harvest impacts are estimated using the week the closure would have occurred in a particular year, and applying that closure to a characteristic or average year representing the relevant time period. The source for these data is NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA, and ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive_ENCOAR_PROD.

Table ES-9 Estimated maximum impacts on the non-Rockfish Program fishery under a Gulf-wide PSC limit with a Rockfish Program carve-out, Option 4 (2007 to 2011)

Total GOA PSC Limit	1,500 RP Carve-Out			2,500 RP Carve-Out			3,500 RP Carve-Out		
	Non-RP PSC Limit	# Years Closed	Earliest Closure	Non-RP PSC Limit	# Years Closed	Earliest Closure	Non-RP PSC Limit	# Years Closed	Earliest Closure
12,500	11,000	-	-	10,000	-	-	9,000	-	-
10,000	8,500	1	December	7,500	1	Late Oct	6,500	1	Early Oct
7,500	6,000	2	Mid Sept	5,000	2	Late April	4,000	3	Late April
5,000	3,500	3	Mid April	2,500	5	Early April	1,500	5	Early April

The impact of the earliest closure to the non-RP fishery is estimated to be 42,000 mt of harvest, \$60 million in first wholesale revenue, and 4,500 avoided Chinook PSC. The impact of an October closure is estimated to be 2,300 mt of harvest, \$3.2 million in first wholesale revenue, and 500 avoided Chinook PSC. The RP fishery itself could receive a Chinook PSC allowance of from 1,500 to 3,500; average annual PSC usage from 2007 to 2012 was 1,357 Chinook salmon.

Table ES-10 Estimated maximum impacts on the non-Rockfish Program fishery under a Gulf-wide PSC limit with a Rockfish Program carve-out and a seasonal limit prior to June 1, Options 3 & 4 (2007 to 2011)

Total GOA PSC Limit	Seasonal Split	1,500 RP Carve-Out			2,500 RP Carve-Out			3,500 RP Carve-Out		
		Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure
12,500	50/50	5,500	-	-	5,000	1	Late April	4,500	2	Late April
	66/34	7,260	-	-	6,600	-	-	5,940	-	-
10,000	50/50	4,250	2	Late April	3,750	2	Late April	3,250	2	Mid April
	66/34	5,610	-	-	4,950	1	Late April	4,290	2	Late April
7,500	50/50	3,000	2	Mid April	2,500	3	Early April	2,000	3	Early April
	66/34	3,960	2	Late April	3,300	2	Mid April	2,640	3	Early April
5,000	50/50	1,750	3	Early April	1,250	5	Early April	750	5	Mid March
	66/34	2,310	3	Early April	1,650	4	Early April	990	5	Mid March

The impact of the earliest closure is estimated to be 14,000 mt of harvest, \$16 million in first wholesale revenue, and 2,900 avoided Chinook PSC. The impact of the latest closure is estimated to be 4,500 mt of harvest, \$5 million in first wholesale revenue, and 1,000 avoided Chinook PSC.

Table ES-11 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by regulatory area, Option 1 (2003 to 2011)

Total GOA PSC Limit	Chinook PSC History							Non-Pollock Groundfish History					
	5 Year			10 Year				5 Year			10 Year		
	Area PSC Limit	# Years Closed	Earliest Closure	Area PSC Limit	# Years Closed	Earliest Closure	Area PSC Limit	# Years Closed	Earliest Closure	Area PSC Limit	# Years Closed	Earliest Closure	
Central GOA	12,500	11,503	-	-	10,291	-	-	10,393	-	-	10,237	-	-
	10,000	9,202	-	-	8,232	2	Mid Sept	8,315	2	Mid Sept	8,190	2	Early Sept
	7,500	6,902	2	Mid May	6,174	3	Mid May	6,238	3	Early May	6,142	3	Early May
	5,000	4,601	6	Late April	4,116	6	Late April	4,157	6	Mid April	4,095	6	Mid April
Western GOA	12,500	997	4	Early April	2,210	-	-	2,107	1	Mid Sept	2,263	-	-
	10,000	787	4	Early April	1,768	2	Mid May	1,685	2	Late April	1,810	2	Mid May
	7,500	598	4	Late March	1,326	3	Early April	1,264	4	Late March	1,358	3	Late March
	5,000	399	5	Late March	884	4	Early April	843	4	Late March	905	4	Late March

The impact of the earliest closure in the Central GOA is estimated to be 37,000 mt of harvest, \$50 million in first wholesale revenue, and 3,500 avoided Chinook PSC. The impact of the latest closure in the Central GOA is estimated to be 7,000 mt of harvest, \$10 million in first wholesale revenue, and 900

avoided Chinook PSC. The impact of the earliest closure in the Western GOA is estimated to be 7,500 mt of harvest, \$8.5 million in first wholesale revenue, and 550 avoided Chinook PSC. The impact of the latest closure in the Western GOA is estimated to be 250 mt of harvest, \$0.3 million in first wholesale revenue, and 25 avoided Chinook PSC.

Table ES-12 Estimated maximum impacts on the non-Rockfish Program fishery under a Chinook salmon PSC limit apportioned by regulatory area with a Rockfish Program carve-out, Options 1 & 4 (2007 to 2011)

Total GOA PSC Limit	Central GOA			Western GOA		
	PSC Limit	# Years Closed	Earliest Closure	PSC Limit	# Years Closed	Earliest Closure
12,500	9,888 - 7,148	0 - 1	Dec	2,264 - 909	0 - 1	Early July
10,000	7,641 - 5,162	0 - 2	Late Sept.	1,749 - 657	0 - 1	Late April
7,500	5,394 - 3,177	2 - 3	Mid April	1,235 - 404	1 - 2	Late April
5,000	3,146 - 1,191	3 - 5	Early April	720 - 152	1 - 4	Late Feb

The impact of the earliest closure in the Central GOA is estimated to be 34,000 mt of harvest, \$64 million in first wholesale revenue, and 4,100 avoided Chinook PSC. The impact of a September closure in the Central GOA is estimated to be 8,000 mt of harvest, \$15 million in first wholesale revenue, and 1,200 avoided Chinook PSC. The impact of the earliest closure in the Western GOA is estimated to be 10,000 mt of harvest, \$17.5 million in first wholesale revenue, and 480 avoided Chinook PSC. The impact of the latest closure in the Western GOA is estimated to be 4,500 mt of harvest, \$8 million in first wholesale revenue, and 150 avoided Chinook PSC.

Table ES-13 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by operational type sector, Option 2 (2003 to 2011)

Total GOA PSC Limit	Chinook PSC History						Non-Pollock Groundfish History						
	5 Year			10 Year			5 Year			10 Year			
	Sector PSC Limit	# Years Closed	Earliest Closure	Sector PSC Limit	# Years Closed	Earliest Closure	Sector PSC Limit	# Years Closed	Earliest Closure	Sector PSC Limit	# Years Closed	Earliest Closure	
CP	12,500	6,039	1	Early Oct	6,397	-	-	4,240	2	Early May	4,471	2	Early May
	10,000	4,831	1	Mid May	5,118	1	Mid May	3,392	2	Late April	3,577	2	Early May
	7,500	3,823	2	Mid May	3,838	2	Mid May	2,544	6	Late April	2,683	5	Late April
	5,000	2,418	6	Late April	2,559	6	Late April	1,696	8	Late March	1,789	8	Late March
CV	12,500	6,480	-	-	6,104	-	-	8,260	-	-	8,029	-	-
	10,000	5,168	-	-	4,883	1	Early Nov	6,608	-	-	6,423	-	-
	7,500	3,876	3	Mid July	3,682	3	Early July	4,956	1	Early Nov	4,817	1	Late Oct
	5,000	2,584	4	Early March	2,442	5	Late Feb	3,304	3	Early July	3,211	3	Late April

The impact of the earliest closure to the CP sector is estimated to be 21,000 mt of harvest, \$33 million in first wholesale revenue, and 2,500 avoided Chinook PSC. The impact of a mid-May closure to the CP sector is estimated to be 18,000 mt of harvest, \$28 million in first wholesale revenue, and 1,100 avoided Chinook PSC. The impact of the earliest closure to the CV sector is estimated to be 34,000 mt of harvest, \$44 million in first wholesale revenue, and 2,300 avoided Chinook PSC. The impact of a mid-July closure to the CV sector is estimated to be 15,000 mt of harvest, \$16 million in first wholesale revenue, and 950 avoided Chinook PSC.

Table ES-14 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by operational type sector with a seasonal limit prior to June 1, Options 2 & 3 (2003 to 2011)

Annual PSC Limit	Catcher/Processors						Catcher Vessels					
	50/50			66/34			50/50			66/34		
	Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure
12,500	3,199 - 2,120	1 - 2	Early April	4,222 - 2,798	0 - 1	Late April	4,130 - 3,052	-	-	5,452 - 4,029	-	-
10,000	2,559 - 1,696	1 - 3	Early April	3,378 - 2,239	1 - 2	Mid April	3,304 - 2,442	0 - 1	Late April	4,381 - 3,223	-	-
7,500	1,919 - 1,272	3 - 4	Early April	2,533 - 1,679	1 - 3	Early April	2,478 - 1,831	1 - 3	Mid April	3,271 - 2,417	0 - 1	Late April
5,000	1,280 - 848	4	Early April	1,889 - 1,119	3 - 4	Early April	1,852 - 1,221	3	Mid April	2,181 - 1,612	2 - 3	Mid April

The impact of the earliest closure to the CP sector is estimated to be 3,700 mt of harvest, \$4.1 million in first wholesale revenue, and 1,700 avoided Chinook PSC. The impact of the latest closure to the CP sector is estimated to be 1,800 mt of harvest, \$1.9 million in first wholesale revenue, and 800 avoided Chinook PSC. The impact of the earliest closure to the CV sector is estimated to be 7,000 mt of harvest, \$8 million in first wholesale revenue, and 900 avoided Chinook PSC. The impact of the latest closure to the CV sector is estimated to be 4,500 mt of harvest, \$5 million in first wholesale revenue, and 600 avoided Chinook PSC.

Table ES-15 Estimated maximum impacts on the non-Rockfish Program fishery under a Chinook salmon PSC limit apportioned by operational type sector with a Rockfish Program carve-out, Options 2 & 4 (2007 to 2011)

Total GOA PSC Limit	Catcher/Processors			Catcher Vessels		
	PSC Limit	# Years Closed	Earliest Closure	PSC Limit	# Years Closed	Earliest Closure
12,500	5,799 - 3,134	0 - 1	Late April	7,170 - 4,255	0	-
10,000	4,481 - 2,263	0 - 3	Mid April	5,540 - 3,073	0 - 2	Early Oct
7,500	3,163 - 1,393	1 - 5	Early April	3,911 - 1,891	1 - 3	Late April
5,000	1,845 - 522	4 - 5	Mid March	2,281 - 709	2 - 5	Mid April

The impact of the earliest closure to the CP sector is estimated to be 18,000 mt of harvest, \$28 million in first wholesale revenue, and 2,300 avoided Chinook PSC. The impact of a mid-April closure to the CP sector is estimated to be 17,500 mt of harvest, \$27.5 million in first wholesale revenue, and 1,400 avoided Chinook PSC. The impact of the earliest closure to the CV sector is estimated to be 22,000 mt of harvest, \$28.5 million in first wholesale revenue, and 2,250 avoided Chinook PSC. The impact of the latest closure to the CV sector is estimated to be 4,000 mt of harvest, \$5 million in first wholesale revenue, and 950 avoided Chinook PSC.

Table ES-16 Estimated maximum impacts on the non-Rockfish Program fishery under a Chinook salmon PSC limit apportioned by operational type sector with a Rockfish Program carve-out and a seasonal limit prior to June 1, Options 2, 3 & 4 (2007 to 2011)

Total GOA PSC Limit	Sector	Seasonal Split	1,500 RP Carve-Out			2,500 RP Carve-Out			3,500 RP Carve-Out		
			Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure	Jan-May Limit	# Years Closed	Earliest Closure
12,500	CP	50/50	2,900 - 1,915	1 - 3	Early April	2,838 - 1,741	1 - 3	Early April	2,372 - 1,567	1 - 3	Early April
		66/34	3,828 - 2,528	0 - 1	Mid April	3,480 - 2,288	1 - 2	Mid April	3,132 - 2,068	1 - 3	Early April
	CV	50/50	3,585 - 2,600	-	-	3,259 - 2,384	0 - 1	Late April	2,933 - 2,127	0 - 1	Late April
		66/34	4,732 - 3,432	-	-	4,302 - 3,120	-	-	3,872 - 2,808	-	-
10,000	CP	50/50	2,241 - 1,480	2 - 3	Early April	1,977 - 1,306	3 - 4	Early April	1,713 - 1,132	3 - 4	Early April
		66/34	2,958 - 1,953	0 - 3	Early April	2,810 - 1,724	1 - 3	Early April	2,282 - 1,494	2 - 3	Early April
	CV	50/50	2,770 - 2,009	0 - 1	Late April	2,444 - 1,773	1 - 2	Mid April	2,118 - 1,537	1 - 2	Mid April
		66/34	3,657 - 2,652	-	-	3,228 - 2,340	0 - 1	Late April	2,788 - 2,028	0 - 1	Late April
7,500	CP	50/50	1,582 - 1,045	3 - 4	Early April	1,318 - 871	4	Early April	1,054 - 698	4 - 5	Late March
		66/34	2,088 - 1,379	3 - 4	Early April	1,740 - 1,149	3 - 4	Early April	1,392 - 919	4	Early April
	CV	50/50	1,955 - 1,418	1 - 2	Mid April	1,630 - 1,182	2	Mid April	1,304 - 948	2	Mid April
		66/34	2,581 - 1,872	0 - 2	Late April	2,151 - 1,580	1 - 2	Mid April	1,721 - 1,248	2	Mid April
5,000	CP	50/50	923 - 609	4 - 5	Mid March	689 - 435	5	Mid March	395 - 261	5	Early March
		66/34	1,218 - 804	4	Early April	870 - 575	4 - 5	Mid March	522 - 345	5	Early March
	CV	50/50	1,141 - 827	2 - 3	Mid April	815 - 591	3 - 4	Mid April	489 - 355	4	Late/Feb
		66/34	1,508 - 1,092	2	Mid April	1,075 - 780	2 - 3	Mid April	645 - 488	4	Early April

The impact of the earliest closure to the CP sector is estimated to be 4,700 mt of harvest, \$5.4 million in first wholesale revenue, and 1,930 avoided Chinook PSC. The impact of the latest closure to the CP sector is estimated to be 2,300 mt of harvest, \$2.6 million in first wholesale revenue, and 850 avoided Chinook PSC. The impact of the earliest closure to the CV sector is estimated to be 12,700 mt of harvest, \$14 million in first wholesale revenue, and 1,100 avoided Chinook PSC. The impact of the latest closure to the CV sector is estimated to be 5,300 mt of harvest, \$5.9 million in first wholesale revenue, and 800 avoided Chinook PSC.

Table ES-17 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by regulatory area and by operational type sector, Options 1 & 2 (2003 to 2011)

Total GOA PSC Limit	Chinook PSC History						Non-Pollock Groundfish History					
	5 Year			10 Year			5 Year			10 Year		
	Sector PSC Limit	# Years Closed	Earliest Closure	Sector PSC Limit	# Years Closed	Earliest Closure	Sector PSC Limit	# Years Closed	Earliest Closure	Sector PSC Limit	# Years Closed	Earliest Closure
CG CP	12,500	5,129	-	4,782	-	-	2,674	3	Early May	2,851	2	Early May
	10,000	4,103	1	3,834	1	Mid May	2,139	6	Mid April	2,281	5	Mid April
	7,500	3,077	2	2,875	2	Mid May	1,605	6	Mid April	1,711	6	Early April
	5,000	2,052	6	1,917	6	Mid April	1,070	8	Early April	1,140	8	Early April
CG CV	12,500	6,374	-	5,498	-	-	7,719	-	-	7,386	-	-
	10,000	5,099	-	4,369	2	Late Sept	6,175	-	-	5,909	-	-
	7,500	3,824	2	3,299	3	Early July	4,631	1	Late Oct	4,431	2	Mid Sept
	5,000	2,549	4	2,199	7	Mid Feb	3,088	3	Mid May	2,954	3	Late March
WG CP	12,500	910	4	1,604	3	Early May	1,566	2	Late April	1,620	2	Late April
	10,000	728	4	1,284	3	Early April	1,253	4	Late March	1,296	3	Late March
	7,500	548	4	963	4	Early April	939	4	Late March	972	4	Late March
	5,000	384	5	642	4	Late March	626	4	Late March	648	4	Mid March
WG CV	12,500	86	4	606	-	-	541	-	-	643	-	-
	10,000	69	4	485	-	-	433	-	-	514	-	-
	7,500	52	5	363	-	-	325	-	-	386	-	-
	5,000	35	5	242	-	-	216	-	-	257	-	-

Table ES-18 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by regulatory area and by operational type sector with a Rockfish Program carve-out, Option 1, 2 & 4 (2007 to 2011)

Total GOA PSC Limit	CG CP			CG CV			WG CP			WGCV		
	PSC Limit	# Years Closed	Earliest Closure	PSC Limit	# Years Closed	Earliest Closure	PSC Limit	# Years Closed	Earliest Closure	PSC Limit	# Years Closed	Earliest Closure
12,500	4,585 - 1,757	0 - 4	Early April	6,589 - 3,785	0 - 1	Late Oct	1,682 - 831	0 - 1	Late April	628 - 79	0 - 2	Late Feb
10,000	3,543 - 1,269	0 - 4	Early April	5,091 - 2,719	0 - 2	Early Oct	1,300 - 600	0 - 1	Late April	486 - 57	0 - 2	Mid Feb
7,500	2,501 - 781	1 - 5	Early April	3,594 - 1,673	1 - 4	Mid April	918 - 369	1 - 2	Late April	343 - 35	0 - 2	Mid Feb
5,000	1,459 - 293	4 - 5	Early March	2,096 - 628	2 - 5	Early April	635 - 138	1 - 4	Late Feb	200 - 13	0 - 2	Late Jan

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 consequently 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. In the absence of a separate PSC limit for the Rockfish Program, the CP sector is more likely to lose a greater percentage of its 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, or by competing constraints such as halibut PSC. 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.

Shoreside processors may incur additional costs under Alternative 2, Option 4. 200% observer coverage may be required at the plant; this would be in the Full Coverage category (sometimes called "pay as you go"), which is not part of the Partial Coverage and, thus, is outside of the scope of observer deployment through the Annual Deployment Plan and the observer fees that pay for partial coverage. Processors would also need to create a designated salmon storage area in their facility, which may impose a direct cost. Managing a hard cap may also include additional requirements to be met in the Catch Monitoring and Control Plan (CMCP).

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 this portion of the Executive Summary.

Some additional monitoring requirements would be required to implement Alternative 2, and may impose a cost. Rockfish Program CPs will have additional monitoring requirements under Option 4. To ensure accurate counts of salmon PSC that is allocated to an entity, NMFS intends to apply the following additional requirements to the Rockfish Program catcher/processors:

- All salmon bycatch of any species must be retained until it is counted by an observer;
- Vessel crew must transport all salmon bycatch from each haul to an approved storage location adjacent to the observer sampling station so that the observer has free and unobstructed access to the salmon, and the salmon must remain within view of the observer from the observer sampling station at all times;
- The observer must be given the opportunity to count the salmon and take biological samples, even if this requires the vessel crew to stop sorting or processing catch until the counting and sampling is complete;
- The vessel owner must install a video system with a monitor in the observer sample station that provides views of all areas where salmon could be sorted from the catch and the secure location where salmon are stored;
- No salmon bycatch of any species may pass the last point where sorting occurs in the factory; and
- Operators of catcher/processors would be required to submit the count of salmon by species in each haul to NMFS using an electronic logbook.

Under Option 4 there would also be some costs for catcher vessels in the Rockfish Program to provide additional space for a salmon storage location. These costs depend on the current layout of the vessel; however costs are expected to be minimal.

Allowing the observer to count all the salmon in the previous haul prior to the beginning of the next haul may reduce the flow of fish through the factory. The degree to which the processing will be slowed would be highly variable and depend on the number of salmon in each haul. Costs would increase in concert with an increase in the time required to convey fish through the sorting area, increased processing times, and the need to reconfigure conveyor belt and sorting layouts. A video monitoring requirement would be modeled similar to those designed for the Chinook salmon monitoring requirements under Amendment 91 for AFA catcher/processors.

Alternative 3

Alternative 3 would require full retention of Chinook salmon by all unobserved non-pollock trawl vessels. Under the restructured observer program, most CP vessels are 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.

An observer work station for CPs would be required. Almost all CP vessels operating in the GOA already have requirements for an observer workstation as part of the Rockfish and Amendment 80 programs.

Management and Enforcement Considerations

Alternative 1

The new Observer Program makes 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. Under observer restructuring, regardless of length, nearly all GOA catcher/processors (CPs) are included in the full coverage category and carry an observer on every trip.³ In addition, all CPs fishing in Rockfish Program sideboard fisheries or fishing under the authority of a rockfish cooperative fishing quota (CQ) permit are required to carry 2 observers (often called "200% observer coverage") and all GOA catcher vessels (CVs) participating in the Rockfish Program are in the full coverage category and carry an observer on every trip.

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.

Monitoring and enforcement provisions were implemented in the Rockfish Program to ensure that harvesters maintain catches within annual allocations and do not exceed sideboard limits. In addition to the full observer coverage requirements outlined in the previous section, there are several other monitoring requirements for vessels participating in the Rockfish Program. Specifically, NMFS: 1) requires that vessels participating in a rockfish cooperative or a rockfish sideboard fishery carry and use a NMFS-approved VMS transmitter; 2) requires CPs in the program to completed a NMFS-approved electronic logbook; 3) requires that CPs in a rockfish cooperative or rockfish sideboard fishery follow specified catch handling procedures prior to processing; 4) requires the weighing of all catch from rockfish cooperatives on NMFS or State approved scales; and 5) requires that shoreside processors receiving rockfish CQ operate under a NMFS approved Catch Monitoring and Control Plan (CMCP).

Observer sampling aboard CVs in the Rockfish Program is the same as other trawl fisheries besides pollock. However, 100% observer coverage is required so that the vessels in a rockfish cooperative obtain a vessel specific halibut PSC rate to support transferable PSC allocations.

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.

³ 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.

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.

At shoreside processing plants for all CV trawl fisheries other than pollock, biological data are only collected from those salmon encountered within the at-sea composition samples. Biological data are not collected at the shoreside processor. Additionally, no observers are currently assigned to shoreside processors receiving deliveries from CV trawl fisheries other than pollock.

Shoreside processors in the central GOA receiving catch from vessels participating in the Rockfish Program are required to operate under a CMCP that details how the processing plant will ensure that all catch delivered is sorted and weighed to species within view of a CMCP specialist. Biological data are not collected from salmon encountered during the delivery.

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

The implementation of Alternative 2 and the associated PSC limits in the GOA non-pollock trawl fisheries would require various changes to Federal regulations and NMFS management practices, when compared to the status quo. Depending on the options and suboptions selected, these changes would include changes to inseason management, monitoring requirements, catch accounting, and enforcement responsibilities.

PSC limits by fishery (e.g. non-pollock trawl) or area (e.g. Western GOA) or sector (CV and CP) would non-transferable Chinook salmon PSC limits managed by NMFS with a directed fishing closure once this limit was reached. This would be similar to how current PSC limits in the GOA pollock fishery are managed. NMFS would likely need to take a conservative inseason management approach and there are 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.

For the GOA non-pollock trawl fisheries NMFS would consider PSC limits that are less than the historic highest weekly rate for the managed fishery to be too small to manage inseason. For the non-pollock trawl CV and CP sector fisheries these amounts are about 1,500 Chinook salmon a week each for the Central GOA and 1,000 Chinook salmon for the CPs and 100 Chinook salmon for the CVs for the Western GOA. These estimates include the rockfish fisheries. If the fishery that is limited by the Chinook salmon PSC is managed under a catch share program then a lower PSC limit may be possible for an entity to manage accurately.

Catch share programs that include PSC limits to entities, such as the Rockfish Program cooperatives, give participants more specific control over their fisheries. Therefore, the general management approach

changes with catch share programs. Entities that receive allocations generally are prohibited from exceeding their allocations. If they exceed an allocation, NOAA may initiate an enforcement action against the entity. Currently, halibut PSC limits are allocated the Rockfish Program cooperatives. NMFS does not issue fishery closures once these PSC limits are reached. Instead, the cooperatives monitor their halibut PSC relative to their PSC limit and are prohibited from exceeding their halibut PSC limits. PSC limits that were allocated to the Rockfish Program cooperatives could include provision for transfers of Chinook salmon PSC between entities.

PSC accounting of Chinook salmon PSC in GOA fisheries at vessel-specific level would require implementation of sophisticated management and enforcement protocols, such as those implemented under Amendment 91 in the Bering Sea. For example, sorting at sea would need to be curtailed and shoreside processors would need to modify sorting line configurations to allow for sorting and weighing of salmon within view of an observer. In addition, a suite of monitoring tools including additional observer coverage, salmon storage containers, and video monitoring on CPs would need to be implemented. However, 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 developed and the amount of change would be much greater for vessels and shoreside processors than was needed in the BSAI. These monitoring requirements would impose large costs on the industry without the benefit and management infrastructure of a catch share program.

Management of catch limits to a specific entity, like a cooperative, are enforced through regulatory provisions that prohibit the entity from exceeding its allocation, therefore a more comprehensive catch monitoring and accounting system is required compared to managing catch limits at a fishery or sector level. This is particularly true when groundfish catch or PSC data collected by observers must be used as a basis for enforcement action should an entity exceed a catch limit. PSC generally is required to be discarded and PSC often limits the catch of economically valuable target species. The greater the potential to limit the target species catch, the greater the incentive created to not have PSC identified and estimated. Under Option 4, with Chinook salmon PSC limits to Rockfish Program entities, NMFS recommends the following additional monitoring requirements for CVs and CPs that would enable census level accounting of Chinook salmon PSC and ensure effective monitoring and enforcement.

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.

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.