

# **SECRETARIAL REVIEW DRAFT**

Final  
ENVIRONMENTAL ASSESSMENT / REGULATORY IMPACT REVIEW /  
FINAL REGULATORY FLEXIBILITY ANALYSIS

For an 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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## 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	<i>Federal Register</i>
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
RP	Central GOA Rockfish Program
RP CV	Rockfish Program Catcher Vessel
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

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## Executive Summary

This document analyzes proposed management measures that would apply to all groundfish 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 all 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 fisheries<sup>1</sup>. 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

Three iterations of alternatives are presented below. These alternatives propose management measures that would apply exclusively to the directed groundfish non-pollock trawl fisheries in the Western and Central Gulf of Alaska. The first iteration (“Initial alternatives for GOA non-pollock trawl Chinook PSC limits”) was approved by the Council in February 2012, and revised in December 2012. These alternatives were presented to the Council in June 2013, and were the basis for the Council’s initial preferred alternative that was selected at that meeting. The second iteration of the alternatives (“Rockfish Program rollover alternatives”) was approved by the Council during the staff tasking agenda item of the June 2013 meeting, and revised at initial review in October 2013. These alternatives were presented to the Council in December 2013, and the selected preferred alternative has been incorporated into the final Council recommendation for GOA non-pollock trawl Chinook PSC limits. The third iteration synthesizes the Council’s actions in June and December 2013<sup>2</sup>; it represents the final preferred alternative, which is the Council’s recommendation going forward.

Alternatives and Options that were selected for the final preferred alternative are highlighted in **bold**.

#### Initial alternatives for GOA non-pollock trawl Chinook PSC limits

Alternative 1: No Action (Status quo)

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

<sup>2</sup> The third iteration of the alternatives does not include new alternatives, but only selects portions of the previous two iterations.

**Alternative 2:** 5,000, **7,500**, 10,000, or 12,500 Chinook salmon PSC limit (hard cap).

**In any year following a year when a sector's PSC usage is below its proportional share of 6,500 Chinook, the sector shall be allowed to access its share of an uncertainty pool of 1,000 fish (in addition to its share of the 7,500 cap). The sector's share of the uncertainty pool (including any seasonal or fishery specific cap) shall be apportioned in the same manner as the 7,500 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-year average or 10-year average);**
- (b) Apportion proportional to historic average non-pollock groundfish harvest (5-year average 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
- (d) **1,200 (from the CV sector's apportionment)**

**Suboption: Applies only to CGOA Rockfish Program CV sector**

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 1<sup>st</sup>, 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 (*sic*) until the number of salmon has been determined by the vessel observer or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed; if no plant observer is available, all salmon shall be recorded, by species, on the fish ticket.**

Note, both Alternative 2 and Alternative 3 could be selected by the Council in its 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.

*Rockfish Program rollover alternatives recommended at December 2013 Council meeting*

Alternative 1: No action (Council's final recommendation would be the preferred alternative selected from the "Initial alternatives for GOA non-pollock trawl Chinook PSC limits")

Alternative 2: The addition of the rollover provision as described in the EA/RIR to the Rockfish Program CV Chinook PSC cap and uncertainty pool.

Alternative 3: The addition of a provision allowing the rollover of all but 160 Chinook PSC on October 1 and a Rockfish Program CV uncertainty pool.

Alternative 4: Roll over all Chinook PSC remaining in the Rockfish Program CV Chinook PSC cap when all Rockfish cooperatives have checked-out of the fishery, but no later than November 15, and no uncertainty pool for the Rockfish Program CV sector.

**Alternative 5: Roll over all Chinook PSC but 50, 100, or 150 fish remaining in the Rockfish Program CV sector Chinook cap on October 1. Any salmon remaining when the Rockfish Program fishery closes will be released to the other CV non-pollock fisheries on November 15. No uncertainty buffer would apply to the Rockfish Program CV sector.**

#### COUNCIL'S FINAL PREFERRED ALTERNATIVE

**Alternative 2:** 7,500 Chinook salmon PSC limit (hard cap).

In any year following a year when a sector's PSC usage is below its proportional share of 6,500 Chinook, the sector shall be allowed to access its share of an uncertainty pool of 1,000 fish (in addition to its share of the 7,500 cap). The sector's share of the uncertainty pool (including any seasonal or fishery specific cap) shall be apportioned in the same manner as the 7,500 cap.

**Option 2:** Apportion limit by directed fishery operational type (CV and CP).

(a) Apportion proportional to historical average bycatch (*sic*) of Chinook salmon (5-year average):

CP cap = 3,600

CV cap = 3,900

**Option 3:** For the CP sector, no more than 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 catcher vessel sector

(d) 1,200 Chinook PSC (from the CV sector's apportionment)

**Suboption 2:** Roll over all Chinook PSC but 150 fish remaining in the Rockfish Program CV sector Chinook cap on October 1. Any salmon remaining when the Rockfish Program fishery closes will be released to the other CV non-pollock fisheries on November 15. No uncertainty buffer would apply to the Rockfish Program CV sector.<sup>3</sup>

**Alternative 3:** Full retention of salmon

Vessels will retain all salmon bycatch (*sic*) until the number of salmon has been determined by the vessel observer or plant observer and the observer's collection of

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<sup>3</sup> Suboption 2: was identified as Alternative 5 for the purposes of the Council's December 2013 action which focused on the roll over (reallocation of PSC) from the Rockfish Program CVs to the non-Rockfish Program CVs of 150 Chinook salmon. To be consistent with the structure of the Council's final preferred alternative Option 4: PSC limit for the CGOA Rockfish Program, Alternative 5, is nested under the Alternative 2, Option 4, within the Rockfish Program apportionment of PSC.

any scientific data or biological samples from the salmon has been completed; if no plant observer is available, all salmon shall be recorded, by species, on the fish ticket.

Table ES-1 provides the proposed PSC limits for the non-pollock trawl fisheries under Alternative 2, and each option to Alternative 2. The PSC limits that were selected for the Council's final preferred alternative are similar to those listed in the following tables and analyzed in this document. The limits listed in table ES-1 differ from the final selected PSC limits by rounding; for example, under the final preferred alternative the CP sector would be apportioned 3,600 Chinook salmon, compared to 3,623 listed in the table below.

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

			Historical basis for average apportionment	5-Year Avg. (2007 through 2011)					10-year Avg. (2002 through 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	Chinook	52%	6,460	5,168	3,876	2,584	49%	6,104	4,883	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	3,838	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	Chinook	1%	86	69	52	35	5%	606	485	363	242
			Groundfish	4%	541	433	325	216	5%	643	514	386	257
		Catcher Processors	Chinook	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	Chinook	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	Chinook	41%	5,129	4,103	3,077	2,052	38%	4,792	3,834	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 shows the proposed Chinook PSC carve-outs that could be separately apportioned to the Central GOA Rockfish Program (RP) under Alternative 2, Option 4; it also shows how such a carve-out would be further apportioned to the two operational type sectors of the RP under Suboption 1. Table ES-3 shows how the remaining Chinook salmon PSC would be apportioned under the various Alternative 2 scenarios once a separate apportionment for the RP (both sectors) has been made. Tables ES-2 and ES-3 do *not* show a fourth considered carve-out scenario, where 1,200 Chinook salmon PSC are taken from the GOA non-pollock CV sector apportionment and assigned to the CV sector of the RP. This fourth scenario, with no further apportionment to RP CV cooperatives, was ultimately selected for the preferred alternative. The Council also included a version of Alternative 2, Option 4, Suboption 2 in its final preferred alternative. Any amount of RP CV Chinook PSC that remains from the sector's apportionment (1,200 Chinook) as of October 1 are rolled over to the non-RP CV sector, less 150 Chinook PSC that remain with the RP CV sector to support fishing through the season's end on November 15; all Chinook PSC that remain from the 150 that are held back will then roll over to the non-RP CV sector on November 15.



**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 through 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**

			Historical basis for average apportionment	5-Year Avg. (2007 through 2011)				10-year Avg. (2002 through 2011)					
GOA-wide Chinook cap				12,500	10,000	7,500	5,000		12,500	10,000	7,500	5,000	
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	Chinook	51%	5,600	4,327	3,055	1,782	53%	5,799	4,481	3,163	1,845
		Processors	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	Chinook	51%	5,091	3,818	2,545	1,273	53%	5,272	3,954	2,636	1,318
		Processors	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	Chinook	51%	4,582	3,309	2,036	764	53%	4,745	3,427	2,109	791
		Processors	Groundfish	35%	3,134	2,263	1,393	522	36%	3,278	2,368	1,457	546

Table ES-4 shows the range of resulting seasonal apportionments for activity prior to June 1, if Alternative 2, Option 3 is included with the various other area and sector apportionments under consideration, including the carve-out for the entire RP (both sectors). **The Council ultimately chose to apply Option 3 (at 66%) to only the CP sector.**

**Table ES-4 Maximum amount of proposed PSC limits for non-pollock trawl fisheries that could be used before June 1<sup>st</sup>, 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	Historical basis for average apportionment	5-Year Average (2007 through 2011)				10-year Average (2002 through 2011)			
GOA-wide Chinook cap					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
			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
		Catcher Processors	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
			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
		Catcher Processors	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
			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
		Catcher Processors	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
			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
		Catcher Processors	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

### Uncertainty pool mechanism

The Council considered a provision to incentivize taking fewer Chinook PSC than the amount set by the hard cap, while also providing sectors that perform well with a moderate amount of flexibility around their PSC apportionment in the case of a subsequent year with high Chinook encounter. This “uncertainty pool mechanism” allows any sector that performs to a defined Chinook salmon avoidance threshold in one year to access, if necessary, additional Chinook PSC in the following year. This additional PSC that is available in the following year is referred to as the “uncertainty buffer.” The buffer can be thought of as an insurance policy that must be earned in every year. Table ES-5 shows the apportionment of the total Chinook PSC limit to each of the three sectors that are defined in the Council’s preferred alternative, where the total GOA non-pollock trawl Chinook PSC cap is 7,500 fish per year, and the Central GOA Rockfish Program CV sector is apportioned 1,200 fish from the total CV sector hard cap of 3,900 fish. A sector’s performance in relation to the uncertainty pool threshold does not affect, nor is it affected by, the performance of other sectors. For the preferred alternative, the Council could choose to apply the uncertainty pool mechanism to each of the three sectors, or could selectively apply it only to certain sectors. Note that if a sector performs within its uncertainty pool threshold in a year (Year 1), and continues to do so in subsequent years (Year 2), the sector’s effective maximum allowable amount of PSC will never exceed its base PSC limit, plus its uncertainty pool buffer. A sector that earns an uncertainty buffer for Year 1, and then does so again in Year 2, is held to the same performance standard (threshold) that it faced in Year 1 in order to maintain the benefit of the uncertainty buffer in the following year (Year 3). These limits guarantee that the incentive to avoid Chinook salmon does not decrease over time, even if past performance has been good.

**Table ES-5 Chinook salmon PSC limit apportionment, uncertainty pool performance thresholds and buffer sizes, as they would exist for each of the three sectors defined in the Council’s preferred alternative**

		Rockfish Program Catcher Vessels	Non-Rockfish Program Catcher Vessels	Catcher/Processors
<i>Apportionment Share</i>		<i>16%</i>	<i>36%</i>	<i>48%</i>
Base PSC Limit	<b>7,500</b>	1,200	2,700	3,600
Uncertainty Pool Threshold	<b>6,500</b>	1,040	2,340	3,120
Uncertainty Pool Buffer	<b>1,000</b>	160	360	480

### Council’s final Preferred Alternative

The Council’s final PA includes six elements:

- (1) A long-term average PSC limit of 7,500 Chinook salmon per year for the combined Western and Central GOA non-pollock trawl fisheries;
- (2) Apportionment of the annual PSC limit between three sectors:
  - 3,600 Chinook PSC: Catcher/Processors (CP),
  - 1,200 Chinook PSC: Rockfish Program Catcher Vessels (RP CV) – i.e., CVs operating under the authority of a rockfish cooperative fishing quota permit,
  - 2,700 Chinook PSC: Non-Rockfish Program Catcher Vessels (non-RP CV) – i.e., all other the non-pollock trawl CV activity within the action area;
- (3) A seasonal Chinook PSC limit for the CP sector;

- (4) An incentive buffer (the “uncertainty pool mechanism”) for the CP and the non-RP CV sectors that provides a sector with additional PSC, if that sector met a certain Chinook avoidance threshold in the preceding year;
- (5) Two in-season rollovers of unused Chinook salmon PSC from the RP CV sector to the non-RP CV sector, occurring on October 1 and at the end of the Rockfish Program season on November 15;
- (6) Full retention of all salmon.

## **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 through 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. The years with the highest Chinook salmon PSC during this time period were 2003 and 2010, 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 currently available; however, the GOA groundfish fisheries have been documented to catch Chinook salmon from Southeast Alaska, Cook Inlet, and the Pacific Northwest 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, 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 Chinook salmon escapement failures. 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.

The preferred alternative would establish 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 affected by some other source of natural or fishing mortality. In the GOA non-pollock trawl fisheries, data are 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 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 no action alternative. 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 the preferred alternative 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 PSC rates on the fishing grounds and the participants' ability to accurately estimate Chinook salmon PSC 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 the preferred alternative, it appears unlikely that Chinook salmon PSC would increase from the no action alternative. Any impact to the Chinook salmon stocks as a whole, is likely to represent either no change from the no action alternative, 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 preferred alternative, 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 the preferred alternative.

## **Regulatory Impact Review**

### Alternative 1

Selecting the no action alternative would maintain the current regulations in the action area. Directed GOA non-pollock groundfish trawl fisheries would not be closed due to Chinook salmon PSC. 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 Chinook salmon PSC, 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, 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 through 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 no action 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 could make remaining 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-6 summarizes the percentage of the hard cap apportioned to each user group, depending on which scenario and set of historical determinants the Council chooses. The Council ultimately selected a 5-year historical average of Chinook PSC to be applied to Option 2, resulting in a 52%/48% apportionment between the CV and CP sectors, respectively.

**Table ES-6 Percentage of annual Chinook salmon PSC limit apportioned to each trawl 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-7 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-7      2011 gross first wholesale value per metric ton of harvest**

<b>Target</b>	<b>First wholesale value (\$/mt)</b>				
	<b>CGOA</b>	<b>WGOA</b>	<b>CP</b>	<b>CV</b>	<b>Aggregate</b>
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.<sup>4</sup> Tables ES-8 through ES-19 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 both sectors of 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 through 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 groundfish harvest outcomes would be zero for permutations of the Alternative 2 options that would not have triggered a closure during the analyzed period.

**Table ES-8      Estimated maximum impacts under a Gulf-wide Chinook salmon PSC limit (2003 through 2011)**

<b>PSC Limit</b>	<b># Years Closed</b>	<b>Earliest Closure Week</b>
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.

<sup>4</sup> 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 under a Gulf-wide PSC limit with a seasonal limit prior to June 1, Option 3 (2003 through 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.

**Table ES-10 Estimated maximum impacts on the non-Rockfish Program fishery under a Gulf-wide PSC limit with a Rockfish Program carve-out, Option 4 (2007 through 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 from 2007 through 2012 was 1,357 Chinook salmon.

**Table ES-11 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 through 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-12 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by regulatory area, Option 1 (2003 through 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	6,236	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	797	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, \$300,000 in first wholesale revenue, and 25 avoided Chinook PSC.

**Table ES-13 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 through 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-14 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by operational type sector, Option 2 (2003 through 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	3,623	2	Mid May	3,838	2	Mid May	2,544	6	Late April	2,683	5	Late April
	5,000	2,416	6	Late April	2,559	6	Late April	1,696	8	Late March	1,789	8	Late March
CV	12,500	6,460	-	-	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	3,662	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-15 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 through 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	4,361 - 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	1,689 - 1,119	3 - 4	Early April	1,652 - 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-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, Options 2 & 4 (2007 through 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	2281 - 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-17 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 through 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	2,636 - 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 - 2,298	1 - 2	Mid April	3,132 - 2,068	1 - 3	Early April
	CV	50/50	3,585 - 2,600	-	-	3,259 - 2,364	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	2,610 - 1,724	1 - 3	Early April	2,262 - 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	-	-	3,226 - 2,340	0 - 1	Late April	2,796 - 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 - 696	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 - 946	2	Mid April
		66/34	2,581 - 1,872	0 - 2	Late April	2,151 - 1,560	1 - 2	Mid April	1,721 - 1,248	2	Mid April
5,000	CP	50/50	923 - 609	4 - 5	Mid March	659 - 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	1,506 - 1,092	2	Mid April	1,075 - 780	2 - 3	Mid April	645 - 468	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-18 Estimated maximum impacts under a Chinook salmon PSC limit apportioned by regulatory area and by operational type sector, Options 1 & 2 (2003 through 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	-	-	4,792	-	-	2,674	3	Early May	2,851	2	Early May
	10,000	4,103	1	Early Oct	3,834	1	Mid May	2,139	6	Mid April	2,281	5	Mid April
	7,500	3,077	2	Mid May	2,875	2	Mid May	1,605	6	Mid April	1,711	6	Early April
	5,000	2,052	6	Late April	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	-	-	4,399	2	Late Sept	6,175	-	-	5,909	-	-
	7,500	3,824	2	Mid July	3,299	3	Early July	4,631	1	Late Oct	4,431	2	Mid Sept
	5,000	2,549	4	Mid March	2,199	7	Mid Feb	3,088	3	Mid May	2,954	3	Late March
WG CP	12,500	910	4	Early April	1,604	3	Early May	1,566	2	Late April	1,620	2	Late April
	10,000	728	4	Late March	1,284	3	Early April	1,253	4	Late March	1,296	3	Late March
	7,500	546	4	Late March	963	4	Early April	939	4	Late March	972	4	Late March
	5,000	364	5	Late March	642	4	Late March	626	4	Late March	648	4	Mid March
WG CV	12,500	86	4	Early Feb	606	-	-	541	-	-	643	-	-
	10,000	69	4	Early Feb	485	-	-	433	-	-	514	-	-
	7,500	52	5	Early Feb	363	-	-	325	-	-	386	-	-
	5,000	35	5	Early Feb	242	-	-	216	-	-	257	-	-

**Table ES-19 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			WG CV		
	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 - 3,765	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	535 - 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. Sixty percent 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 the operator 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 received 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 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. Two hundred percent 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 U.S. 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 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 apportioned to an entity, NMFS intends to apply the following additional requirements to the Rockfish Program catcher/processors:

- All salmon PSC of any species must be retained until it is counted by an observer;
- Vessel crew must transport all salmon PSC 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 PSC 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 advance understanding of the stock origin of Chinook salmon taken as PSC. This 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.

### Council's final Preferred Alternative

The Council gave careful consideration to the selection of the total Chinook PSC cap level for non-pollock trawl fisheries, ultimately arriving at 7,500. The considered range included cap levels from 5,000 to 12,500 Chinook salmon per year. The low end of the range falls below the GOA non-pollock trawl fishery's historical average Chinook PSC use, which is around 6,000 fish per year. The upper end of the range was selected in view of 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); it also encompasses the highest year of historical non-pollock Chinook PSC (10,877 fish in 2003). The options under Alternative 2 were examined according to the number of fishery closures and the timing of those closures as they would have occurred during the 2003 through 2011 historical period. The emerging trade-offs to consider centered around the amount of Chinook salmon that would not have been taken if the fishery had closed, and the amount or value of the groundfish that would not have been landed.

The selected limit of 7,500 Chinook salmon PSC reflects the Council's intent to balance two objectives: minimizing Chinook PSC to the extent practicable, and preserving the potential for the full harvest of trawl groundfish fishery TACs. The Council explicitly recognized that the Chinook salmon resource is currently fully utilized, and it is valuable to many stakeholder groups. These stakeholder groups are diverse, including but not limited to commercial, recreational, and cultural users. The Council recognized that Chinook salmon conservation is necessary, and that selecting a high hard cap level could place the majority of the conservation burden on non-trawl user groups. At the same time, the Council also recognized that the GOA non-pollock trawl fisheries provide important cultural and economic benefits to GOA coastal port and processing communities, as well as fish tax revenues for the State of Alaska. As such, selecting a hard cap level that is expected to dramatically curtail the groundfish season could have a foreseeable direct adverse impact on an array of stakeholders, including harvesters, plant workers, and fishery supporting businesses. Given the limitations in current knowledge about the linkage between trawl

interception of Chinook salmon in the GOA and Chinook returns to Alaska and Pacific Northwest rivers, the Council selected the hard cap level that it deemed to strike the most equitable balance of required conservation action.

The Council selected the option to apportion Chinook salmon PSC between the CV and CP sectors, in accordance with historical PSC levels over the analyzed 5-year period (2007 through 2011). The choice of sector-level apportionment was largely based on two factors: first, the sectors have significantly different fishing plans in terms of timing and key target species; second, the sectors currently experience very different levels of observer coverage. The resulting split apportions 52% of the total GOA non-pollock PSC limit to the CV sector, and 48% to the CP sector. **The final recommended annual limits are 3,900 and 3,600 Chinook salmon per year, for the CV and CP sectors, respectively.**

The Council also took apportionment measures to preserve fishing opportunities in the Rockfish Program fishery, which has become a relatively high-value fishery since implementation. Both the CP and the CV sectors of the RP fishery are managed through harvester cooperatives, and, thus, have additional tools available to aid in mitigating Chinook salmon encounter. The Council recommended a seasonal PSC limit as a measure to ensure that sufficient Chinook PSC is available to open the CP sector of the Central GOA Rockfish Program fishery and to prosecute rockfish in the Western GOA limited access fishery. CPs historically begin fishing RP quota at the beginning of June. Under the preferred alternative, directed fishing by CPs operating in the GOA non-pollock trawl fishery would be closed until June 1<sup>st</sup> if the sector, in aggregate, takes 66% of its annual PSC apportionment of 3,600 Chinook prior to that date. The Council chose to make a separate Chinook PSC apportionment for the Rockfish Program CV sector, to the same end of ensuring the ability to open the RP fishery. This apportionment of 1,200 Chinook PSC would be “carved out” of the total CV sector apportionment of 3,900 Chinook PSC, leaving 2,700 Chinook to support non-Rockfish Program CV activity throughout the year. The RP CV apportionment is not further apportioned to individual cooperatives within that sector, so the cooperatives are collectively responsible for fishing within the 1,200 Chinook limit. Residual Chinook PSC from the RP CV apportionment will be rolled over to the non-RP CV sector. All but 150 of the remaining PSC will be rolled over on October 1, and whatever remains on November 15 will be rolled over on that date. The Council selected October 1 because, historically, most RP CV activity is completed by this date. October 1 is also a key time in the non-RP CV fishery, as it falls during the Pacific cod B season. Should the non-RP CV sector be closed on PSC due to high Chinook encounter in the spring and early summer, the rollover will allow the valuable Pacific cod fishery to open. The Council chose to hold back 150 Chinook PSC from the initial rollover – as opposed to lower considered hold-back amounts – in order to allow for the full harvest of RP quota, especially noting that salmon avoidance measures, new halibut PSC regulations, and other unpredictable factors may push back the start of the RP CV sector’s activity in future years. Table ES-20 shows the rollovers that would have occurred during the relevant historical time period.

**Table ES-20 Historical October 1 Chinook PSC rollover amount under the preferred alternative, 2007 through 2012**

<b>Year</b>	<b>Oct. 1 PSC Rollover</b>
2007	585
2008	n/a
2009	277
2010	85
2011	682
2012	233
<b>Average*</b>	<b>372</b>

\* Includes only years in which a rollover would have occurred



The Council's preferred alternative includes a provision to incentivize taking fewer Chinook PSC than the amount set by the limit, while also providing sectors that perform well with a moderate amount of flexibility around their PSC apportionment in the case of a subsequent year with high PSC encounter. The Council's final recommendation includes the following incentive structure, termed the "uncertainty pool," which would apply only to the CP sector and the non-Rockfish Program CV sector. The Council acknowledged that hard cap measures could potentially result in a sector being indifferent to the amount of PSC encountered, so long as it does not trigger a fishery closure. To promote further Chinook avoidance, a sector that records less than its proportional share of a 6,500 Chinook salmon total hard cap in one year would be allowed to access up to its proportional share of 1,000 *additional* Chinook in the following year. The Council chose not to include the RP CV sector in this mechanism, noting that its apportionment of 1,200 Chinook PSC is likely adequate to absorb intermittent high-PSC events. The Council further noted that including the RP CV sector would require a reduction in the amount of Chinook PSC that is eligible to be "rolled over" to the non-RP CV sector on October 1; both analysis and stakeholder input indicated that the sector would derive a greater benefit from a larger rollover than from access to an uncertainty buffer. Based on the analyzed historical years during which the Rockfish (Pilot) Program was in place – 2007 through 2012 – the CP and non-RP CV sectors would have fished within the uncertainty pool threshold more often than not.

## **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.<sup>5</sup> 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

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<sup>5</sup> 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.

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. 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 accuracy 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 relatively 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.

Chinook salmon PSC limits – by fishery (e.g. non-pollock trawl), by area (e.g. Western GOA), or by sector (CV and CP) would be non-transferable. These limits would be managed by NMFS, and reaching the limit would trigger a directed fishing closure. 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 historical 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.

Accounting of Chinook salmon PSC in GOA fisheries at the 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, is 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 has recommended additional monitoring requirements for CVs and CPs that would enable census level accounting of Chinook salmon PSC and would 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, a very unsatisfactory procedure.

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.

# 1 Introduction

This document analyzes proposed management measures that would apply to all groundfish 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 all 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 an Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA). An EA/RIR/IRFA provides assessments of the environmental impacts of an action and its reasonable alternatives (the EA), the economic benefits and costs of the action alternatives, as well as their distribution (the RIR), and the impacts of the action on directly regulated small entities (the IRFA). This EA/RIR/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 EA/RIR/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 GOA trawl fisheries. 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<sup>6</sup>. 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 GOA trawl fisheries, which also intercept Chinook salmon. Under the regulations, it is incumbent upon fishermen to avoid catching Chinook salmon; however, the Council has determined that it is necessary to evaluate management measures to protect against the risk of high Chinook salmon PSC in future years.

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 (sic) in the non-pollock GOA trawl fisheries, which currently do not have a Chinook salmon bycatch (sic) control measure.*

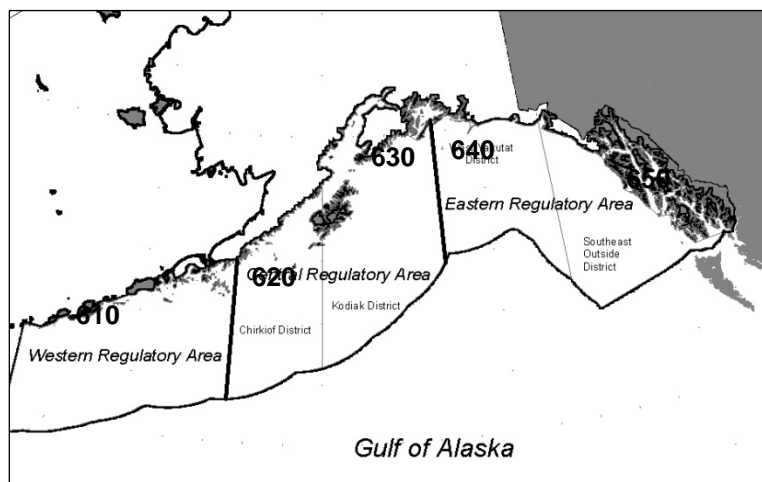
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<sup>6</sup> Except when their retention is authorized by other applicable law for biological sampling or for programs such as the Prohibited Species Donation Program.

## 1.2 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. The action would not regulate the Eastern GOA regulatory areas (640, 649, 650, and 659). 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. Overall, the Eastern GOA accounts for less than 2 percent of total GOA Chinook salmon PSC.

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



## 1.3 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.” The term “economic discards” refers to commercially captured fish for which access to a sufficiently compensating market does not exist, and are therefore not retained.

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<sup>7</sup>. 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.

<sup>7</sup> Except when retention is authorized by other applicable law for biological sampling or for programs such as the Prohibited Species Donation Program.

## 1.4 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 PSC 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 comprehensive Chinook salmon PSC management in all GOA trawl fisheries and to evaluate a broader suite of bycatch and PSC 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 of 25,000 Chinook salmon for the Central and Western GOA pollock fisheries. 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 bycatch management 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 that 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 suite of alternatives and the scope of the comprehensive amendment package, focusing 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 2.6. Note, the Council has continued to pursue a separate agenda item that would provide the fleet with a broader array of tools with which to manage the reduction of PSC – both Chinook salmon and Pacific halibut – in the GOA; since February 2013, that agenda item has been (albeit, technically incorrectly) referred to as GOA Trawl Bycatch Management.

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 Chinook salmon PSC 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 PSC 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 alternatives considered in this 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.<sup>8</sup> Moreover, the Council wanted to maintain the flexibility allowed by analyzing the higher limit, given the imprecision of data on 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 PSC allowances for some sectors. 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).

The Council initially reviewed this analysis in December 2012. Following that review, the Council made several revisions to Alternative 2, including the addition of an option to make a separate apportionment of Chinook salmon PSC to the Central GOA Rockfish Program (RP). An option limiting the amount of a sector's annual Chinook PSC apportionment that could be taken prior to June 1 was also added. In June 2013, the Council took final action, selecting a preferred alternative (PA) for Chinook PSC limits in the GOA non-pollock trawl fisheries. The preferred alternative included the option to create a separate Chinook PSC apportionment for the CV sector of the Rockfish Program. At the time of final action, the Council also included in its PA an incentive program – called an “uncertainty pool,” and described in Section 2.2.4 – which incentivized Chinook avoidance beyond simply meeting the apportioned hard cap PSC limit, while also providing a small amount of flexibility in the PSC hard cap for a sector that had successfully met a lower Chinook PSC threshold in the preceding year. Including the uncertainty pool mechanism in the selected PA did not open up the possibility of allowing a greater amount of Chinook salmon PSC during any given year than those PSC levels that had been analyzed and presented to the Council, and that are included in this document. Nevertheless, having included the uncertainty pool, the Council determined that it was not prudent to select an option that would have allowed unused Chinook PSC from the Rockfish Program CV sector's annual apportionment to “roll over” and be made available to support other non-pollock CV fishing activity towards the end of the calendar year. The Council recognized that a preferred alternative including both the uncertainty pool and the Rockfish Program rollover provision had not been analyzed and presented to the Council's advisory bodies and the public. As a result, the Council initiated a trailing action, directing the analysts to examine whether or not the June 2013 PA could be modified to include the Rockfish rollover provision without compromising the selected Chinook hard cap limits or the efficacy and intent of the uncertainty pool mechanism. An initial review of alternatives for the trailing action (modification of the existing PA) was presented in October 2013, and the Council took final action on it in December 2013. Both sets of alternatives are listed in Section 2, and the resulting combined preferred alternative for Chinook PSC limits in the GOA non-pollock trawl fisheries is listed separately.

## **1.5 Other Relevant Council Actions**

In recent years, the Council has demonstrated its commitment to reducing PSC (Chinook salmon, “other” salmon, Pacific halibut, crab) in the GOA fisheries. However, participants, particularly in the Central GOA fisheries, 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 would help fleets in achieving PSC reductions.

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<sup>8</sup> NOAA catch accounting estimated Chinook salmon PSC at 10,877 in 2003 for the affected fisheries.



In October 2012, the Council approved both a purpose and need statement and goals and objectives, for a PSC and bycatch management program in the Central GOA trawl fisheries. The Council revised its purpose and need statement in February 2013 to include trawl fisheries in the other GOA trawl management areas. The purpose of the proposed analysis is to create a new management structure for the GOA trawl fisheries that mitigates the impacts of a derby-style race for fish, and may allocate allowable harvest and/or PSC to individuals, cooperatives, or other entities. 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 program that may allocate catch quota could induce speculative entry to the fisheries. Members of the public testified that there is already evidence of increased participation in GOA groundfish fisheries. To dampen this effect, the Council stated that it may not credit Central GOA trawl catch history that occurred after December 31, 2012, for purposes of making any allocation under a future fishery management program. The Council issued a similar statement pertaining to Western GOA trawl catch history, setting March 1, 2013, as the control date.

The Council reviewed preliminary discussion papers on aspects of a PSC and bycatch management program in June and October 2013. These reports addressed the role of the Council in establishing cooperatives, potential interactions with state-waters management, effects of limited duration quota allocations, allocation via auction mechanisms, and potential avenues for the protection of community stability. The Council has also received written proposals from several stakeholder groups that address elements that the public would like to see included in alternatives for a trawl PSC and bycatch management program. The development of alternatives and iterative review of the subsequent analyses will likely mean that this issue will be on the Council's agenda for many meetings before the Council is ready to make a final recommendation.

## 2 Description of Alternatives

Three sets of alternatives are presented below. These alternatives propose management measures that would apply exclusively to the directed non-pollock trawl fisheries in the Western and Central Gulf of Alaska. The first set ("Initial alternatives for GOA non-pollock trawl Chinook PSC limits") was approved by the Council in February 2012, and revised in December 2012. These alternatives were presented to the Council in June 2013, and were the basis for the Council's initial preferred alternative that was selected at that meeting. The second set ("Rockfish Program rollover alternatives") was approved by the Council during the staff tasking agenda item of the June 2013 meeting, and revised at initial review in October 2013. These alternatives were presented to the Council in December 2013, and the selected preferred alternative has been incorporated into the final Council recommendation for GOA non-pollock trawl Chinook PSC limits. The third set synthesizes the Council's actions in June and December 2013; it represents the final preferred alternative, which is the Council's recommendation going forward.

Alternatives and Options that were selected for the final preferred alternative are highlighted in **bold**.

### Initial alternatives for GOA non-pollock trawl Chinook PSC limits

Alternative 1: Status quo.

**Alternative 2: 5,000, 7,500, 10,000, or 12,500 Chinook salmon PSC limit (hard cap).**

**In any year following a year when a sector's PSC usage is below its proportional share of 6,500 Chinook, the sector shall be allowed to access its share of an uncertainty**

**pool of 1,000 fish (in addition to its share of the 7,500 cap). The sector's share of the uncertainty pool (including any seasonal or fishery specific cap) shall be apportioned in the same manner as the 7,500 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:

- (c) **Apportion proportional to historical average PSC of Chinook salmon (5-year average or 10-year average);**
- (d) Apportion proportional to historical average non-pollock groundfish harvest (5-year average 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:**

- (e) 1,500
- (f) 2,500
- (g) 3,500
- (h) 1,200 (from the CV sector's apportionment)**

**Suboption: Applies only to CGOA Rockfish Program CV sector**

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 1<sup>st</sup>, rollover all but 200, 300, or 400 remaining PSC allotted 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 PSC until the number of salmon has been determined by the vessel observer or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed; if no plant observer is available, all salmon shall be recorded, by species, on the fish ticket.**

Note, both Alternative 2 and Alternative 3 could be selected by the Council in its 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.

#### Rockfish Program rollover alternatives

Alternative 1: No action (Council's final recommendation would be the preferred alternative selected from the "Initial alternatives for GOA non-pollock trawl Chinook PSC limits")

Alternative 2: The addition of the rollover provision as described in the EA/RIR to the Rockfish Program CV Chinook PSC cap and uncertainty pool.

Alternative 3: The addition of a provision allowing the rollover of all but 160 Chinook PSC on October 1 and a Rockfish Program CV uncertainty pool.

Alternative 4: Roll over all Chinook PSC remaining in the Rockfish Program CV Chinook PSC cap when all Rockfish cooperatives have checked-out of the fishery, but no later than November 15, and no uncertainty pool for the Rockfish Program CV sector.

**Alternative 5: Roll over all Chinook PSC but 50, 100, or 150 fish remaining in the Rockfish Program CV sector Chinook cap on October 1. Any Chinook PSC allotment remaining when the Rockfish Program fishery closes will be released to the other CV non-pollock fisheries on November 15. No uncertainty buffer would apply to the Rockfish Program CV sector.**

### COUNCIL'S FINAL PREFERRED ALTERNATIVE

**Alternative 2:** A 7,500 Chinook salmon PSC limit (hard cap).

In any year following a year when a sector's PSC performance is below its proportional share of 6,500 Chinook, the sector shall be allowed to access its share of an uncertainty pool of 1,000 fish (in addition to its share of the 7,500 cap). The sector's share of the uncertainty pool (including any seasonal or fishery specific cap) shall be apportioned in the same manner as the 7,500 cap.

**Option 2:** Apportion limit by directed fishery operational type (CV and CP).

(a) Apportion proportional to historical average PSC of Chinook salmon (5-year average):

CP cap = 3,600

CV cap = 3,900

**Option 3:** For the CP sector, no more than 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 catcher vessel sector

(d) 1,200 Chinook PSC (from the CV sector's apportionment)

**Suboption 2:** Roll over all Chinook PSC, but 150 fish, remaining in the Rockfish Program CV sector Chinook cap on October 1. Any Chinook PSC salmon remaining when the Rockfish Program fishery closes will be released to the other CV non-pollock fisheries on November 15. No uncertainty buffer would apply to the Rockfish Program CV sector.

**Alternative 3:** Full retention of salmon

Vessels will retain all salmon PSC until the number of salmon has been determined by the vessel observer or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed; if no plant observer is available, all salmon shall be recorded, by species, on the fish ticket.

## **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 avoided to the extent practicable, injury 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. Other options and suboptions could limit the amount of the Chinook PSC that could be taken prior to June 1 (Option 3), or could create a separate Chinook PSC apportionment for the Central GOA Rockfish Program fishery (Option 4). The following subsections describe the different elements of Alternative 2 that are analyzed in this document, and that could be selected in combination with one another as part of the Council's preferred alternative.

### **2.2.1 Considered range and apportionment of Chinook salmon PSC limits (Options 1 & 2)**

The total PSC limits under consideration for the entire action area are 5,000; 7,500; 10,000; or 12,500 Chinook salmon per year. 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 subdivision of the non-pollock trawl fishery to which the PSC limit applies would be closed for directed fishing if the cap is reached.

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 by operation type (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 either according to historical average Chinook salmon prohibited species catch, or according to historical average harvest of non-pollock groundfish, using either a 5-year or a 10-year average. The 5-year historical period covers 2007 through 2011, and the 10-year historical period covers 2002 through 2011; these years were the most recent available data at the time when the Council was first presented with an initial review of these alternatives, and the subsequent year for which data has since become available falls within the range of the utilized historical data. Table 2-1 shows the analyzed PSC limits for the GOA non-pollock trawl fisheries under Alternative 2, and Options 1 and 2 to Alternative 2. The PSC limits that were selected for the Council's final preferred alternative are similar to those listed in the following tables and analyzed in this document, and differ only due to small rounding from, for example, 3,623 Chinook salmon (Table 2-1) to 3,600 Chinook salmon for the CP sector.

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

			Historical basis for average apportionment	5-Year Avg. (2007 through 2011)					10-year Avg. (2002 through 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	Chinook	52%	6,460	5,168	3,876	2,584	49%	6,104	4,883	3,662	2,442
		Catcher Vessels	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	3,838	2,559
		Catcher Processors	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	Chinook	1%	86	69	52	35	5%	606	485	363	242
		Catcher Vessels	Groundfish	4%	541	433	325	216	5%	643	514	386	257
		Catcher Processors	Chinook	7%	910	728	546	364	13%	1,604	1,284	963	642
		Catcher Processors	Groundfish	13%	1,566	1,253	939	626	13%	1,620	1,296	972	648
	CGOA	Catcher Vessels	Chinook	51%	6,374	5,099	3,824	2,549	44%	5,498	4,399	3,299	2,199
		Catcher Vessels	Groundfish	62%	7,719	6,175	4,631	3,088	59%	7,386	5,909	4,431	2,954
		Catcher Processors	Chinook	41%	5,129	4,103	3,077	2,052	38%	4,792	3,834	2,875	1,917
		Catcher Processors	Groundfish	21%	2,674	2,139	1,605	1,070	23%	2,851	2,281	1,711	1,140

## 2.2.2 Set maximum percentage of the PSC limit that may be taken before June 1 (Option 3)

Option 3 would limit the amount of the annual Chinook PSC hard cap that could be taken before June 1<sup>st</sup>. If the total GOA non-pollock hard cap is apportioned between areas and/or operational type sectors (i.e., if Option 1, Option 2, or Options 1 & 2 are also selected), then each apportioned subdivision of the overall fishery would have its own pre-June seasonal limit. This document analyzes seasonal limits of either 50% or 66% of the annual limit – overall, or apportioned in accordance with Option 1 and/or Option 2. If the fishery or fishery subdivision reaches the seasonal limit, that fishery would be closed until June 1<sup>st</sup>. Option 3 is a usage limit, but not a seasonal apportionment. If the specified proportion of the PSC limit is not taken before June 1<sup>st</sup>, any remainder in the pre-June seasonal PSC limit is still available to be used later in the year.

This option could be chosen in conjunction with Option 4, as well as other options. Option 4 would establish a separate Chinook PSC apportionment for the Central GOA Rockfish Program, and is further described below in Section 2.2.3. The analysts have interpreted that if both Options 3 and 4 are selected, then the seasonal usage limit would apply only to the portion of the overall GOA non-pollock PSC limit that is apportioned to the non-Rockfish Program (non-RP) fisheries. This interpretation is based on two factors: first, the Council indicated that the rationale for apportioning a separate PSC limit to the Rockfish Program is that the Program has the requisite management tools, through the cooperative structure, for participants to manage their own PSC limit inseason; and second, the Rockfish Program fishery does not begin until May 1<sup>st</sup>.

Table 2-2 provides the maximum amount of the proposed non-pollock trawl PSC limits that could be taken before June 1<sup>st</sup> under Option 3 and the various combinations of Option 3 with other options.

**Table 2-2 Maximum amount of proposed PSC limits for non-pollock trawl fisheries that could be used before June 1<sup>st</sup>, 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	Historical basis for average apportionment	5-Year Average (2007 through 2011)				10-year Average (2002 through 2011)			
GOA-wide Chinook cap					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
			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
		Catcher Processors	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 PSC allowance 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
			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
		Catcher Processors	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 PSC allowance 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
			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
		Catcher Processors	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 PSC allowance 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
			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
		Catcher Processors	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

## 2.2.3 Establish a separate Chinook salmon PSC limit for the CGOA Rockfish Program (Option 4)

Option 4 would create a separate PSC limit apportionment to the Central GOA Rockfish Program. This document analyzes four Chinook salmon PSC amounts that could be set aside for the RP fishery. Under

the first three considered levels, either 1,500, 2,500, or 3,500 Chinook salmon would be taken from the total GOA non-pollock Chinook PSC limit before any other sector or area apportionments, which would be based on PSC or catch history, are made. For instance, if Options 2 and 4 are selected together, the RP “carve-out” would be set aside and the remaining total Chinook PSC limit would be apportioned between the CV and CP sectors based upon the chosen metrics; it is important to note that historical Chinook PSC or groundfish landings that occurred while fishing under a Rockfish Program cooperative quota permit would not be factored into the apportionment between the operational type sectors of the non-RP non-pollock fishery. The fourth considered carve-out would directly apportion 1,200 Chinook PSC to the CV sector of the RP fishery, taken from the selected total apportionment for GOA catcher vessels in the non-pollock trawl fishery.

If the Council chooses to set aside 1,500, 2,500 or 3,500 Chinook PSC for the Rockfish Program fishery – both CV and CP sectors – the Council may also choose Suboption 1. Suboption 1 would divide the carve-out between the two sectors according to historical Chinook salmon PSC performance within the Program fishery, using the 2007 through 2012 fishing years to determine each sector’s proportional share. The resulting apportioned PSC limits are provided in Table 2-3. The apportioned PSC limits would be further apportioned to cooperatives within each sector, based on each member LLP holder’s proportion of target rockfish catch history from the program’s initial allocations.

**Table 2-3 Proposed PSC limits for Central GOA rockfish program, under Alternative 2 Option 4, with Suboption 1**

		6-Year Chinook salmon PSC usage (2007 through 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	RP Catcher Vessels	62%	937	1,561	2,186
	RP Catcher Processors	38%	563	939	1,314

If the Rockfish Program Chinook PSC apportionment applies only to the CV sector of the fishery, as under the fourth scenario, the Rockfish Program CV sector’s apportionment of 1,200 Chinook PSC would not be further apportioned among the RP cooperatives according to the initial allocation of catch history to co-op members’ LLPs.

Suboption 2 would permit some amount of the remaining Chinook salmon PSC that was apportioned to the Rockfish Program to “roll over” for use in other GOA non-pollock trawl fisheries at a given date during the fishing year. Under either of the first three considered carve-outs (1,500, 2,500, or 3,500 Chinook PSC), Suboption 2 would rollover remaining RP PSC on October 1, *less* either 200, 300, or 400 Chinook salmon PSC. The amount that is not rolled over (200, 300, or 400 Chinook) would support RP activity from October 1 through the end of the RP season on November 15; any Chinook PSC allowances that are not utilized as of November 15 would not be available for any other fishery. The salmon that are rolled over to the other non-pollock fisheries on October 1 would be apportioned to the CV and CP sectors of the non-RP non-pollock fishery in accordance with the Council’s chosen methodology for apportioning the non-RP PSC between the two sectors at the beginning of the year.

The Council could also select a rollover (Suboption 2) along with the fourth considered RP carve-out, where 1,200 Chinook PSC are directly apportioned to the Rockfish Program CV sector. Under this scenario, all but 150 of the unused Chinook salmon PSC from the RP CV sector’s apportionment would be rolled over to support non-RP non-pollock activity on October 1. Any of the 150 Chinook PSC that are

held back in the RP CV sector on October 1 that are not utilized as of November 15 would become available to the non-RP non-pollock CV sector on that date.<sup>9</sup>

The Council could choose both Suboptions 1 and 2 as part of its preferred alternative.

The Council could choose Option 4 by itself, with the remainder of the PSC limit to apply to all other non-pollock trawl fisheries that are not part of the Central GOA Rockfish Program, or the Council could choose to apply Option 4 in combination with Option 1 or Option 2. Some of the PSC limits that result from these combinations are extremely small, and are untenable as they would be very difficult for NMFS to manage (further discussion of the management challenges associated with small PSC limits, and a metric for defining a manageability threshold, is provided in Section 5.2.1.1). Table 2-4 lists the proposed PSC limits for the non-pollock trawl fisheries that are not part of the Central GOA rockfish program, under Alternative 2 with Option 4, with Options 1 and 4, or with Options 2 and 4. In the case that the Council selects a direct apportionment of 1,200 Chinook PSC to the RP CV sector, apportionment of the non-RP non-pollock Chinook PSC limit to the CV and CP sectors is covered in the description of the Council's final preferred alternative (Section 2.4).

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<sup>9</sup> This rollover scenario, which is part of the Council's final preferred alternative as summarized in Section 2.4, emerged as the preferred alternative in a trailing action that was initiated at the time the Council selected its original preferred alternative for a Chinook salmon PSC limit in the non-pollock fishery (June 2013). Three other alternatives were considered for rolling over unused Chinook PSC from the RP CV sector to the non-RP non-pollock CV fishery that occurs in the fall, as well as a 'no action' alternative that would not have allowed unused RP PSC to be rolled over in any manner. Those rollover alternatives are described under Section 2.6 (Alternatives considered but not advanced), and under the Analysis of impacts for Alternative 2 (Section 4.7). The Council received both an initial review and a public review draft analyzing the rollover alternatives (NPFMC 2013).



**Table 2-4 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**

			Historical basis for average apportionment	5-Year Avg. (2007 through 2011)				10-year Avg. (2002 through 2011)					
GOA-wide Chinook cap				12,500	10,000	7,500	5,000	12,500	10,000	7,500	5,000		
Option 4(a): 1,500 Chinook salmon PSC allowance 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 PSC allowance 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 PSC allowance 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

## 2.2.4 Uncertainty pool mechanism

The Council also considered a provision to incentivize taking fewer Chinook PSC than the maximum amount set by the hard cap, while also providing sectors that perform well with a moderate amount of flexibility around their PSC apportionment in the case of a subsequent year with high Chinook encounter. Termed the “uncertainty pool,” this mechanism allows any sector that performs to a defined Chinook salmon avoidance threshold in one year to access, if necessary, additional Chinook PSC in the following year. This additional PSC that is available in the following year is referred to as the “uncertainty buffer.” The buffer can be thought of as an insurance policy that must be earned anew each year. A sector that utilizes its apportioned share of the uncertainty pool, earned in the previous year, would in the following year return to fishing under a simple hard cap equal to its apportioned share of the selected Chinook PSC limit. Table 2-5 shows the apportionment of the total Chinook PSC limit to each of the three sectors that

are defined in the Council's preferred alternative, where the total GOA non-pollock trawl Chinook PSC cap is 7,500 fish per year, and the Central GOA Rockfish Program CV sector is apportioned 1,200 fish from the total CV sector hard cap of 3,900 fish. The uncertainty pool threshold is the Chinook avoidance performance level that each sector must not exceed in order to have the benefit of a PSC buffer in the following year. For each sector, the size of that earned relief is listed as the uncertainty pool buffer. A sector's performance in relation to the uncertainty pool threshold does not affect, nor is it affected by, the performance of other sectors. For the preferred alternative, the Council could choose to apply the uncertainty pool mechanism to each of the three sectors, or could selectively apply it only to certain sectors.

**Table 2-5 Chinook salmon PSC limit apportionment, uncertainty pool performance thresholds and buffer sizes, as they would exist for each of the three sectors defined in the Council's preferred alternative**

		Rockfish Program Catcher Vessels	Non-Rockfish Program Catcher Vessels	Catcher/Processors
<i>Apportionment Share</i>		<i>16%</i>	<i>36%</i>	<i>48%</i>
Base PSC Limit	<b>7,500</b>	1,200	2,700	3,600
Uncertainty Pool Threshold	<b>6,500</b>	1,040	2,340	3,120
Uncertainty Pool Buffer	<b>1,000</b>	160	360	480

Table 2-6 illustrates how a sector's annual PSC limit might vary from one year to the next, given the performance incentives and the limitations designed into the mechanism. Note that if a sector performs within its uncertainty pool threshold in a year (Year 1), and continues to do so in subsequent years (Year 2), the sector's effective maximum allowable amount of PSC will never exceed its base PSC limit plus its uncertainty pool buffer. A sector that earns an uncertainty buffer for Year 2 is held to the same performance standard (threshold) that it faced in Year 1 in order to maintain the benefit of the uncertainty buffer in the following year (Year 3). These limits guarantee that the incentive to avoid Chinook salmon does not decrease over time, even if past performance has been good. Moreover, there is no scenario in which a sector's PSC exceeds its apportioned amount of the base PSC limit when averaged over a set of consecutive years.<sup>10</sup> This is ensured by the fact that, in order to earn the uncertainty pool buffer in Year 2, the sector would have had to come in under its base PSC limit by *at least* the buffer amount in Year 1.

<sup>10</sup> If, for example, the RP CV sector recorded 1,039 Chinook PSC in Year 1, 1,360 in Year 2, and 1,200 in every year after that, then the average annual PSC for Years 2 through 'X' would be greater than 1,200, but the average including Year 1 would be less than 1,200. The preceding example serves only to show that average annual Chinook PSC levels over a range of years would not, in the limit, violate the PSC hard caps that the Council has selected for its preferred alternative. To be clear, earning an "uncertainty buffer" depends *only* upon Chinook PSC outcomes in the previous year, and not any long-run average over a set of years.

**Table 2-6 Interdependency of annual sector PSC limits under the uncertainty pool mechanism, as sectors are defined in the Council's preferred alternative**

	If Year 1 PSC...	Then in Year 2...	If Year 2 PSC...	Then in Year 3...
<b>Rockfish Program Catcher Vessels</b>	<u>Path A:</u> 1,040 ≤ Yr.1 ≤ 1,200	Limit = 1,200	1,040 ≤ Yr.2 ≤ 1,200	Limit = 1,200
			or Yr.2 < 1,040	Limit = 1,200 + 160
	<u>Path B:</u> Yr.1 < 1,040	Limit = 1,200 + 160	1,040 ≤ Yr.2 ≤ 1,360	Limit = 1,200
			or Yr.2 < 1,040	Limit = 1,200 + 160
<b>Non-Rockfish Program Catcher Vessels</b>	<u>Path A:</u> 2,340 ≤ Yr.1 ≤ 2,700	Limit = 2,700	2,340 ≤ Yr.2 ≤ 2,700	Limit = 2,700
			or Yr.2 < 2,340	Limit = 2,700 + 360
	<u>Path B:</u> Yr.1 < 2,340	Limit = 2,700 + 360	2,340 ≤ Yr.2 ≤ 3,060	Limit = 2,700
			or Yr.2 < 2,340	Limit = 2,700 + 360
<b>Catcher/Processors</b>	<u>Path A:</u> 3,120 ≤ Yr.1 ≤ 3,600	Limit = 3,600	3,120 ≤ Yr.2 ≤ 3,600	Limit = 3,600
			or Yr.2 < 3,120	Limit = 3,600 + 480
	<u>Path B:</u> Yr.1 < 3,120	Limit = 3,600 + 480	3,120 ≤ Yr.2 ≤ 4,080	Limit = 3,600
			or Yr.2 < 3,120	Limit = 3,600 + 480

### 2.2.5 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 the entire action area (Central and Western GOA regions combined), apportioned separately to the Central and Western GOA, apportioned to the CV and CP fleets across the entire action area, or apportioned to the CV and CP fleets within each of the Central and Western GOA areas. The Council proposes that any PSC apportionment to a subset of the entire GOA non-pollock groundfish trawl fleet should be based on either historical average Chinook salmon PSC, or historical average non-pollock groundfish harvest; the Council could choose to base these apportionments on either a 5-year or a 10-year fishing history.

For this analysis, 5-year and 10-year historical average Chinook salmon PSC or groundfish harvest are calculated from data covering the 2007 through 2011 and 2002 through 2011 periods, respectively. Equation 1 is the formula used to apportion Chinook salmon PSC to a given subset of the GOA non-pollock groundfish trawl fisheries based on a 5-year average of historical PSC; and Equation 2 is a similar formula for using a 10-year average basis.

**Equation 1** 
$$\text{Apportionment}_i = \left( \frac{\sum_{y=2007}^{2011} \text{BASIS}_{i,y} / 5}{\sum_{y=2007}^{2011} \text{BASIS}_{GOA,y} / 5} \right) \times \text{GOA Limit}_a$$

**Equation 2** 
$$\text{Apportionment}_i = \left( \frac{\sum_{y=2002}^{2011} \text{BASIS}_{i,y} / 10}{\sum_{y=2002}^{2011} \text{BASIS}_{GOA,y} / 10} \right) \times \text{GOA Limit}_a$$

*BASIS* is the annual amount – to be summed – of either Chinook salmon PSC or GOA non-pollock groundfish harvest, depending on which historical metric the Council chooses to use in determining apportionment; *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 taking the ratio of the period average PSC (or groundfish harvest) for a subset of the GOA and the period average PSC (or groundfish harvest) of the entire GOA, and then multiplying the ratio by the proposed gulf-wide PSC limit for non-pollock groundfish trawl.

Table 2-7 summarizes historical average Chinook salmon PSC by the GOA-subsets defined in Alternative 2 and Options 1 and 2. The percentage value listed next to the period average indicates a given subset's proportional share of average historical PSC within each Alternative 2 option. Table 2-8 provides the same information for historical non-pollock groundfish harvest. Under Option 4 in Alternative 2, the Central GOA rockfish program would be apportioned a separate Chinook PSC allowance. Table 2-9 provides actual Chinook salmon PSC by the program, since its inception in 2007. Table 2-10 and Table 2-11 summarize Chinook salmon PSC usage and non-pollock groundfish harvest for all trawl activity that occurred outside of the Central GOA rockfish program. Table 2-1 through Table 2-4, above, report the resulting proposed PSC limits, by option.

**Table 2-7 Historical Chinook salmon PSC and 5-year & 10-year basis averages in all non-pollock trawl fisheries**

by apportionment subsets defined in Alternative 2 including Options 1 and 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	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%

**Table 2-8 Historical non-pollock groundfish harvest (mt) and 5-year & 10-year basis averages in all non-pollock trawl fisheries**

by apportionment subsets defined in Alternative 2 including Options 1 and 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		56,886	60,631	49,127	52,434	59,208	63,835	73,512	64,265	69,360	69,570	68,109	100%	61,883	100%
Western GOA		13,334	10,888	8,316	10,070	12,036	14,472	13,674	11,024	9,596	8,627	11,479	17%	11,204	18%
Central GOA		43,552	49,743	40,812	42,363	47,172	49,363	59,839	53,241	59,765	60,944	56,630	83%	50,679	82%
WGOA & CGOA	Catcher Vessels	33,302	34,401	34,305	33,564	36,874	42,478	51,213	42,085	46,529	42,725	45,006	66%	39,747	64%
	Catcher/Processors	23,584	26,230	14,823	18,870	22,335	21,357	22,300	22,180	22,832	26,846	23,103	34%	22,136	36%
WGOA	Catcher Vessels	4,967	1,412	1,704	4,271	4,740	4,316	4,685	1,804	1,833	2,099	2,947	4%	3,183	5%
	Catcher/Processors	8,367	9,476	6,612	5,799	7,296	10,157	8,989	9,220	7,762	6,528	8,531	13%	8,021	13%
CGOA	Catcher Vessels	28,335	32,989	32,601	29,293	32,133	38,163	46,528	40,280	44,685	40,626	42,058	62%	36,564	59%
	Catcher/Processors	15,217	16,754	8,211	13,070	15,039	11,200	13,311	12,960	15,069	20,318	14,572	21%	14,115	23%

**Table 2-9 Historical Chinook salmon PSC, 2007 through 2012, and 6-year basis average in the Central GOA Rockfish Program**

	2007	2008	2009	2010	2011	2012	Average	
Catcher Vessels	*	*	*	965	397	817	847	62%
Catcher/Processors	*	*	*	248	340	439	510	38%
<b>CG Rockfish Program Total</b>	<b>1940</b>	<b>1929</b>	<b>1068</b>	<b>1213</b>	<b>736</b>	<b>1256</b>	<b>1357</b>	<b>100%</b>

\* indicates that the data cannot be displayed due to confidentiality constraints.

**Table 2-10 Historical Chinook salmon PSC and 5-year & 10-year basis averages in all non-pollock trawl fisheries EXCEPT Central GOA Rockfish Program**

by apportionment subsets defined in Alternative 2 including Options 1 and 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	3,058	3,388	3,228	4,006	8,534	6,195	5,070	100%	5,498	100%	
Western GOA	2,420	2,122	1,850	1,616	351	304	282	117	1,277	582	512	10%	1,092	20%	
Central GOA	5,338	8,755	2,743	1,728	2,707	3,083	2,947	3,889	7,258	5,613	4,558	90%	4,406	80%	
WGOA & CGOA	Catcher Vessels	4,629	4,601	2,271	617	1,429	1,869	857	2,019	4,152	3,549	2,489	49%	2,599	47%
	Catcher/Processors	3,129	6,275	2,322	2,726	1,628	1,519	2,371	1,987	4,383	2,646	2,581	51%	2,899	53%
WGOA	Catcher Vessels	2,349	143	20	58	201	9	107	10	96	44	1%	299	5%	
	Catcher/Processors	72	1,979	1,830	1,558	150	295	174	107	1,277	487	468	9%	793	14%
CGOA	Catcher Vessels	2,281	4,458	2,251	559	1,228	1,859	750	2,010	4,152	3,453	2,445	48%	2,300	42%
	Catcher/Processors	3,057	4,297	492	1,168	1,479	1,224	2,197	1,880	3,106	2,159	2,113	42%	2,106	38%

**Table 2-11 Historical non-pollock groundfish harvest (mt) and 5-year & 10-year basis averages in all non-pollock trawl fisheries EXCEPT Central GOA Rockfish Program**  
by apportionment subsets defined in Alternative 2 including Options 1 and 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		56,886	60,631	49,127	52,434	59,208	53,391	62,677	53,905	53,653	55,262	55,778	100%	55,717	100%
Western GOA		13,334	10,888	8,316	10,070	12,036	14,472	13,674	11,024	9,596	8,627	11,479	21%	11,204	20%
Central GOA		43,552	49,743	40,812	42,363	47,172	38,919	49,003	42,881	44,057	46,635	44,299	79%	44,514	80%
WGOA & CGOA	Catcher Vessels	33,302	34,401	34,305	33,564	36,874	34,210	42,439	33,952	36,926	34,252	36,356	65%	35,422	64%
	Catcher/Processors	23,584	26,230	14,823	18,870	22,335	19,181	20,238	19,952	16,727	21,010	19,422	35%	20,295	36%
WGOA	Catcher Vessels	4,967	1,412	1,704	4,271	4,740	4,316	4,685	1,804	1,833	2,099	2,947	5%	3,183	6%
	Catcher/Processors	8,367	9,476	6,612	5,799	7,296	10,157	8,989	9,220	7,762	6,528	8,531	15%	8,021	14%
CGOA	Catcher Vessels	28,335	32,989	32,601	29,293	32,133	29,894	37,754	32,148	35,093	32,154	33,409	60%	32,239	58%
	Catcher/Processors	15,217	16,754	8,211	13,070	15,039	9,025	11,248	10,733	8,965	14,482	10,890	20%	12,274	22%

## 2.3 Alternative 3: Full Retention

Alternative 3 would require full retention of Chinook salmon by all non-pollock groundfish trawl vessels operating in the GOA. This provision would require a regulatory change to existing requirements that prohibit 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 is delivered under an authorized prohibited species donation program. If the salmon is to be observed, counted, and sampled at a shoreside plant, but no plant observer is available, the number of salmon must be recorded by species on the fish ticket.

Alternative 3 was selected as part of the Council's preferred alternative in June 2013. Alternative 3 was selected in addition to the suboptions of Alternative 2 that are highlighted in Section 2.4.

## 2.4 Council's Final Preferred Alternative

The Council defined its final preferred alternative (PA) in December 2013, by selecting an alternative from the trailing action to reincorporate a Rockfish Program rollover provision into the PA that it had selected in June 2013. The elements of the final PA are listed at the beginning of Section 2.

The Council selected Alternative 2, establishing 7,500 Chinook salmon as the annual hard cap PSC limit for the Western and Central GOA non-pollock trawl fishery. The Council also selected Option 2, apportioning that hard cap limit between the CV and CP sectors. Sector apportionments were set at 3,900 Chinook per year for the CV sector and 3,600 Chinook per year for the CP sector, which is in accordance with the 5-year historical average of Chinook salmon PSC levels from 2007 through 2011 – 52% for the CV sector, and 48% for the CP sector (see Table 2-7).

The Council also selected Alternative 2, Option 4, which creates a separate Chinook PSC apportionment for the Central GOA Rockfish Program. Specifically, the PA includes the fourth of the Rockfish Program “carve-out” scenarios that are described in Section 2.2.3. The resulting Rockfish Program apportionment is only for the CV sector of the RP fishery, and is set at 1,200 Chinook salmon. This amount is taken from the CV sector's total annual apportionment of 3,900 Chinook. All CV non-pollock groundfish activity that occurs outside of the Rockfish Program will have a base apportionment of 2,700 Chinook PSC.

However, the PA also includes Option 4, Suboption 2, which allows for a rollover of some remaining Chinook PSC allowance from the Rockfish Program CV sector to the CV sector of the non-Rockfish Program fleet. The nature of the rollover is defined by Alternative 5 of the trailing action (December 2013), where all but 150 of the remaining Chinook PSC allowance in the Rockfish Program CV sector apportionment are rolled over to other CV activity on October 1; any Rockfish Program CV sector Chinook PSC allowance remaining at the RP season's close on November 15 is similarly rolled over at that time.

By applying the Rockfish Program carve-out (Alternative 2, Option 4) to only the CV sector, the Council's PA effectively establishes three sectors that each receive an annual Chinook PSC apportionment: the CP sector, the Rockfish Program CV sector, and the non-Rockfish Program CV sector.

The Council selected Alternative 2, Option 3, and applied it only to the CP sector. No more than 66% of the CP sector's annual Chinook PSC apportionment may be taken prior to June 1. With the CP PSC limit set at 3,600 Chinook, the sector is, thus, limited to 2,376 Chinook salmon PSC from January 20 to May 31. If the CP sector reaches this limit, the sector will be closed out of directed fishing for non-pollock groundfish in the action area until June 1. The pre-June limit is a seasonal maximum, so taking fewer than 2,376 Chinook salmon prior to June 1 (which is a desirable outcome) does not change the CP sector's permissible annual maximum of 3,600.

Under Alternative 2, the Council also chose to apply the uncertainty pool mechanism to two of the three defined non-pollock trawl sectors – the CP sector and the non-Rockfish Program CV sector. As described in Section 2.2.4, these sectors could access an additional amount of Chinook PSC in one year, if they individually met a certain Chinook avoidance threshold in the preceding year. Table 2-5 displays the base Chinook PSC limits, avoidance thresholds, and uncertainty buffer sizes for the selected total non-pollock trawl PSC limit of 7,500 Chinook. In order to earn an uncertainty buffer in the following year, the CP sector would have to record fewer than 3,120 Chinook PSC. This threshold is equal to 48% of a supposed 6,500 total PSC limit. The size of the earned buffer in the following year is 480 Chinook salmon, which is equal to 48% of a theoretical uncertainty pool of 1,000 Chinook PSC. This buffer is additional to the 3,600 Chinook PSC with which the CP sector begins each year.<sup>11</sup> Likewise, the non-Rockfish Program CV sector would have to record fewer than 2,340 Chinook PSC in order to earn an uncertainty buffer in the following year. This threshold is equal to 36% of a supposed 6,500 total PSC limit. The size of the buffer in the following year is 360 Chinook salmon, which is equal to 36% of a 1,000 Chinook PSC uncertainty pool. The Rockfish Program CV sector is not eligible for the uncertainty pool and, thus, it begins every year with an apportionment of 1,200 Chinook salmon PSC.

Finally, the Council also selected Alternative 3, which requires full retention of all salmon. All species of salmon must be retained until a vessel or processing plant observer has determined the species and number of salmon, and has had an opportunity to collect any scientific data or biological samples. If salmon are retained on an unobserved trip and a shoreside plant observer is not available, the number of retained salmon must be recorded on the fish ticket by species.

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<sup>11</sup> The Council's PA notes that a sector's "share of the uncertainty pool (including any seasonal or fishery specific cap) shall be apportioned in the same manner as the 7,500 cap." This language means that if the CP sector begins a year with an additional 480 Chinook PSC as a result of earning its uncertainty buffer in the previous year, then the pre-June seasonal PSC limit would increase by 317 Chinook PSC (66% of 480). The resulting pre-June PSC limit for the CP sector would be 2,693 (or 2,376 + 317).

## 2.5 Management and Monitoring

The management methods used for a PSC limit depends on whether NMFS manages PSC limits for a group of vessels or whether these PSC limits are allotted among specific entities within a fishery. There are two general types of PSC limits: 1) fishery, area, or sector-level PSC limits; and 2) PSC limits to specific entities. 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. Under Alternative 2, 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 (see Section 5.2 for more detail):

### Rockfish program CPs

The monitoring requirements for Rockfish Program CPs would include maintaining all current observer coverage and monitoring requirements, plus adding requirements for a salmon storage container, video monitoring of relevant locations, and retention of all salmon for observer sampling.

### Rockfish Program CVs and Shoreside Processors

For the Rockfish Program CVs, the necessary monitoring would include maintaining current observer coverage, while adding the following additional requirements: Retain all salmon until delivered to processor. For shoreside processing plants, the requirements would include 200% observer coverage at the plant, additional Catch Monitoring and Control Plan (CMCP) provisions, salmon storage areas, and retention of all salmon.

## 2.6 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 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*, based on species predominance in the catch composition, 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 operators' ability to schedule fishing activity to avoid Chinook. Mandatory membership could ameliorate any competitive imbalance caused by the reduced catch rates of those fishermen 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 sustains 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-members of cooperatives 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-member vessels in years of high PSC. 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 PSC cooperative, cooperative management of the pollock fishery, restricting fisheries by season or time of day in order to reduce PSC, and used of 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 fisheries, and advance the consideration of a cooperative management program on a separate track.

#### Central GOA Rockfish Program CV sector – Other action alternatives considered for a rollover of unused Chinook salmon PSC

Throughout the decision process, the Council has considered a "rollover" provision as part of any set of alternatives that includes a separate apportionment of Chinook salmon PSC for the Central GOA Rockfish Program. The purpose of a separate apportionment for the RP was articulated as a recognition of the value of the fishery, and the negative community and economic impacts that are possible if the RP fishery is closed due to high Chinook PSC levels at other times and in other parts of the trawl fishery. The Council has stated that it does not intend for the unused portion of any RP apportionment to be retired at the end of the RP season, and, thus, be made unavailable to support other important trawl fisheries that occur later in the year. When the Council first took final action in June 2013, the rollover option was not



selected because the potential impact and manageability of selecting *both* a Rockfish Program rollover and the uncertainty pool mechanism had not been analyzed. Staff was directed to carry out such an analysis, and five alternatives were provided. A ‘no action’ alternative would have left the rollover out of the final preferred alternative. In December 2013, the Council selected one of the four action alternatives (described in the final PA, Section 2.4). The three other considered alternatives for reincorporating a rollover are briefly described below. Analysis of these alternatives is included in this document in Appendix 2.

- 1) Include a rollover provision similar to the one that the Council considered in June 2013 (which is described as Suboption 2 in Section 2.2.3), but apply it only to the CV sector of the Rockfish Program. Originally, this suboption called for rolling over all but 200, 300, or 400 of the remaining Chinook PSC from the RP apportionment. The rollover would be date-certain on October 1 of each year. Since that suboption was associated with a PSC apportionment to both the CP and CV sectors of the RP, the number of Chinook PSC that are not rolled over was adjusted. The Council’s June 2013 final action apportioned 52% of the total PSC limit to the CV sector. The number of fish that would not be rolled over was adjusted accordingly, resulting in a rollover of all but 104, 156, or 208 of the remaining Chinook PSC from the Rockfish Program CV sector’s apportionment of 1,200 Chinook.
- 2) Include a rollover provision that functions just as the one described above, but roll over all but 160 Chinook PSC. Again, the rollover would occur each year on October 1. The hold-back amount of 160 Chinook was selected because that number matched the Rockfish Program CV sector’s potential uncertainty buffer. The Council initially thought that holding back this amount would be a sufficient measure to ensure that PSC encounters in the non-Rockfish Program CV sector after October 1<sup>st</sup> would not jeopardize the uncertainty buffer that the RP CV sector may have earned to carry into the following year. However, the analysis described in Section 4.9 of this document highlighted concerns about the possibility of PSC in the RP CV sector after October 1<sup>st</sup>, as well as changes in RP fishing patterns that may stem from co-op members’ overriding concern about maintaining their buffer for the following year.
- 3) Allow all remaining Chinook PSC allowance amounts to be rolled over from the Rockfish Program CV sector, but not until all RP CV cooperatives have officially checked out of the fishery. The check-out and rollover process could occur at any time during the RP season, which ends on November 15. The RP CV sector would be removed from the uncertainty pool aspect of the preferred alternative, thus, eliminating the need to hold back some of the residual Chinook PSC allowance to ensure that it is not used in the fall non-RP CV fishery, and then again in the following year’s RP CV fishery. The Council primarily expressed concern that relying upon the multiple RP CV cooperatives to coordinate the timing of their check-out could be onerous and possibly contentious, as co-ops may differ in the timing of their plan to fully harvest RP quota.

### **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 are addressed in Section 4.8 of the RIR, and Section 5.3. Consequently, the Environmental Assessment focuses on the impacts of the no action (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, are incorporated by reference, 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.<sup>12</sup> 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 catcher 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.

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<sup>12</sup> 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).

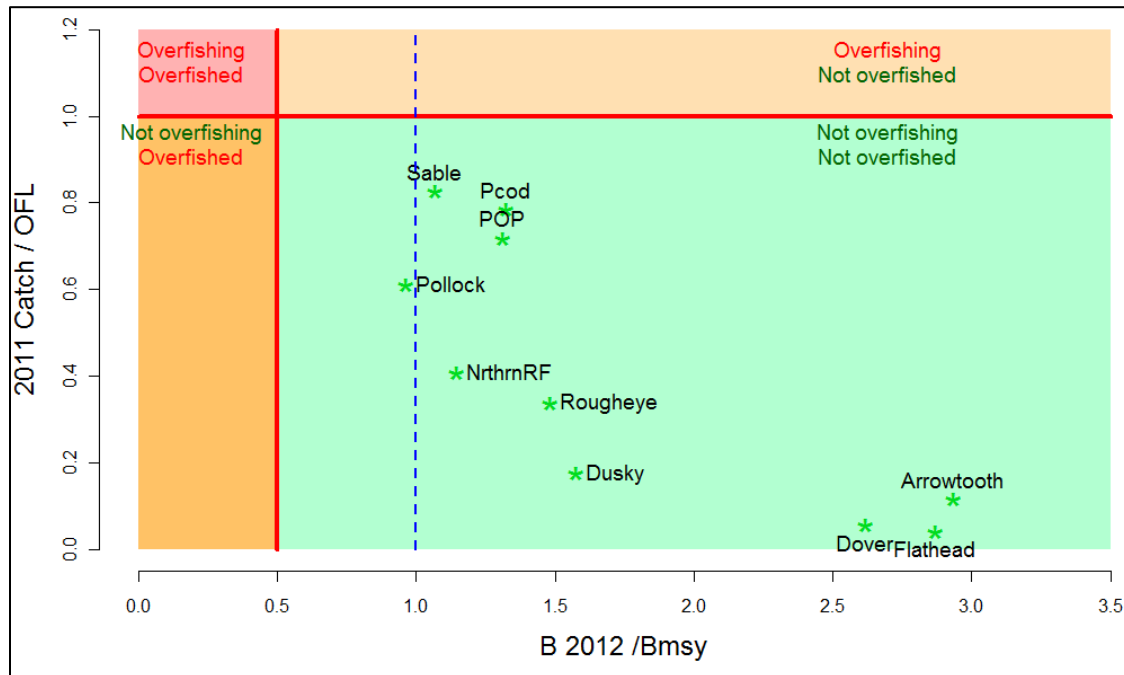
**Table 3-1 Criteria used to determine significance of effects on target groundfish stocks.**

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.**

<b>No impact</b>	No incidental take of the ecosystem component species in question.
<b>Adverse impact</b>	There are incidental takes of the ecosystem component species in question
<b>Beneficial impact</b>	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.
<b>Significantly adverse impact</b>	An action that diminishes protections afforded to prohibited species in the groundfish fisheries would be a significantly adverse impact.
<b>Significantly beneficial impact</b>	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.
<b>Unknown impact</b>	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. The tables included 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. The subsections in that part of the analysis discuss the avoided Chinook PSC and forgone groundfish harvest associated with closures could have occurred at key marking points during the course of the fishing year.

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, neither Alternative 2 nor the parts selected for the preferred alternative is 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. The same is also true for the elements of Alternative 2 that were selected for the preferred alternative.

### **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).

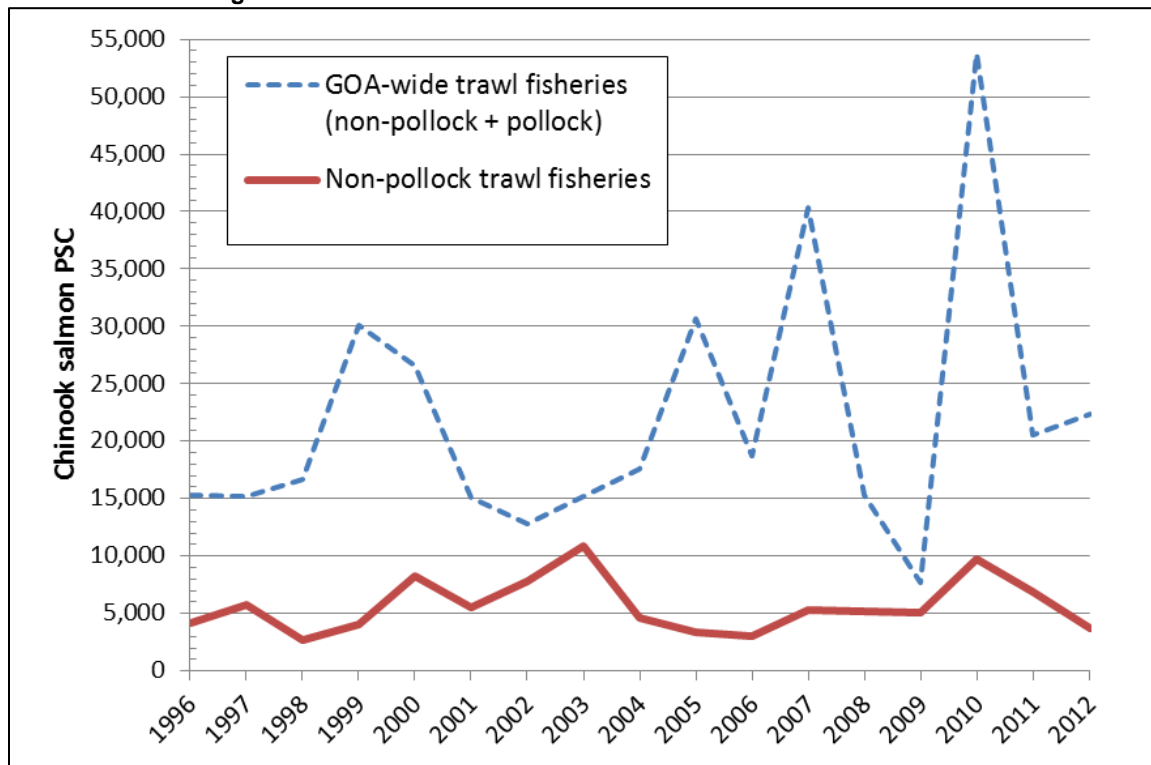
General results from the study found that immature chum salmon are primarily predators of macrozooplankton while Chinook salmon tend to prey on small nektonic prey such as fish and squid. Prey compositions shift between species and between seasons in different habitats and a seasonal reduction in diversity 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 than 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 4.4.11. 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. 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).**

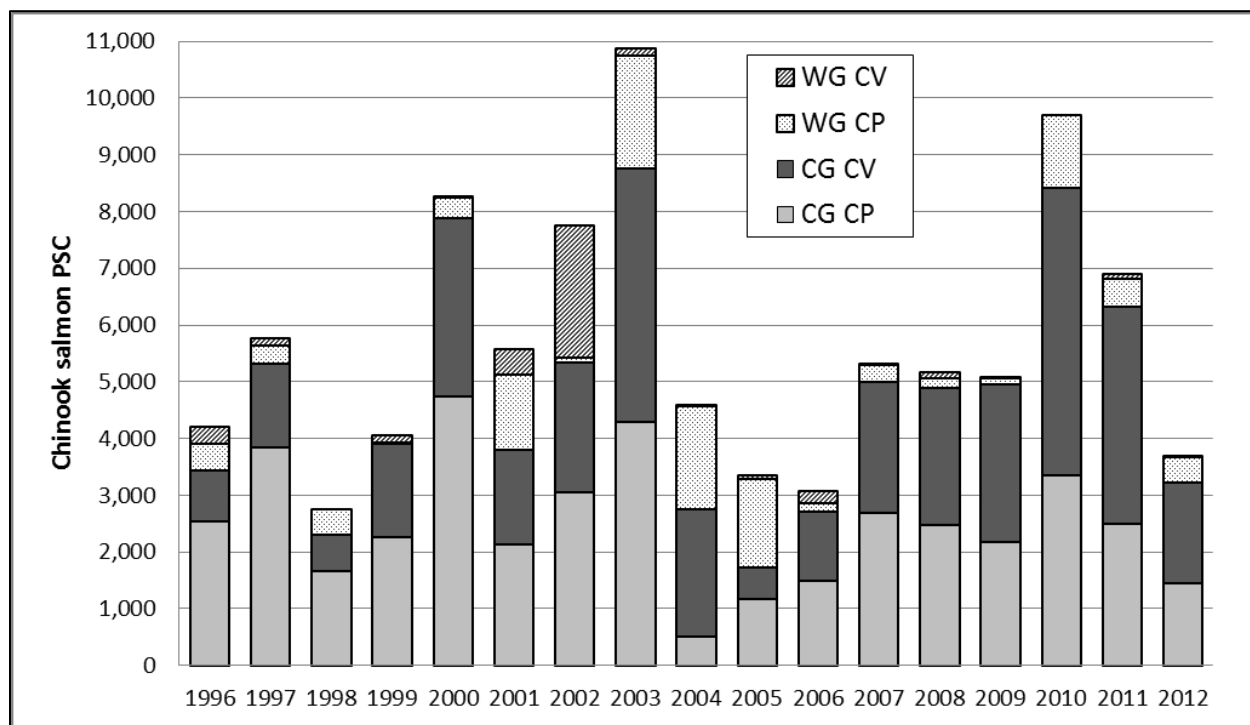
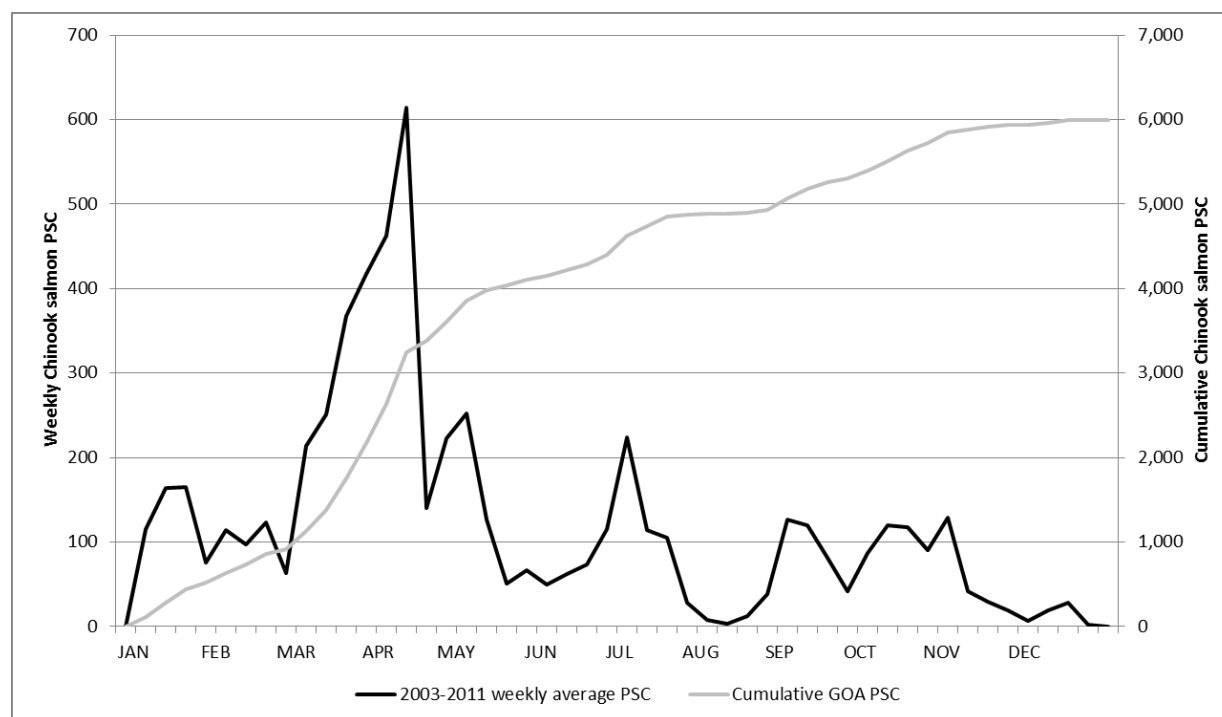


Figure 3-4 illustrates the distribution of Chinook salmon PSC throughout the calendar year, based on 2003 to 2011. In the general pattern, Chinook PSC is first taken in the Pacific cod A-season fishery in January and early February. The early spring (March – April) spike in PSC represents increasing 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 GOA 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.

### 3.3.2.2 Chinook Salmon Abundance in the Gulf of Alaska

A simple measure by which to assess the overall abundance of Chinook salmon in the affected fishing areas does not exist. As a result, it is difficult to say whether or not years with high Chinook salmon PSC in the GOA trawl fishery, such as 2003 and 2010 (Table 2-7), were the result of more numerous Chinook salmon present in the fishing grounds.

The best available information on salmon abundance covers only the Aggregate Abundance Based Management fisheries in the Pacific Salmon Treaty areas. The Pacific Salmon Commission's 2012 Exploitation Rate Analysis lists abundance indices for Chinook salmon in the Southeast Alaska, Northern British Columbia and West Coast Vancouver Island troll fishery areas, from 1999 to 2012. Abundance indices for the high GOA Chinook salmon PSC years were not substantially different from the period average index values, and in some regions were lower than the index values for years with relatively low GOA Chinook salmon PSC.<sup>13</sup> The best available source of information on Chinook salmon abundance in the areas directly affected by this action is the escapement estimates listed in Appendix 1. These tables do not reflect a significant deviation above average escapement totals or percentages of escapement goals met for the highest trawl PSC years.

<sup>13</sup> See Table 3-3 on page 28 of the report, available at <http://www.psc.org/pubs/TCCHINOOK12-4.pdf>

### 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; Guthrie et al., 2012; Guthrie et al., 2013), 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. In January 2012, vessels participating in the directed pollock trawl fisheries agreed to voluntarily retain all salmon encountered while fishing pollock in the Western and Central GOA in anticipation of Amendment 93 to the Fishery Management Plan for Groundfish of the Gulf of Alaska (GOA FMP) requiring 100% retention of all salmon caught in Western and Central GOA pollock fisheries. 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	240	0.0173	13 from area 610, 143 from area 620, 84 from area 630
2012	1005		334 from area 610, 394 from area 620, 236 from area 630, 5 from area 640, and 36 from area 649

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 sampling regimen for the collection of both Chinook salmon and chum PSC samples, whereby observers would sample every  $n^{\text{th}}$  fish from the census of salmon. Because all Chinook salmon stocks are not randomly distributed at sea (Guyon et al. 2010a; NMFS 2009b), systematic 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 made available to the dockside observer 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 because the majority of Chinook salmon intercepted in the GOA are captured in the pollock fishery (Section 5.1.2.1). Beginning in 2011, the agency's sampling procedures for Chinook (and chum) salmon were revised in the Bering Sea 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. 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, beginning in 2013, dockside observers will be deployed to conduct the same systematic sampling for unobserved pollock deliveries, however salmon genetic samples are not collected from the non-pollock trawl fisheries. Instituting offload sampling for these fisheries, as occurs with pollock deliveries, is not viable, as most of the catch is sorted at sea (see Chapter 5). 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 2011. 240 Chinook salmon axillary process samples from the GOA were received by the NMFS Auke Bay Laboratory from the Alaska pollock trawl fisheries PSC. The overall fraction sampled was 1.7%. Genetic samples were collected opportunistically, so the following stock composition estimates should be considered as stock compositions of the sample set rather than a representative composition of the entire GOA Chinook salmon bycatch. Chinook stocks from British Columbia (40%) and the U.S. west coast (26%) comprised the largest stock groups, with smaller contributions from Northwest GOA (15%) and Coastal Southeast Alaska (14%) stocks (Guthrie et al., 2013). The results provide "presence" indicators of Chinook salmon stocks, rather than relative abundance.

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).

CWT recoveries provide reliable documentation of the presence of a stock that is caught by the groundfish fisheries, and can inform presence of stocks at the ESU-level, where genetic sampling may not. However, the recoveries to date cannot be used to establish the relative abundance of stocks, nor can they be used 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. Rather, they represent the composition of the samples that are taken, that originate from the sites where a CWT program is in place. 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).

CWT programs have been established to achieve various program goals; these include the evaluation of hatchery survival and returns, ESA stock management, ocean survival studies, PST issues, and tracking of indicator stocks that aid in modeling for incidental catch salmon targets. Again, due to sampling issues in the fisheries and to the non-random distribution of CWT programs, CWT recoveries are not a sufficient metric for describing the proportion of GOA trawl-caught Chinook salmon PSC by stock of origin. In the future, increased CWT effort in specific Alaska runs of particular interest may provide additional insight into the effects of the GOA trawl fishery, but that information, too, would be of limited use in determining proportional stocks of PSC Chinook salmon origin.

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%
<b>Total</b>	<b>609</b>	<b>3757.2</b>	<b>38.1</b>	<b>234.8</b>	<b>100%</b>	<b>100%</b>

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.



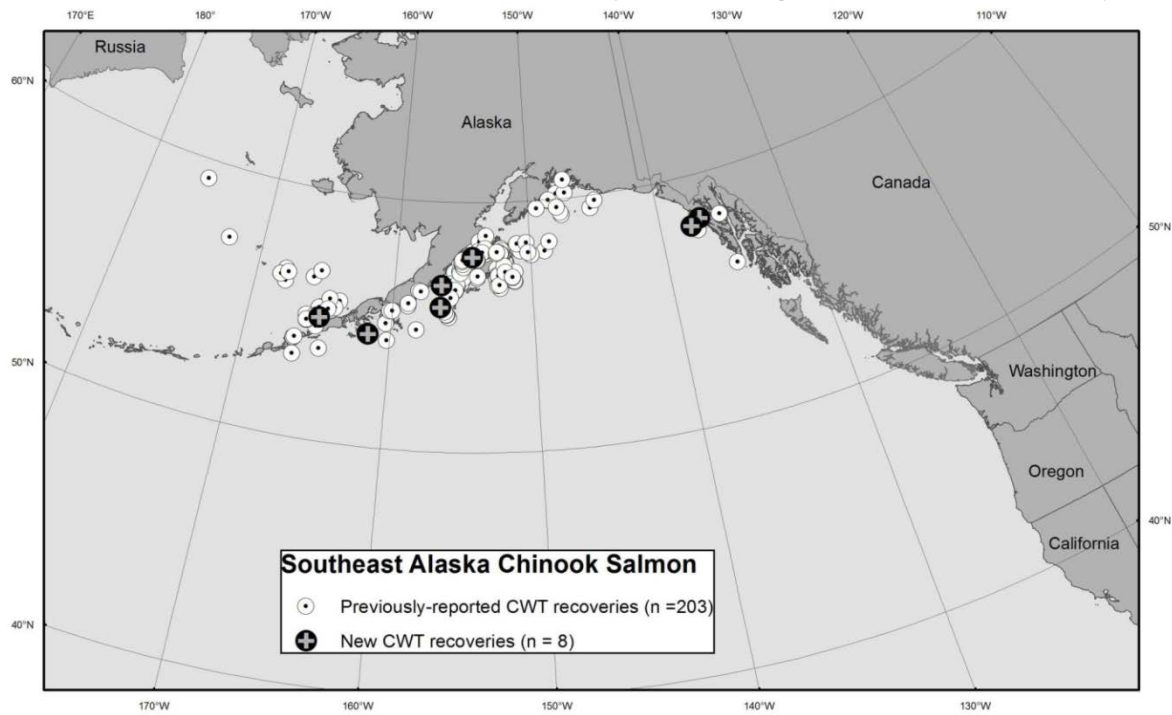
**Table 3-5 Observed Number and Mark Expansion of CWT Alaska-origin Chinook salmon prohibited species catch of the GOA groundfish fishery by run year and release basin, 1995 through 2010.**

Run Year	Cook Inlet, Alaska		Southeast Alaska		Alaska TOTAL	
	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, and Balsiger 2012

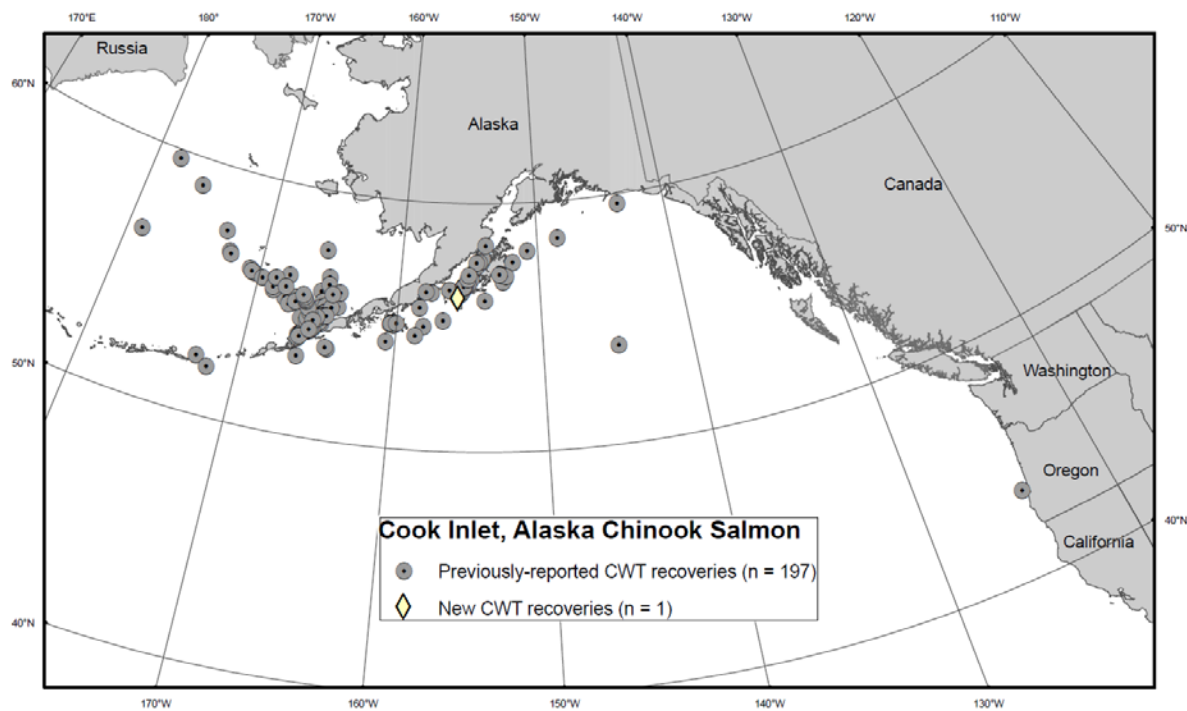
Maps of CWT Chinook salmon distribution in the North Pacific Ocean, GOA, and Bering Sea by state or province of origin are shown (Figure 3-5 through Figure 3-11). These maps are compiled from CWT recoveries from high seas commercial fisheries and research surveys, 1981 through 2012, and are updated annually (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.**



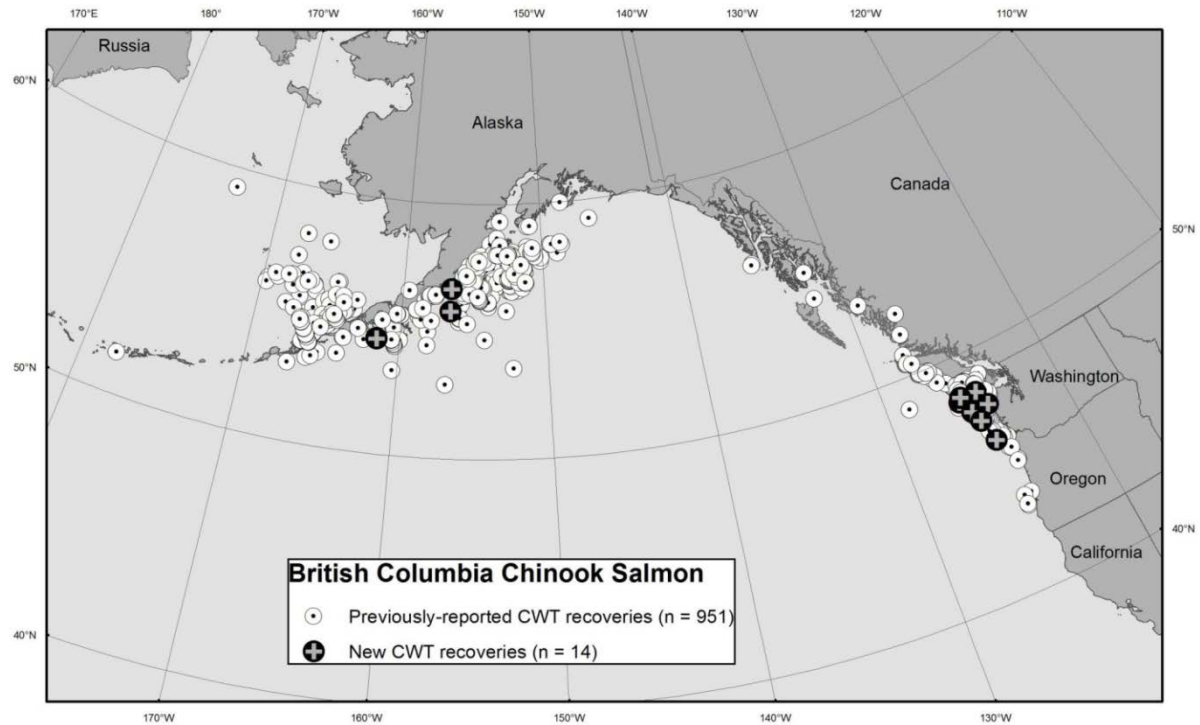
Source: Celewycz et al. 2012

**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.**



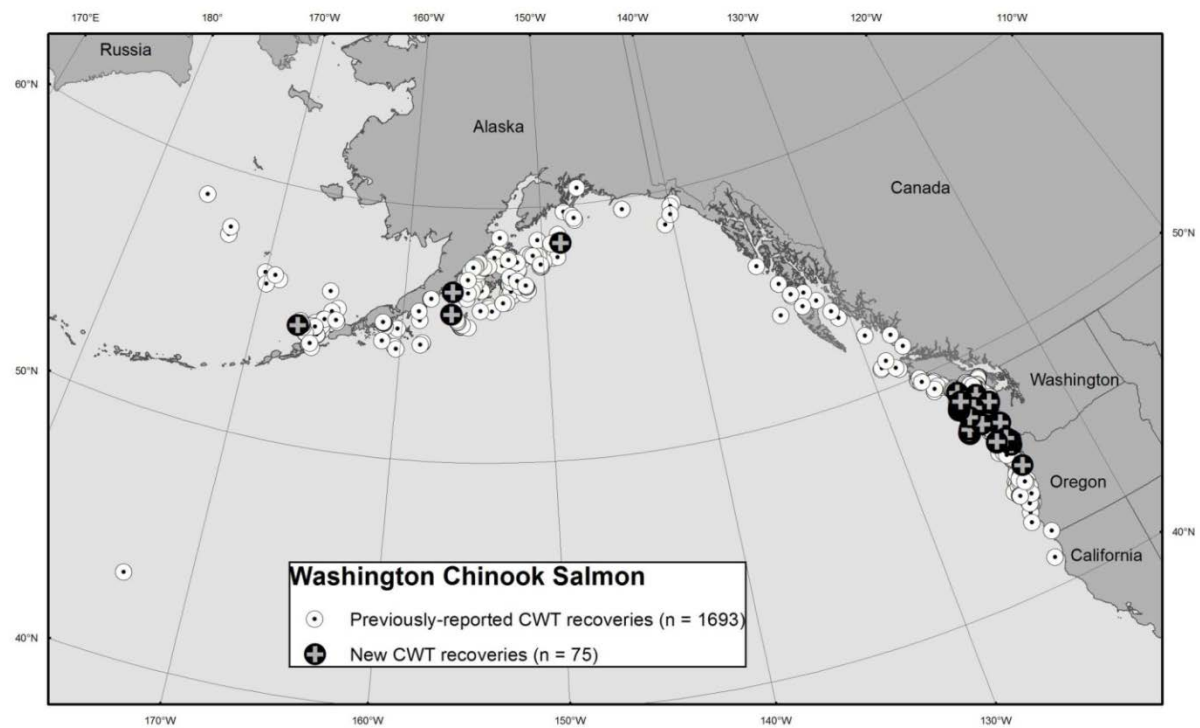
Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 10/27/2011.

**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.**



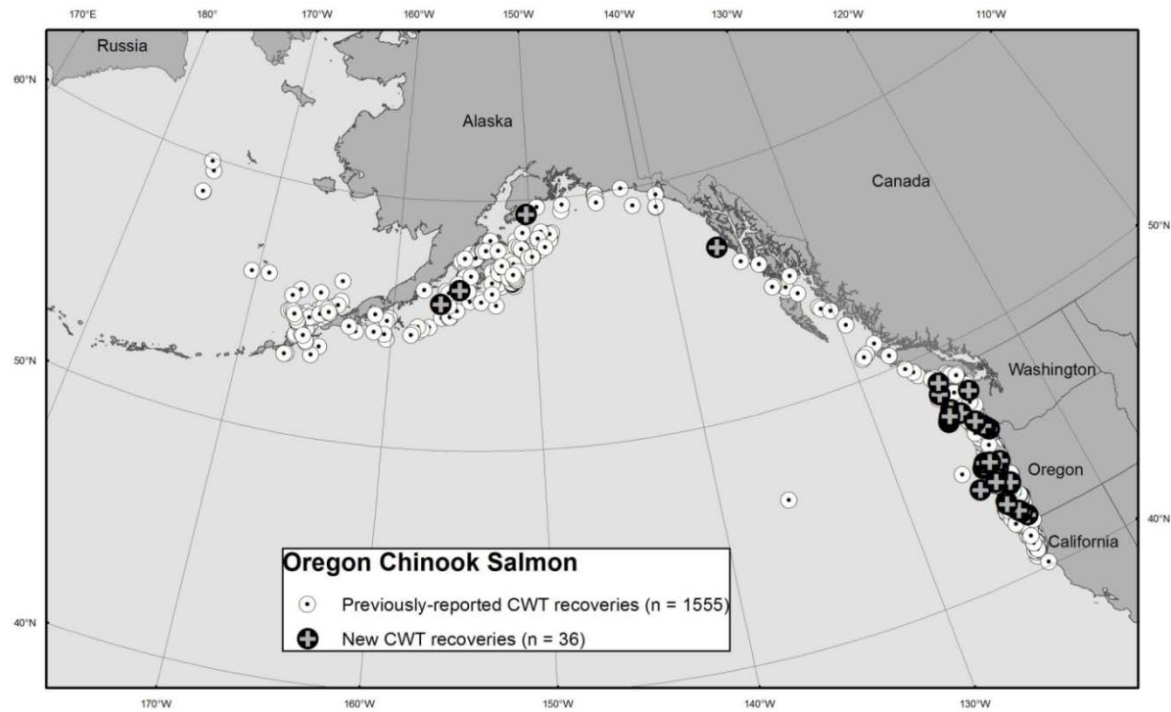
Source: Celewycz et al. 2012

**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.**



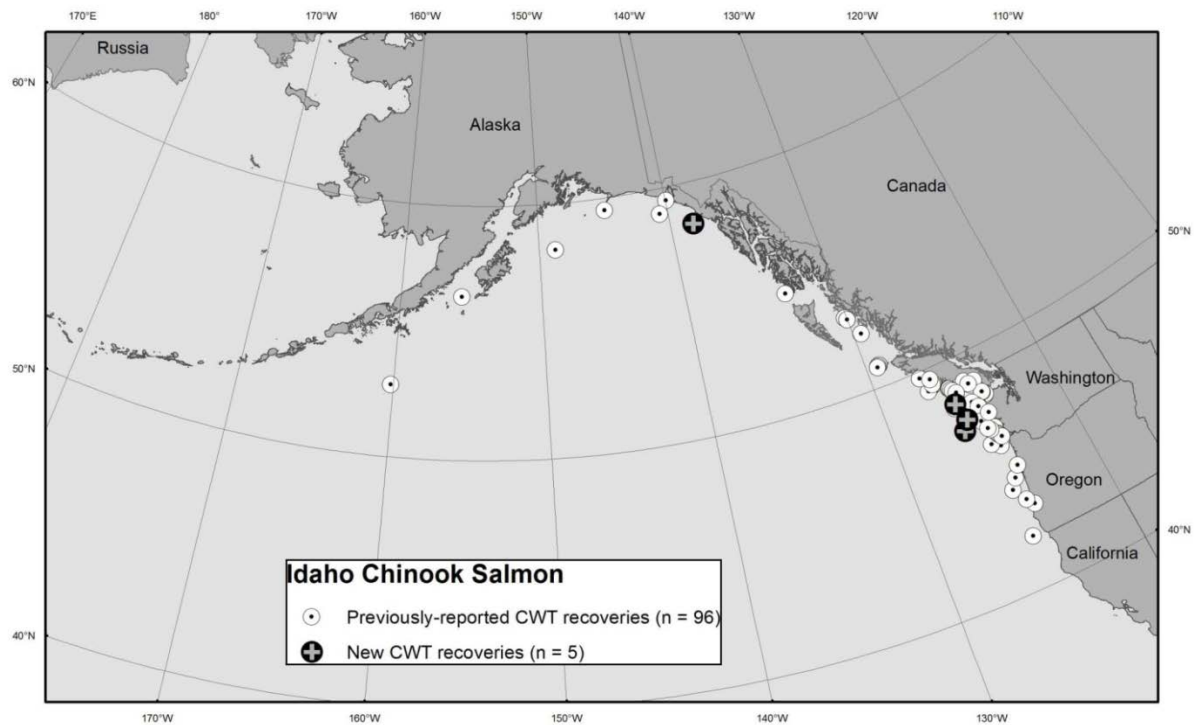
Source: Celewycz et al. 2012

**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.



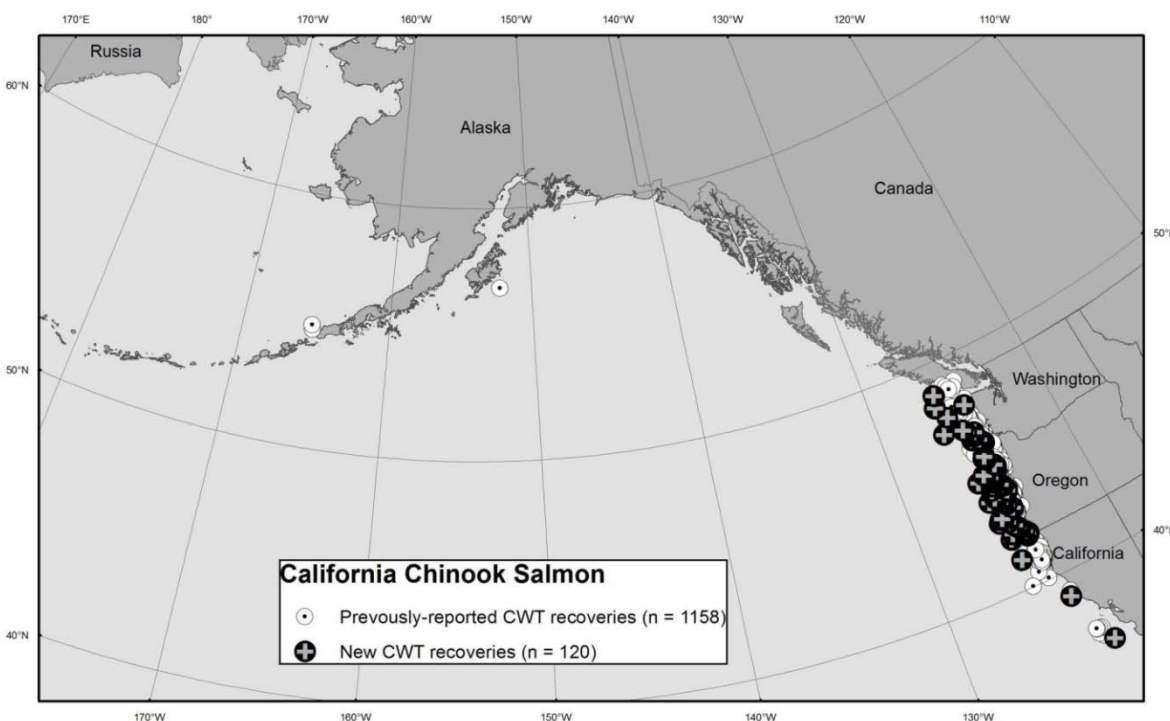
Source: Celewycz et al. 2012

**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.**

Origin	Rearing Type				TOTAL
	Unknown	Hatchery	Mixed	Wild	
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
<b>TOTAL</b>	<b>1</b>	<b>576</b>	<b>11</b>	<b>17</b>	<b>605</b>
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 . Section 3.3.5.11 provides a summary of Alaska Chinook salmon stock performance in 2012. Information on stock status and abundance for non-Alaskan Chinook salmon populations is periodically published by the North Pacific Anadromous Fish Commission.<sup>14</sup>

#### **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).

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<sup>14</sup> For example, see Heard 2007.

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.

Beginning during 2011 and continuing in 2012, additional restrictions were placed on fishing inside the barrier around the Copper River mouth due to low Chinook returns. These restrictions may cause smaller boats to fish outside of the protected areas inside the barrier islands, where weather conditions can be more difficult.

### **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). 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 1). 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 Strait 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 Island 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 1). 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 1). 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 to 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. In the Western GOA, the 2012 escapement to the Chignik River was approximately 100 fish above the lower end of the escapement goal.

The Upper Cook Inlet commercial fishery harvested 2,358 Chinook salmon in 2012. This level was 85% less than the 1966-2011 average annual harvest, and the total ex-vessel value of Chinook salmon (\$98,000) was approximately 0.3% of the total Upper Cook Inlet commercial fishery (ADFG, 2012).

In 2011, State managers developed an action plan that aimed to reduce both sport and commercial Chinook salmon harvest for stocks of management concern in the northern Cook Inlet. Directed commercial fishing for Chinook was closed for the entire 2011 season in the area from approximately three miles south of Tyonek north to the Susitna River. Commercial fishing in the area was further restricted in 2012, reducing the Northern District fishery periods from 12 hours to 6 hours in duration. The Northern District's 2012 Chinook salmon harvest was 57% less (1,037 fish) than the previous 10-year average. In 2012, 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. The Deshka River was the only system in the northern Cook Inlet with inseason weir monitoring; in 2012, the Deshka River achieved the low-end of its escapement goal (14,088 fish, with a sustainable escapement goal defined between 13,000 and 28,000 fish). This escapement was 48% below the previous 10-year average, and was attributed to closures and restrictions on both the sport and commercial fisheries (ADFG, 2012).

In response to weak runs of early returning Chinook salmon in the Upper Cook Inlet, the 2012 sport fishery for late-run (July 1) Kenai River Chinook had a no-bait restriction. In addition, the commercial set gillnet fishery was heavily restricted – the set gillnet fishery was closed for the first three periods of the year – with the intent to allow enough Chinook escapement so that the gillnet fishery for sockeye salmon could be opened in late July. Chinook salmon passage estimates in the Kenai River remained lower than expected, resulting in a July 19 closure of the sport fisher and the Upper Subdistrict set gillnet fishery. Passage estimates improved enough to allow an Upper District set gillnet fishery for the regular periods beginning on August 6, and an additional period on August 12. Overall, the estimated Chinook salmon harvest in the Upper Subdistrict set gillnet fishery (584 fish) was the lowest since 1966, approximately 95% less than the previous 10-year average (ADFG, 2012).

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

Chinook salmon stock	Total run size	Escapement goals met <sup>a</sup>	Subsistence fishery	Commercial fishery	Sport fishery	Stock of concern
Bristol Bay	Below average	0 of 1 <sup>b</sup> (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 <sup>c</sup>	Yes, with restrictions	Restricted in Northern District and Eastside set gillnets in Central District	Various restrictions including complete closure	6 stocks of concern
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

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> 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/>, or at the Pacific Salmon Commission website, [www.psc.org](http://www.psc.org).

### 3.3.5.13 Asian Stocks

On the Asian coast, Chinook salmon occur from the Anadyr River area of Siberia southward to Hokkaido, Japan.<sup>15</sup> Chinook salmon occur primarily in Russia, from the Amur River, northward to the Anadyr River (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 in the supplemental 2007 biological opinion (Stelle 2012).<sup>16</sup>

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.

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<sup>15</sup> <http://www.adfg.state.ak.us/pubs/notebook/fish/chinook.php>

<sup>16</sup> Further information on the challenges encountered in the early stages of managing Chinook salmon PSC under a hard cap management structure is discussed in the RIR (Section 4.4.5) and in Section 5.2.1.1.

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.rmpec.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 indeterminate.

**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.**

Listing Status	ESU Name	Chinook salmon in GOA Trawl Fisheries	
		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.**

Listing Status	ESU Name	Chinook salmon in GOA Research Surveys	
		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 ten analyzed historical years (Table 2-7). 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 whether the groundfish fisheries' take of Chinook salmon is, or is not, 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 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.

To the extent to which Alternative 2 benefits Chinook salmon stocks, which is described above as unknown, a PSC limit may benefit commercial, sport and subsistence users of Chinook salmon. Section 3.3.5.11 identifies a number of river systems in the action area – on the Alaska Peninsula, around Kodiak Island, and in Southcentral Alaska – where low salmon returns have led to management actions that closed or curtailed these non-trawl resource uses in 2012.

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 year that was typical of the analyzed historical period. At the highest possible level, lower PSC limits generated more “avoided Chinook salmon PSC,” based on historical fishing patterns, than did higher limits. An analysis of the closures, identifying how each PSC limit apportionment option, or suite of options, specifically relates to salmon savings and forgone groundfish harvest is provided in the RIR (Section 4.7.1).

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. Moreover, the currently available data is not sufficient to link the size of the Chinook salmon taken as PSC to a specific age-class. 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.

While an AEQ model has not been developed for the Chinook salmon that are taken as PSC in the GOA groundfish trawl fisheries, this report can provide very high-level information that gives an approximate range of a reasonable AEQ rate. The State generally uses assumed natural mortality rates of 40% for 2 year old Chinook, 30% for 3 year olds, 20% for 4 year olds, and 10% for 5 year olds and older. Deriving an AEQ rate would require adjusting these percentages by an AEQ factor that accounts for other demographic characteristics. These age-specific factors change from year to year, and none are currently calculated for the GOA trawl fishery. However, for a rough measure, one might look at AEQ factors for the salmon troll fishery in Southeast Alaska. These factors are available for Age-2 to Age 5+ salmon. The following AEQ factors are for ocean-type stocks, and would have to be applied to an age group one year greater when dealing with stream-type stocks such as the stocks considered in this analysis. For Age-2 salmon, the assumed natural mortality rate would be multiplied by 0.59 to arrive at an Age 3 AEQ rate; the Age-3 natural mortality rate would be multiplied by 0.82 to arrive at an Age 4 AEQ rate; the Age-4 natural mortality rate would be multiplied by 0.96; and the Age-5+ natural mortality rate would be multiplied by 1.00. These figures are not intended to be applied to Chinook salmon PSC estimates to adjust the impacts of Alternative 2, especially considering the above statement that much of the Chinook salmon PSC in the GOA trawl fishery is immature salmon. Rather, they are included in an effort to present the best available, most applicable information, with the modest goal of characterizing the range of what a reasonable AEQ rate *might* look like in these fisheries.

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 produce a stock composition analysis, but rather documents the presence of a particular salmon stock in the Chinook salmon PSC. In 2011 (the most recent year for which analysis is available), GOA samples were predominantly from Chinook salmon stocks from British Columbia, the Pacific Northwest, the Northwest GOA, 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, it is nonetheless 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 or 2010. To the extent that Alternative 2, and the Council's preferred alternative, 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 individual stocks are likely to be affected, nor to what degree.

There are currently no specific prohibited species control measures in place for Chinook salmon in the GOA non-pollock trawl fisheries. However, regulations do 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 action, and

its selection of a preferred alternative, 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 take active measures 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, and the elements selected for the Council's preferred alternative, 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, nor would the elements selected for the preferred alternative.

As described in the methodology for the environmental assessment, there are no environmental impacts in implementing full retention of salmon, as proposed in Alternative 3 and the preferred alternative. The retention of salmon would affect neither fishing practices, nor Chinook salmon PSC in the regulated 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 3-14. 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 3-14 Marine mammals likely to occur in the Gulf of Alaska.**

	Species	Stocks
<b>NMFS Managed Species</b>		
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
<b>USFWS Managed Species</b>		
	Northern sea otter** <sup>3</sup>	Southeast Alaska, Southcentral Alaska, Southwest Alaska

Source: Allen and Angliss 2012.

\*ESA-listed species; \*\*Listed as depleted under the MMPA.

<sup>1</sup> Steller sea lions are listed as endangered west of Cape Suckling and threatened east of Cape Suckling.

<sup>2</sup> NMFS designated critical habitat for the northern right whale on July 6, 2006 (71 FR 38277).

<sup>3</sup> 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 3-15 and Table 3-16. Note that Table 3-16 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 3-15 Status of Pinnipedia and Carnivora stocks potentially affected by the action.**

<b>Pinnipedia and Carnivora species and stock</b>	<b>Status under the ESA</b>	<b>Status under the MMPA</b>	<b>Population trends</b>	<b>Distribution in action area</b>
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](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 through competition for prey species (Brix 2010).

### Southern Resident Killer Whale

The Southern Resident killer whale (SRKW) 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 to 200 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 3-16 Status of Cetacea stocks potentially affected by the action.**

<b>Cetacea species and stock</b>	<b>Status under the ESA</b>	<b>Status under the MMPA</b>	<b>Population trends</b>	<b>Distribution in action area</b>
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.

<b>Cetacea species and stock</b>	<b>Status under the ESA</b>	<b>Status under the MMPA</b>	<b>Population trends</b>	<b>Distribution in action area</b>
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 3-17 contains the significance criteria for analyzing the effects of the proposed action on marine mammals. The no action 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 no action 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 3-17 Criteria for determining significance of impacts to marine mammals.**

	<b>Incidental take and entanglement in marine debris</b>	<b>Prey availability</b>	<b>Disturbance</b>
<b>Adverse impact</b>	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.
<b>Beneficial impact</b>	There is no beneficial impact.	There is no beneficial impact.	There is no beneficial impact.
<b>Insignificant impact</b>	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
<b>Significantly adverse impact</b>	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.
<b>Significantly beneficial impact</b>	Not applicable	Not applicable	Not applicable
<b>Unknown impact</b>	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: No Action**

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 and the Preferred Alternative: Hard Caps**

The range of hard caps under Alternative 2, and the elements selected for the preferred alternative, 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 and the preferred alternative 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. The same conclusion is applied for the Council's preferred alternative.

#### **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 3-18 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 3-18 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, <b>cod</b> , capelin, and pollock), and cephalopods
Humpback whale	Zooplankton, schooling fish (pollock, herring, capelin, saffron cod, sand lance, Arctic cod, and <b>salmon</b> )
Minke whale	Pelagic schooling fish (including herring and <b>pollock</b> )
Beluga whale	Wide variety of invertebrates and fish including <b>salmon</b> and pollock
Killer whale	Marine mammals (transients) and fish (residents) including herring, halibut, <b>salmon</b> , and <b>cod</b> .
Ribbon seal	<b>Cod</b> , pollock, capelin, eelpout, sculpin, flatfish, crustaceans, and cephalopods.
Northern fur seal	Pollock, squid, herring, <b>salmon</b> , capelin
Harbor seal	Crustaceans, squid, fish (including <b>salmon</b> ), and mollusks
Steller sea lion	Pollock, Atka mackerel, Pacific herring, Capelin, Pacific sand lance, Pacific cod, and <b>salmon</b>

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 3-19 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 3-19). 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 3-19 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 No Action: 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 SRKW 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.

In 2012, the Northwest Region concurred with Alaska Region that the federal and State of Alaska parallel groundfish fisheries and Amendment 93 to the GOA FMP were not likely to adversely affect Southern Resident killer whales or their critical habitat (Balsiger 2012; Stelle 2012). In a memo dated February 15, 2012 to the Alaska Region, the Northwest Region determined that the amount of Chinook salmon taken in the groundfish fisheries would result in an insignificant reduction in adult equivalent prey resources for Southern Resident killer whales. Only a fraction of Chinook salmon stocks included as bycatch in the Alaska groundfish fisheries overlap with stocks found in the Southern Resident killer whale's range and diet. In addition only a small fraction of those fish would have potentially entered inland waters of Washington that are designated critical habitat for Southern Residents, and that reduction is not anticipated to affect the conservation value of the critical habitat (Stelle 2012).

Similar to Amendment 93, Amendment 97 sets Chinook salmon PSC limits in the groundfish fisheries. Consequently, Amendment 97 may also reduce the potential effects of the GOA non-pollock fisheries on the availability of prey for marine mammals, especially in years when the salmon cap is reached and non-pollock fishing may be constrained. Because of the full retention requirement, better information regarding the origin of the salmon taken in the fisheries could be available in the future, providing an increased understanding of potential effects and further informing fisheries management. It is not likely that the potential effects on prey would result in population level effects on marine mammals, including Southern Resident killer whales, and therefore the EA found that the effects of Amendment 97 on marine mammals are likely insignificant (NMFS 2014). Because of the location and harvest amounts of potential prey species under Amendment 97, there would be no effect on the fitness of any individual whales. Amendment 97 would not adversely affect Southern Resident killer whales indirectly through prey competition.

#### 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).

AKR PRD concurred with AKR SFD that the federal and State of Alaska parallel groundfish fisheries and Amendment 93 to the GOA FMP were not likely to adversely affect Cook Inlet beluga whales or their critical habitat (Brix 2010; Rivera 2012). In the memo dated February 15, 2012 to AKR SFD, AKR PRD determined that the amount of Chinook salmon and chum salmon taken in the groundfish fisheries is not likely to have a discernable effect on mortality of individual salmon stocks. Salmon bycatch in the Alaska groundfish fisheries is dispersed over area and over different regional stocks; therefore, it is not likely there would be any discernable effects on the genetic structure of any Chinook or chum salmon stocks. Because the Chinook salmon taken in the GOA groundfish fisheries are likely a small proportion of overall Cook Inlet Chinook salmon returns, it is not likely that the Chinook salmon bycatch in the entire Alaska groundfish fisheries would have a measurable effect on the availability of Chinook salmon prey to Cook Inlet beluga whales. The memo also stated that Amendment 93, which set a hard cap on the number of Chinook salmon taken in the GOA pollock fishery, could benefit those species that depend on salmon, such as Cook Inlet beluga whales, by limiting salmon harvests in years of high Chinook salmon PSC. The hard cap would be more constraining on the fishery, making more salmon available for prey. Thus, Amendment 93 may have reduced the potential effects of the GOA pollock fishery on prey availability for marine mammals (Rivera 2012).

Similar to Amendment 93, Amendment 97 sets Chinook salmon PSC limits in the groundfish fisheries. Consequently, Amendment 97 may also reduce the potential effects of the GOA non-pollock fisheries on the availability of prey for marine mammals, especially in years when the salmon cap is reached and non-pollock fishing may be constrained. Because of the full retention requirement, better information regarding the origin of the salmon taken in the fisheries could be available in the future, providing an increased understanding of potential effects and further informing fisheries management. It is not likely that the potential effects on prey would result in population level effects on marine mammals, including Cook Inlet beluga whales, and therefore the EA found that the effects of Amendment 97 on marine mammals are likely insignificant (NMFS 2014). Because of the behavior of Cook Inlet beluga whales and the location and harvest amounts of potential prey species under Amendment 97, there would be no effect on the fitness of any individual whales. Amendment 97 would not adversely affect Cook Inlet beluga whales indirectly through prey competition and there will be no effects on Cook Inlet beluga whale prey as a result of this action.

#### 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 and the Preferred Alternative**

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. The same conclusion is also applied for the Council's preferred alternative.

### **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 and the Preferred Alternative: 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. The same conclusion is also applied for the Council's preferred alternative.

## 3.5 Seabirds

### 3.5.1 Seabird Species and Status

Thirty-eight species of seabirds breed in Alaska (Table 3-20). 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 3-20).

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/mbmp/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](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 3-20 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 3-21). 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 3-21 ESA-listed and candidate seabird species that occur in the GOA.**

Common Name	Scientific Name	ESA Status
Short-tailed Albatross	<i>Phoebastria albatrus</i>	Endangered
Steller's Eider	<i>Polysticta stelleri</i>	Threatened
Kittlitz's Murrelet	<i>Brachyramphus brevirostris</i>	Candidate

### Short-tailed Albatross

Short-tailed albatross (*Phoebastria 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**

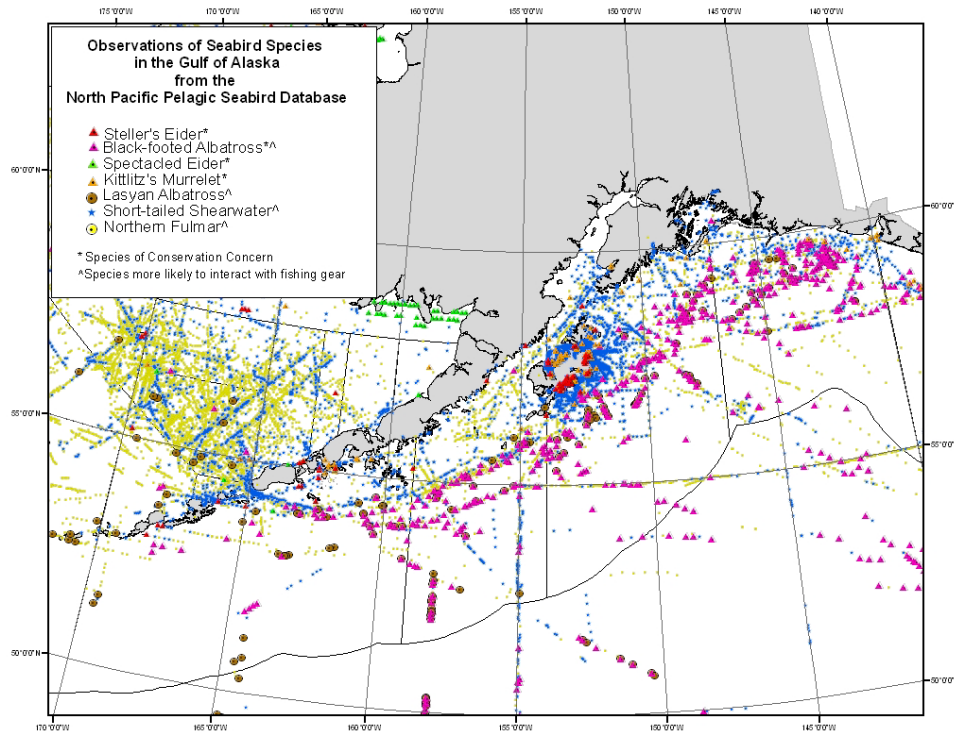
USFWS and Oregon State University placed 52 satellite tags on Laysan, black-footed, and short-tailed albatrosses in the Central Aleutian Islands to study movement patterns of the birds in relation to commercial fishing activity and other environmental variables. From 2002 to 2006, 21 individual short-tailed 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,



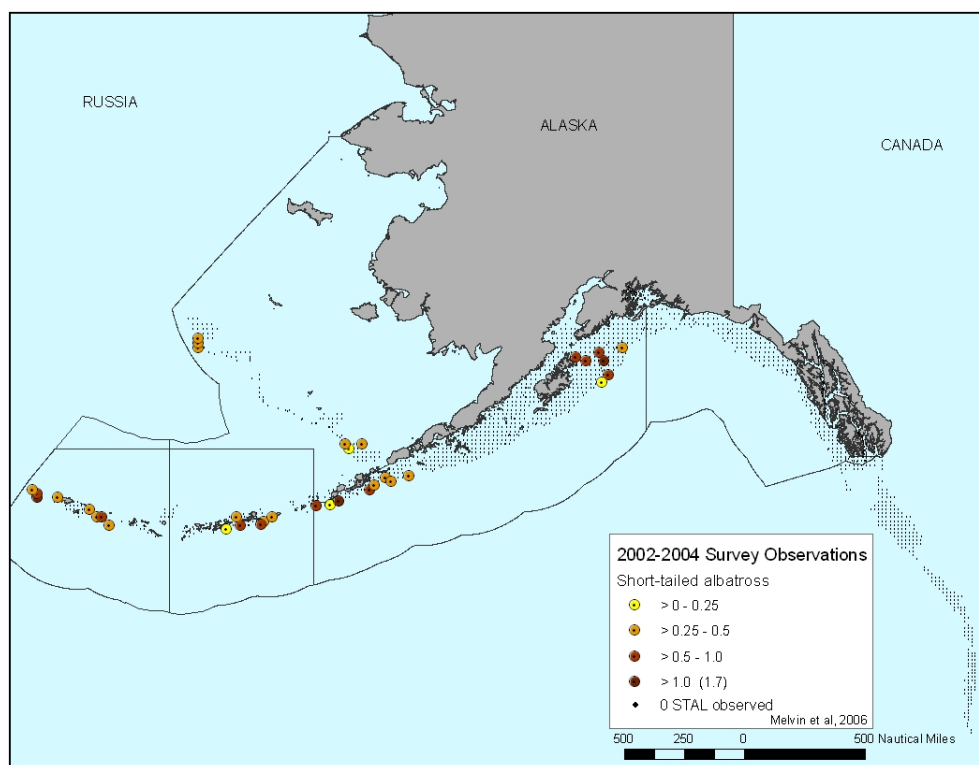
543, 610) being the most frequently used (Suryan et al. 2006). Non-breeding albatross concentrate foraging in oceanic areas characterized by gradients in topography and water column productivity. The primary hot spots for short-tailed albatrosses in the Northwest Pacific Ocean and Bering Sea occur where 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

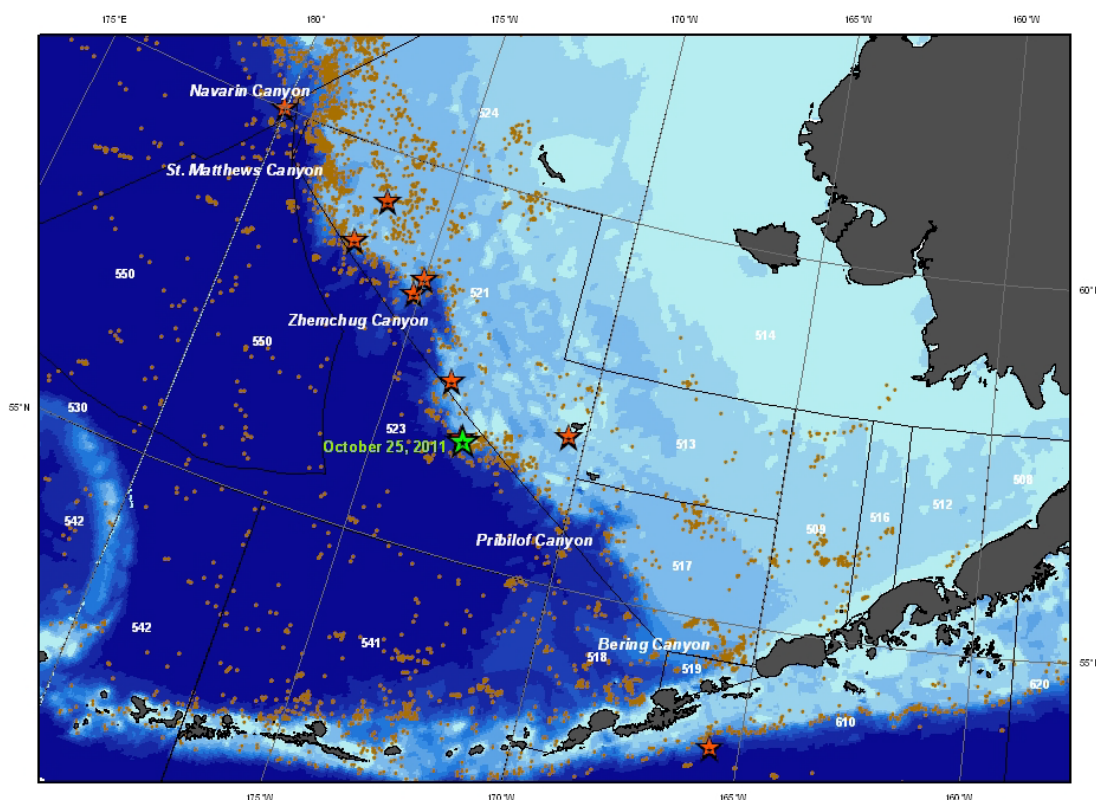
Table 3-22 lists the short-tailed albatrosses reported taken in Alaska fisheries since 1983. With the exception of one take in the Western GOA, all takes occurred along the shelf break in the Bering Sea. The Western GOA take was in the hook-and-line halibut fishery. No takes were reported from 1999 through 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 3-22 and Figure 3-14). NMFS is working closely with industry and the observer program to understand the specific circumstances of these incidents.

**Table 3-22 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 3-23. 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 3-23 Criteria used to determine significance of impacts on seabirds.**

	<b>Incidental take</b>	<b>Prey availability</b>	<b>Benthic habitat</b>
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 to 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 3-24, 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 non-pelagic 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 3-24 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 non-pelagic 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 non-pelagic 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 non-pelagic 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 no action 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 no action alternative no substantive changes are expected, and impacts are expected to be negligible.

### **3.5.2.5 Alternative 2 and the Preferred Alternative**

#### **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. The same conclusion is also applied for the Council's preferred alternative.

## **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 3-25 summarizes the action alternatives' impacts to seabird populations.

**Table 3-25 Summary of impacts to seabirds from alternatives in this analysis.**

<b>Alternative</b>	<b>Impact on incidental take of seabirds in Alaska waters</b>	<b>Impact on prey density and benthic habitat</b>
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 3-26 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 3-26 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, and the elements selected for the Council's preferred alternative, 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. The same conclusion is also applied for the Council's preferred alternative.

## **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, and the elements selected for the Council's preferred alternative, 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. The same conclusion is also applied for the Council's preferred alternative.

## **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 3-27). 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 3-27 Reasonably Foreseeable Future Actions.**

Ecosystem-sensitive management	<ul style="list-style-type: none"> <li>Increasing understanding of the interactions between ecosystem components, and ongoing efforts to bring these understandings to bear in stock assessments,</li> <li>Increasing protection of ESA-listed and other non-target species components of the ecosystem,</li> <li>Increasing integration of ecosystems considerations into fisheries decision-making</li> </ul>
Fishery rationalization	<ul style="list-style-type: none"> <li>Continuing rationalization of federal fisheries off Alaska,</li> <li>Fewer, more profitable, fishing operations,</li> <li>Better harvest, PSC, and bycatch control,</li> <li>Rationalization of groundfish in waters in and off Alaska,</li> <li>Expansion of community participation in rationalization programs</li> </ul>
Traditional management tools	<ul style="list-style-type: none"> <li>Authorization of groundfish fisheries in future years,</li> <li>Increasing enforcement responsibilities,</li> <li>Technical and program changes that will improve enforcement and management</li> </ul>
Other federal, state, and international agencies	<ul style="list-style-type: none"> <li>Future exploration and development of offshore mineral resources</li> <li>Reductions in United States Coast Guard fisheries enforcement activities</li> <li>Continuing oversight of seabirds and some marine mammal species by the USFWS</li> <li>Expansion and construction of boat harbors</li> <li>Expansion of state groundfish fisheries</li> <li>Other state actions</li> <li>Ongoing EPA monitoring of seafood processor effluent discharges</li> </ul>
Private actions	<ul style="list-style-type: none"> <li>Commercial fishing</li> <li>Increasing levels of economic activity in coastal zone off Alaska</li> <li>Expansion of aquaculture</li> </ul>

Reasonably foreseeable future actions that may affect target and prohibited species are shown in Table 3-27. These actions include but are not limited to the implementation of Amendment 89 Area closures for *Chionoecetes 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 1.5), 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. The same conclusion is also applied for the Council's preferred alternative.

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. The same conclusion is also applied for the Council's preferred alternative.

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 and the Council's preferred alternative 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 non-pollock trawl fisheries of the Central (regulatory areas 620 and 630) and Western GOA (regulatory area 610) groundfish fisheries off Alaska. 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 non-pollock 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 Purpose and Need

The purpose of this action is to address the capture of Chinook salmon in the non-pollock 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.<sup>17</sup> 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 groundfish 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 that it is necessary to evaluate management measures to protect against the risk of high Chinook salmon PSC in future years.

## 4.3 Description of the Alternatives

Three sets of alternatives are presented below. These alternatives propose management measures that would apply exclusively to the directed non-pollock trawl fisheries in the Western and Central Gulf of Alaska. The first set (“Initial alternatives for GOA non-pollock trawl Chinook PSC limits”) was approved by the Council in February 2012, and revised in December 2012. These alternatives were presented to the Council in June 2013, and were the basis for the Council’s initial preferred alternative that was selected at that meeting. The second set (“Rockfish Program rollover alternatives”) was approved by the Council during the staff tasking agenda item of the June 2013 meeting, and revised at initial review in October 2013. These alternatives were presented to the Council in December 2013, and the selected preferred alternative has been incorporated into the final Council recommendation for GOA non-pollock trawl Chinook PSC limits. The third set synthesizes the Council’s actions in June and December 2013; it represents the final preferred alternative, which is the Council’s recommendation going forward.

Alternatives and Options that were selected for the final preferred alternative are highlighted in **bold**.

### Initial alternatives for GOA non-pollock trawl Chinook PSC limits

Alternative 1: Status quo.

**Alternative 2: 5,000, 7,500, 10,000, or 12,500 Chinook salmon PSC limit (hard cap).**

**In any year following a year when a sector’s PSC usage is below its proportional share of 6,500 Chinook, the sector shall be allowed to access its share of an uncertainty pool of 1,000 fish (in addition to its share of the 7,500 cap). The sector’s share of the uncertainty pool (including any seasonal or fishery specific cap) shall be apportioned in the same manner as the 7,500 cap.**

Option 1: Apportion limit between Central and Western GOA.

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<sup>17</sup> Except when their retention is authorized by other applicable law for biological sampling or for programs such as the Prohibited Species Donation Program.

**Option 2: Apportion limit by operational type (CV vs. CP).**

Applies to both Options 1 and 2:

- (a) **Apportion proportional to historical average PSC of Chinook salmon (5-year average or 10-year average);**
- (b) Apportion proportional to historical average non-pollock groundfish harvest (5-year average or 10-year average).

**Option 3:** No more than 50% or **66%** of the annual Chinook PSC 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
- (d) **1,200 (from the CV sector's apportionment)**

**Suboption: Applies only to CGOA Rockfish Program CV sector**

Suboption 1: Divide by sector (CV and CP), based on actual Chinook salmon PSC by sector for the rockfish catch share program years of 2007 through 2012. Each LLP holder within a sector will receive an allowance 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 allowances will be apportioned to their respective cooperative.

Suboption 2: On October 1<sup>st</sup>, rollover all but 200, 300, or 400 remaining Chinook salmon PSC allotted amount 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 PSC until the number of salmon has been determined by the vessel observer or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed; if no plant observer is available, all salmon shall be recorded, by species, on the fish ticket.**

Note, both Alternative 2 and Alternative 3 could be selected by the Council in its 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.

*Rockfish Program rollover alternatives*

Alternative 1: No action (Council's final recommendation would be the preferred alternative selected from the "Initial alternatives for GOA non-pollock trawl Chinook PSC limits")

Alternative 2: The addition of the rollover provision as described in the EA/RIR to the Rockfish Program CV Chinook PSC cap and uncertainty pool.

Alternative 3: The addition of a provision allowing the rollover of all but 160 fish from the Chinook PSC allowance on October 1 and a Rockfish Program CV uncertainty pool.

Alternative 4: Roll over all Chinook PSC remaining in the Rockfish Program CV Chinook PSC cap when all Rockfish cooperatives have checked-out of the fishery, but no later than November 15, and no uncertainty pool for the Rockfish Program CV sector.



**Alternative 5: Roll over all but 50, 100, or 150 fish remaining in the Rockfish Program CV sector Chinook PSC cap on October 1. Any salmon remaining when the Rockfish Program fishery closes will be released to the other CV non-pollock fisheries on November 15. No uncertainty buffer would apply to the Rockfish Program CV sector.**

**COUNCIL'S FINAL PREFERRED ALTERNATIVE**

**Alternative 2:** 7,500 Chinook salmon PSC limit (hard cap).

In any year following a year when a sector's PSC usage is below its proportional share of 6,500 Chinook, the sector shall be allowed to access its share of an uncertainty pool of 1,000 fish (in addition to its share of the 7,500 cap). The sector's share of the uncertainty pool (including any seasonal or fishery specific cap) shall be apportioned in the same manner as the 7,500 cap.

**Option 2:** Apportion limit by directed fishery operational type (CV and CP).

(a) Apportion proportional to historic average PSC of Chinook salmon (5-year average):

CP cap = 3,600

CV cap = 3,900

**Option 3:** For the CP sector, no more than 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 catcher vessel sector

(d) 1,200 Chinook PSC (from the CV sector's apportionment)

**Suboption 2:** Roll over all Chinook PSC but 150 fish remaining in the Rockfish Program CV sector Chinook cap on October 1. Any Chinook salmon PSC allowance remaining when the Rockfish Program fishery closes will be released to the other CV non-pollock fisheries on November 15. No uncertainty buffer would apply to the Rockfish Program CV sector.

**Alternative 3:** Full retention of salmon

Vessels will retain all salmon PSC until the number of salmon has been determined by the vessel observer or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed; if no plant observer is available, all salmon shall be recorded, by species, on the fish ticket.

#### **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 November 15. 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 4.4.5 for a breakdown of 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 management. 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 harm 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-year and 10-year groundfish and 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). The CAS was fully implemented during the 2003 fishing year; it utilizes logbook data, while data from prior time periods come from a blend of fish ticket records and the 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 through 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.<sup>18</sup> 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 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.<sup>19</sup> 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 groundfish 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, fishermen with licenses to trawl in both the Central and Western GOA may have an opportunity to move between areas and fish where Chinook PSC allowance is available. If PSC is apportioned by regulatory area, fishermen 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 operators may feel less incentive to avoid PSC in an area that is nearing its limit.

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<sup>18</sup> 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.

<sup>19</sup> Depending on the day of the week on which January 1 falls, there are 53 days in a year upon which a calendar week could end.

#### 4.4.2.1 Annual pattern of trawl fleet participation

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 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 operators 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 closures, due to poor performance in avoiding Chinook salmon PSC, would more likely adversely 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)**

	Catcher/Processors					Catcher Vessels				
	Ending Quarter					Ending Quarter				
	1	2	3	4	Total	1	2	3	4	Total
<b>Year: 2004</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1		4		5	1	16	3	39	58
	2		3		3	2				0
	3		8		8	3		6		6
	4				0	4				0
Total	1	0	15	0	16	Total	16	3	45	64
<b>Year: 2005</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1		6		7	1	29	3	30	63
	2				0	2		1		1
	3		9		9	3		4		4
	4				0	4				0
Total	1	0	15	0	16	Total	29	4	34	68
<b>Year: 2006</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1		1	2	3	1	28	4	5	57
	2			2	2	2			1	1
	3		10		10	3		3		3
	4				0	4				0
Total	0	0	11	4	15	Total	28	4	8	61
<b>Year: 2007</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1		4	2	6	1	31	1	4	55
	2		3		3	2		1	6	8
	3		6		6	3				0
	4				0	4				0
Total	0	0	13	2	15	Total	31	2	5	63
<b>Year: 2008</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1		1	2	4	1	29	3	1	55
	2		1	2	3	2		2	4	6
	3		7		7	3		1	3	4
	4				0	4				0
Total	1	0	9	4	14	Total	29	3	4	65
<b>Year: 2009</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1			2	2	1	27	2	2	56
	2		2	1	3	2			1	1
	3		13		13	3			2	2
	4				0	4				0
Total	0	0	15	3	18	Total	27	2	2	59
<b>Year: 2010</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1		2	2	4	1	19	1	6	51
	2		1	1	2	2		1		1
	3		11		11	3				0
	4				0	4				0
Total	0	0	14	3	17	Total	19	1	7	52
<b>Year: 2011</b>										
Beginning Quarter	1	2	3	4	Total	1	2	3	4	Total
	1		1	1	3	1	16	1		29
	2		1	2	5	2			1	1
	3		9		9	3			3	3
	4				0	4			3	3
Total	1	1	12	3	17	Total	16	1	0	53

\*(See footnote 20 for further guidance on interpreting Table 4-1). Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA.

<sup>20</sup> 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 1<sup>st</sup> Quarter (January to March) – and so on. Cells in the first column indicate the number of vessels that recorded their final

#### 4.4.2.2 Catcher Vessel Fleet

The active GOA catcher vessel (CV) trawl fleet included 100 unique vessels during the 2003 through 2011 period. The most CVs landing GOA non-pollock groundfish in any given year was 71 (2003), and the fewest was 52 (2010). Sixty-two CVs were active during the 2012 fishing year. Thirty-five of those vessels were part of a Central GOA Rockfish Program cooperative, though only 28 actually made Rockfish Program landings (Table 4-36). Eighteen active CVs, all of them Rockfish Program participants, were also part of the AFA pollock fleet; only five of these vessels were licensed to an Alaska owner. Overall, 12 of the 36 CVs that were part of a cooperative management fishery in 2012 were Alaska-owned. Twenty-six GOA CVs were not part of any cooperative management program; thirteen of these vessels were Alaska-owned.

Table 4-2 summarizes the number of CVs that recorded groundfish landings of a given species or species group, 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.<sup>21</sup> Total revenue reflects the gross earnings from all activities, including participation in non-groundfish fisheries.

The table also reports the number of GOA CVs that landed groundfish from the Bering Sea/Aleutian Islands management area. Fifty-seven 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 frequency 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-through-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 BSAI.

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

	CV Vessels												Revenue (MMS)				
YEAR	Total Licensed Vessels	Active Vessels	Western GOA				Central GOA				Dual Licensed Vessels (CG&WG)	BSAI All Groundfish	GOA Groundfish Revenue	BSAI Groundfish Revenue	Total Revenue		
			WG Licensed Vessels	Active Vessels			CG Licensed Vessels	Active Vessels									
				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	20.6	22.8	58.5
2004	221	63	162	21	21	10	20	179	52	52	46	52	120	33	22.6	16.8	53.0
2005	220	67	178	28	30	25	28	161	45	45	45	45	119	29	31.8	16.3	65.5
2006	218	61	160	28	28	26	28	176	41	41	41	41	118	19	33.1	11.6	63.6
2007	218	63	160	31	31	27	30	176	37	37	37	37	118	28	34.8	19.4	74.3
2008	217	65	160	22	24	15	23	176	42	42	39	42	118	26	45.8	22.2	93.1
2009	211	59	154	24	25	15	25	171	34	34	33	34	114	22	25.0	10.3	53.8
2010	124	52	78	16	16	12	16	97	40	40	37	40	51	23	37.1	12.5	60.3
2011	124	53	78	12	14	11	13	97	46	47	41	46	51	28	38.0	17.5	74.0

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 through 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.

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

<sup>21</sup> The data in Table 4-2 reflect actual landings by species, as opposed to landings by designated trip target.

For the 2012 fishing year, 18 GOA CVs participated in both the AFA and the Central GOA Rockfish Program fisheries. Of these 18 vessels, 10 were endorsed for groundfish trawling in both the Central and the Western GOA, seven were endorsed only in the Central GOA, and one was endorsed only in the Western GOA. Eighteen other GOA CVs participated in the Rockfish Program, but not the AFA fishery. Eight of these vessels were endorsed in both the Central and the Western GOA, and the other 10 were endorsed for the Central GOA only. Finally, 26 GOA CVs did not participate in any cooperative management program. Twenty-one of these vessels were endorsed in both the Central and the Western GOA, two were endorsed only in the Central GOA, and three were endorsed only in the Western GOA.

Latent effort in the CV fleet ranged from 150 to 158 inactive license holders from 2003 through 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. The same number of CVs, 124, held licenses in 2012 as in 2011; however, the number of active vessels increased from 53 to 62. Sixteen vessels that did not fish in the GOA non-pollock trawl fishery in 2011 did so in 2012, meaning that seven vessels active in 2011 did not participate. Of the 16 new 2012 vessels, 10 were registered to Alaska owners and six were registered to Washington owners (AKFIN, Catch Accounting data).

Vessel length in the CV fleet directly affects the level of observer coverage and, by extension, the degree to which PSC is based on extrapolation and estimation. Under the then prevailing North Pacific Groundfish Observer Program, vessels under 60' in length were 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 restructured 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 through 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**

The Economic Stock Assessment and Fishery Evaluation (SAFE), prepared by NMFS, reports vessel operator residency according to the owner's listed residence, citing the NMFS Restricted Access Management (RAM) License Limitation Program (LLP) records. Tracking participation by the mailing address listed on a vessel owner's LLP license provides some information about which communities are economically dependent on GOA groundfish fisheries. Operator residence, however, is a rough measure of community economic affiliation, as LLP license addresses do not necessarily reflect a vessel's homeport. It is likely that a portion of any 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 just over half of their 2011 revenue from the GOA. For the 2012 fishing year, 25 of the 62 active CVs were owned by Alaska interests.

**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 (\$ million)			% 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 via fishery-supporting industry. 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 were homeported.



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

Home Port		# Catcher Vessels	Groundfish Revenue (\$ million)			% 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 Alaska. 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 through 2011 period. The most CP vessels landing GOA groundfish in any given year was 21 (2003), and the fewest was 14 (2008). All 17 of the CPs that were active in the most recent year (2012) are affiliated with the Amendment 80 program. Four active CPs are currently participating in the Central GOA Rockfish Program. One of the Amendment 80/Rockfish Program CPs is also the only AFA CP that is permitted to operate in the GOA. Under the restructured Observer Program, each CP is required to carry an observer on 100% of fishing days.

Table 4-7 summarizes the number of CP vessels that recorded groundfish landings of a given species or species complex – including pollock – as well as the aggregate revenue generated. CP revenue is based upon first wholesale prices. Total revenue includes earnings generated in non-groundfish fisheries, or when acting in a non-harvest capacity such as a mothership or a tender vessel. 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 through 2011**

	CP Vessels														Revenue (MM\$)		
YEAR	Total Licensed Vessels	Active Vessels	WG Licensed Vessels	Western GOA				CG Licensed Vessels	Central GOA				Dual Licensed Vessels (CG&WG)	BSAI All Groundfish	GOA Groundfish Revenue	BSAI Groundfish Revenue	Total Revenue
				Active Vessels					Active Vessels								
				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	19.7	124.2	165.8
2004	38	16	29	14	14	13	11	28	9	10	11	7	19	16	13.5	121.7	143.1
2005	38	16	29	12	13	11	10	28	9	11	12	9	19	15	20.7	148.8	185.1
2006	38	15	27	11	11	10	9	28	12	11	8	8	17	14	27.3	119.6	159.7
2007	37	15	26	13	13	11	12	27	9	9	8	8	16	14	21.2	131.2	176.3
2008	37	14	26	11	11	11	10	27	9	9	10	9	16	12	20.3	148.3	217.5
2009	37	18	26	14	14	14	13	27	12	11	11	11	16	17	20.3	196.5	234.9
2010	28	17	20	13	13	13	13	21	9	9	10	10	13	16	24.1	241.8	264.9
2011	28	17	20	14	14	14	14	21	9	9	9	9	13	16	36.3	284.1	366.2

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 through 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.

Table 4-8 provides a snapshot of 2011 CP participation and revenue in groundfish fisheries off Alaska. 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. Alaska vessels that were active in 2011 were homeported 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 (\$ million)			% 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 through 2011**

		Shorebased Processor	Floating Processor	Catcher/ Processor
<b>AK</b>	Akutan	1		
	Dutch Harbor	2	1	6
	King Cove	1	1	
	Kodiak	14		
	Sand Point	1		
	Seward	3		
	Unalaska	1		
<b>WA</b>	Bellingham			2
	Renton			4
	Seattle		6	22
	South Bend			1
<b>Other</b>				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 through 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 through 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 through 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 for 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 port city with the highest volume of fish landings, relies on deliveries from the CV fleet.

**Table 4-10 GOA non-pollock sector CV harvest and revenue by processing port, 2007 through 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%
<b>GOA TOTAL</b>	<b>226,773</b>		<b>274,651</b>	

\* 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 through 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%
<b>GOA TOTAL</b>	<b>115,514</b>		<b>146,482</b>	

# "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 through 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 through 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%
<b>GOA TOTAL</b>		<b>342,288</b>		<b>421,133</b>	

# "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 through 2011, Dutch Harbor did not receive any Gulf-groundfish 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 GOA groundfish harvest that Dutch Harbor received from 2007 through 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 likely 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](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](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 through 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 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 landings of non-pollock groundfish are of secondary importance in value to species such as salmon and halibut, and represent smaller volumes than pollock, they are important contributors to both the overall value and volume of processing, and to filling production 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 through 2011 period, between 1 and 5 vessels that participate in the Western GOA non-pollock fisheries reported themselves as homeported in King Cove.<sup>22</sup> 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 derives 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 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**

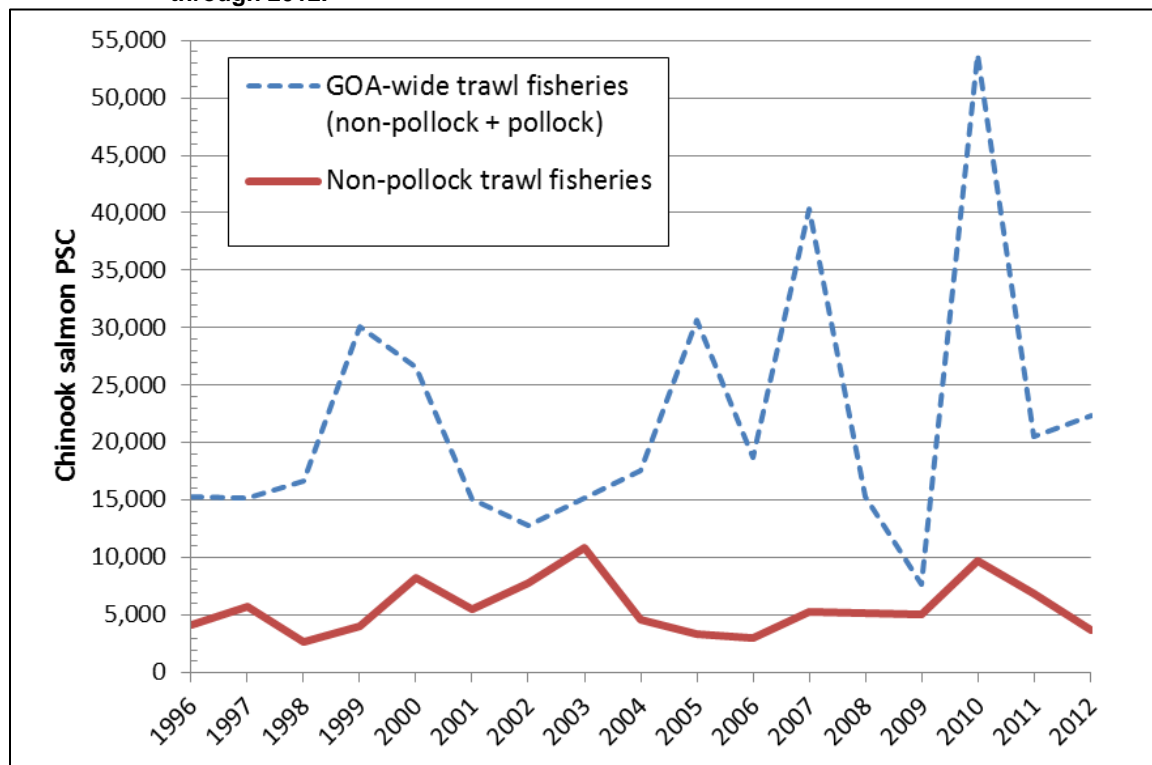
In 2012, the Council approved an annual Gulf-wide trawl PSC limit of 25,000 Chinook salmon in the GOA pollock fishery. The bottom and midwater pollock fisheries (considered jointly in this analysis)

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<sup>22</sup> 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.

comprise the majority of GOA trawl harvest. There is no directed pollock fishery in the GOA for CP trawl vessels. From 2003 through 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 (0.30 Chinook salmon per mt of pollock harvested) was second only to GOA rex sole (0.46), 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 through 2011 and all active CVs in 2006, 2007, 2009, and 2010. All active vessels in 2012 landed pollock.

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

		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>Catcher/ Processors</b>	<b># Vessels Landing Pollock</b>	18	13	14	12	14	13	18	17	17	17
	<b>Total Vessels</b>	21	16	16	15	15	14	18	17	17	17
<b>Catcher Vessels</b>	<b># Vessels Landing Pollock</b>	65	61	63	61	63	64	59	52	51	62
	<b>Total Vessels</b>	71	63	67	61	63	65	59	52	53	62

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 allowance and the Western GOA receives 26.7%. In each year from 2003 through 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/mt of catch in the Central GOA pollock trawl fishery and 0.29/mt of catch 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 valued 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. 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 through 2011. During this period, the pollock fleet generated \$3,097 in wholesale groundfish revenue for each Chinook salmon taken as PSC or, in estimated ex-vessel value, \$1,239 for each Chinook salmon. These estimates are “gross”, in the fullest sense of that term. Not least, because they do not account for the “value” attributable to each Chinook salmon, had it not been lost to trawl PSC (e.g., subsistence-use, commercial harvest, sport catch, ESA-salmon stock escapement, Cook Inlet Beluga CHD ‘primary constituent element’ – essential feature).

### **GOA pollock trawl fishery performance under a Chinook salmon hard cap, 2012**

The first hard cap on Chinook salmon PSC in the GOA was implemented during the 2012 C Season for pollock, which opens by regulation on August 25 (see Sections 1.4). Looking back at the 2012 C and D GOA pollock seasons provides the first available sample of how the GOA trawl fleet might respond under a hard cap.<sup>23</sup> In doing so, it is important to understand that the new PSC limit was only one of several new developments influencing the fishery during that period. At the time, the trawl CV fishery was also experiencing some additional vessel participation that has been anecdotally linked to fishing for catch history in the period upon which a future allocative management program might be based (Section 4.4.2.2). In relation, the 2012 fall season also featured some deviation from historical patterns of participation across the management boundary that divides the Western GOA and the Central GOA.<sup>24</sup>

In recent years, the Central GOA pollock trawl fishery has operated under a voluntary quasi-cooperative structure. These agreements were intended to facilitate PSC avoidance through enhanced fleet

<sup>23</sup> Also refer to 5.2.1.1 for a description of early experience with inseason management of a Chinook salmon hard cap.

<sup>24</sup> Refer to Figure 1-1 for a map of the management areas (610, 620, 630) included in these fisheries.



communication and a slowing of the fishery, to improve inseason management of the available pollock TAC, and to better coordinate deliveries to shoreside processing facilities.

Participants in the voluntary Central GOA pollock cooperative coordinated to delay starting their C season until mid-September, in order to allow shoreside processors in the area time to finish pink salmon production. By this time, the Western GOA pollock fishery, in which some Central GOA-based vessels with Area 610 endorsements participated, had met its available harvest limit. When the Central GOA C season began, more vessels participated than had done so in the past; the perception that additional vessels who would deliver to westward-bound tenders were entering the fishery motivated all vessels to concentrate early activity in Area 620, where tendering was possible. As a result, industry representatives reported that participants in the Central GOA deviated from their original voluntary catch sharing plan. Noting the additional effort, the Agency announced an upcoming closure with 24 hours of notice. The ensuing race to catch pollock resulted in a fishery that occurred in poor weather conditions, and, according to industry representatives, with target harvest prioritized ahead of PSC avoidance. After the fishery had closed, the Agency determined that a seasonal TAC overage had occurred; in addition, the season's largest Chinook salmon PSC encounters were recorded during this period. Inseason management was further complicated by an influx of participation by vessels with low observer coverage (under 60' vessels from the Western GOA, and AFA vessels that had fulfilled their quarterly observer-days requirement in the Bering Sea).

The D season for GOA pollock opens by regulation on October 1. The Agency determined that if all Central GOA endorsed vessels targeted Area 620 upon the opening – around 60 vessels, based out of both Central and Western GOA ports – the remaining available pollock TAC for that area could be harvested in one or two days. With this consideration, coupled with the need to manage a Chinook salmon PSC hard cap, the Agency decided not to re-open the Area 620 fishery until the two fleets developed a plan to manage the available TAC. The fleet agreed to a voluntary catch sharing plan with a one trip limit, as opposed to a one day race. Those vessels participating in the voluntary share agreement that fished closer to the Area 610/620 boundary encountered difficult fishing conditions, and did not harvest their entire share of the available “quota.” As a result, the Area 620 D season ultimately ended with a portion of the allowable catch unharvested.

Meanwhile, the D season opened in the Western GOA on October 1, but was closed in mid-October as the harvest limit was approached. The fishery was re-opened for four days under a voluntary catch sharing plan in order to fully utilize the TAC. At the time, the Catch Accounting System indicated that there was enough available Chinook Salmon PSC to support the reopening. However, as delayed observer data entered the system, PSC from earlier weeks was retroactively applied to unobserved trips and it was later determined that a Chinook salmon PSC overage had occurred.

While the action under consideration deals specifically with non-pollock fisheries, the preceding summary provides some notion of the multiple moving parts that influence inseason management of a hard-capped fishery. Within the broader context of increased participation and limited observer coverage, a PSC limit might be viewed as one of several exacerbating factors that ultimately resulted in instances of overharvest, underharvest, and a PSC overage. That said, it is important to acknowledge that the Fall 2012 pollock season is a single sample that occurred during a transitional management period, and is not necessarily indicative of future outcomes.

#### **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 through 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 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, economic factors, and relative product prices.

**Table 4-15 Annual non-pollock groundfish trawl harvest in the Gulf of Alaska, 2003 through 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 through 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/processers 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/processers harvested 22% of total weight; Western GOA catcher/processers 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 through 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 through Table 4-20 provide cumulative target harvest weight and proportions of total harvest for each of the predominant fisheries, from 2003 through 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 through 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
<b>GOA TOTAL</b>	<b>561,935</b>	<b>100%</b>	

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 through 2011**

Western GOA					Central GOA				
TARGET	Harvest (mt)	% Subtotal	% Total	Rank	TARGET	Harvest (mt)	% Subtotal	% Total	Rank
Rockfish	50,717	51%	9%	1	Rockfish	136,602	29%	24%	1
Pacific Cod	28,275	29%	5%	2	Arrowtooth Flounder	134,981	29%	24%	2
Arrowtooth Flounder	13,080	13%	2%	3	Pacific Cod	89,219	19%	16%	3
<b>WG SUBTOTAL</b>	<b>98,718</b>	<b>93%</b>			Shallow Water Flatfish	66,070	14%	12%	4
<b>GOA TOTAL</b>	<b>561,935</b>		<b>16%</b>		<b>CG SUBTOTAL</b>	<b>463,217</b>	<b>92%</b>		
					<b>GOA TOTAL</b>	<b>561,935</b>		<b>76%</b>	

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 through 2011**

GOA Trawl Catcher Vessels					GOA Trawl Catcher/Processors				
TARGET	Harvest (mt)	% Subtotal	% Total	Rank	TARGET	Harvest (mt)	% Subtotal	% Total	Rank
Pacific Cod	113,495	31%	20%	1	Rockfish	104,904	53%	19%	1
Arrowtooth Flounder	95,138	26%	17%	2	Arrowtooth Flounder	52,923	27%	9%	2
Rockfish	82,416	23%	15%	3	Rex Sole	24,710	12%	4%	3
Shallow Water Flatfish	63,631	17%	11%	4	<b>CP SUBTOTAL</b>	<b>197,772</b>	<b>92%</b>		
<b>CV SUBTOTAL</b>	<b>364,164</b>	<b>97%</b>			<b>GOA TOTAL</b>	<b>561,935</b>		<b>32%</b>	
<b>GOA TOTAL</b>	<b>561,935</b>		<b>63%</b>						

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 through 2011**

Western GOA Trawl Catcher Vessels					Western GOA Trawl Catcher/Processors				
TARGET	Harvest (mt)	% Subtotal	% Total	Rank	TARGET	Harvest (mt)	% Subtotal	% Total	Rank
Pacific Cod	26,359	98%	5%	1	Rockfish	50,363	70%	9%	1
<b>WG CV SUBTOTAL</b>	<b>26,863</b>	<b>98%</b>			Arrowtooth Flounder	13,063	18%	2%	2
<b>GOA TOTAL</b>	<b>561,935</b>		<b>5%</b>		Flathead Sole	3,804	5%	1%	3
					Rex Sole	2,279	3%	0%	4
					Pacific Cod	1,916	3%	0%	5
					<b>WG CP SUBTOTAL</b>	<b>71,855</b>	<b>99%</b>		
					<b>GOA TOTAL</b>	<b>561,935</b>		<b>13%</b>	

Central GOA Trawl Catcher Vessels					Central GOA Trawl Catcher/Processors				
TARGET	Harvest (mt)	% Subtotal	% Total	Rank	TARGET	Harvest (mt)	% Subtotal	% Total	Rank
Arrowtooth Flounder	95,120	28%	17%	1	Rockfish	54,540	43%	10%	1
Pacific Cod	87,137	26%	16%	2	Arrowtooth Flounder	39,861	32%	7%	2
Rockfish	82,062	24%	15%	3	Rex Sole	22,432	18%	4%	3
Shallow Water Flatfish	63,585	19%	11%	4	<b>CG CP SUBTOTAL</b>	<b>125,917</b>	<b>93%</b>		
<b>CG CV SUBTOTAL</b>	<b>337,300</b>	<b>97%</b>			<b>GOA TOTAL</b>	<b>561,935</b>		<b>21%</b>	
<b>GOA TOTAL</b>	<b>561,935</b>		<b>58%</b>						

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. Gross wholesale revenue is estimated by summing the average values (per output weight) of all the products, from fillets to fish meal, that are derived from a given species<sup>25</sup>, then applying that aggregate value to the total harvest weight for that species as it is recorded in CAS. Wholesale value is an appropriate measure of value for CP vessels, but ex-vessel value is a more relevant measure for CVs. Gross first wholesale revenues give a sense of the general economic impact of groundfish harvest, but it is important to note that wholesale revenues reported by processors cannot be added to ex-vessel revenues paid to harvesters in order to gauge total economic production. Ex-vessel payments to CVs are, in fact, a cost to processors; the amount of the ex-vessel payment is only one of several factors that determine shoreside wholesale values. Within this section, unless otherwise stated, 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 through 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

<sup>25</sup> As reported in Commercial Operator's Annual Reports (COAR).

almost exclusively harvests Pacific cod, which has had higher value than other non-pollock groundfish species.

Table 4-17 through Table 4-25 provide cumulative target first wholesale value and proportion of total fishery value for each of the predominant fisheries, from 2003 through 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.<sup>26</sup>

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 through Table 4-25 show the relative importance of key harvest species to the total GOA cumulative wholesale value from 2003 through 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 through 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.

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

	<b>Wholesale Value (\$1000)</b>	<b>% of GOA TOTAL</b>
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

<sup>26</sup> The 2011 average wholesale value (as opposed to an average for the entire 2003 through 2011 period) is summarized for each target species in Table 4-66. **Error! Reference source not found.**, located in Section 4.7. That table also breaks out average annual wholesale value by regulatory area and operational type sector.

**Table 4-22 Wholesale value by trip target species and proportion of total Gulf of Alaska non-pollock trawl groundfish value, 2003 through 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
<b>GOA TOTAL</b>	<b>668,807</b>	<b>100%</b>	

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 through 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
<b>WG SUBTOTAL</b>	<b>129,968</b>	<b>98%</b>		
<b>GOA TOTAL</b>	<b>668,807</b>		<b>19%</b>	

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
<b>CG Subtotal</b>	<b>538,839</b>	<b>98%</b>		
<b>GOA TOTAL</b>	<b>668,807</b>		<b>79%</b>	

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 through 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
<b>CV SUBTOTAL</b>	<b>429,045</b>	<b>96%</b>		
<b>GOA TOTAL</b>	<b>668,807</b>		<b>62%</b>	

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
<b>CP SUBTOTAL</b>	<b>239,762</b>	<b>96%</b>		
<b>GOA TOTAL</b>	<b>668,807</b>		<b>34%</b>	

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 through 2011 (ordered by total harvest weight)**

Western GOA Trawl Catcher Vessels					Western GOA Trawl Catcher/Processors				
TARGET	Wholesale Value (\$1000)	% Subtotal	% Total	Rank	TARGET	Wholesale Value (\$1000)	% Subtotal	% Total	Rank
Pacific Cod	45,071	100%	7%	1	Rockfish	61,469	73%	9%	1
<b>WG CV SUBTOTAL</b>	<b>45,278</b>	<b>100%</b>			Arrowtooth Flounder	12,910	15%	2%	2
<b>GOA TOTAL</b>	<b>668,807</b>		<b>7%</b>		Pacific Cod	2,485	3%	0%	5
					Rex Sole	2,733	3%	0%	4
					Flathead Sole	4,627	5%	1%	3
					<b>WG CP SUBTOTAL</b>	<b>84,690</b>	<b>99%</b>		
					<b>GOA TOTAL</b>	<b>668,807</b>		<b>13%</b>	

Central GOA Trawl Catcher Vessels					Central GOA Trawl Catcher/Processors				
TARGET	Wholesale Value (\$1000)	% Subtotal	% Total	Rank	TARGET	Wholesale Value (\$1000)	% Subtotal	% Total	Rank
Rockfish	112,674	29%	17%	2	Rockfish	73,452	47%	11%	1
Arrowtooth Flounder	73,443	19%	11%	3	Arrowtooth Flounder	44,457	29%	7%	2
Pacific Cod	127,484	33%	19%	1	Rex Sole	26,365	17%	4%	3
Shallow Water Flatfish	53,775	14%	8%	4	Flathead Sole	4,686	3%	1%	4
<b>CG CV SUBTOTAL</b>	<b>383,768</b>	<b>96%</b>			<b>CG CP SUBTOTAL</b>	<b>155,071</b>	<b>96%</b>		
<b>GOA TOTAL</b>	<b>668,807</b>		<b>55%</b>		<b>GOA TOTAL</b>	<b>668,807</b>		<b>22%</b>	

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 have presumed that a reduction in harvest would likely decrease the fleet's revenue and, assuming no changes in cost structure, profit. Also, as noted below, there is no evidence of an offsetting price effect whereby decreased revenue would be mitigated by fishermen receiving a significantly greater ex-vessel price per unit in low-harvest years; this is likely a reflection of the fact that non-pollock groundfish products have many substitutes on the world market.

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 through 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 through 2011 & 2007 through 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

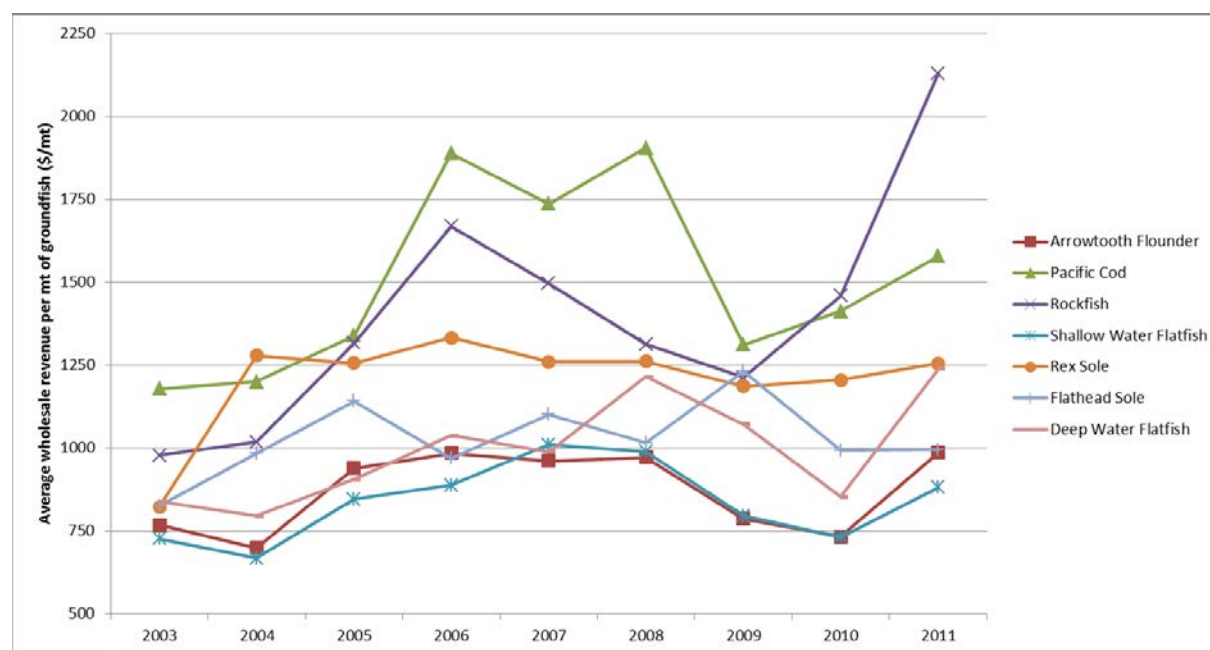
(Note: averages are derived from NOAA Catch Accounting System records at the fishing trip level)

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 through 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 (2010) 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).<sup>27</sup>

Figure 4-3 does indicate that wholesale revenues generated from trips targeting rockfish have increased in real dollar value per metric ton since 2009. Data on the wholesale value per metric ton of rockfish product – as opposed to all species product harvested on trips targeting rockfish – indicate that the value of that particular species is driving the increase in trip target value. The average annual value of one metric ton of rockfish product declined from 2006 to 2009, reaching a low of \$985; this value increased to \$1,258 in 2010, and \$2,010 in 2011. Anecdotal reports from Central GOA processors suggest that the increase in rockfish value can be attributed to higher product quality under the Rockfish Pilot Program and subsequent Rockfish Program, as derby-style fishing has been reduced. These sources note that the increase in the value of rockfish product lagged behind program implementation by one to two years as it took time for the perception of Central GOA rockfish product quality to match the fishery's performance.

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

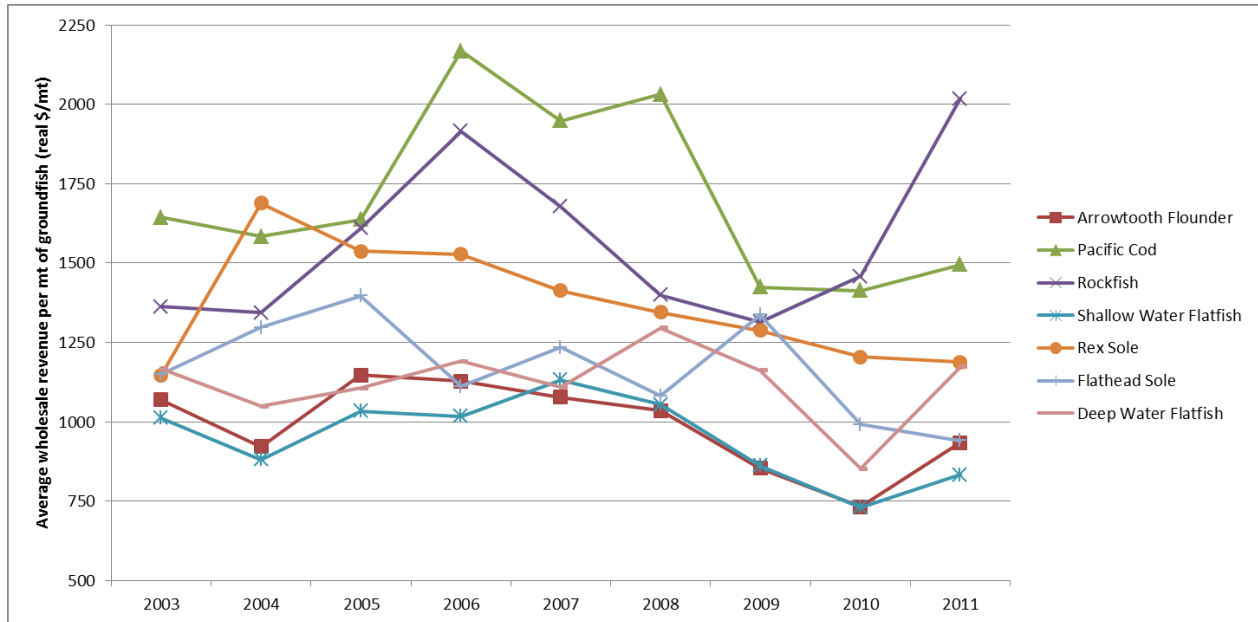


Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive\_ENCOAR\_PROD

<sup>27</sup> 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.

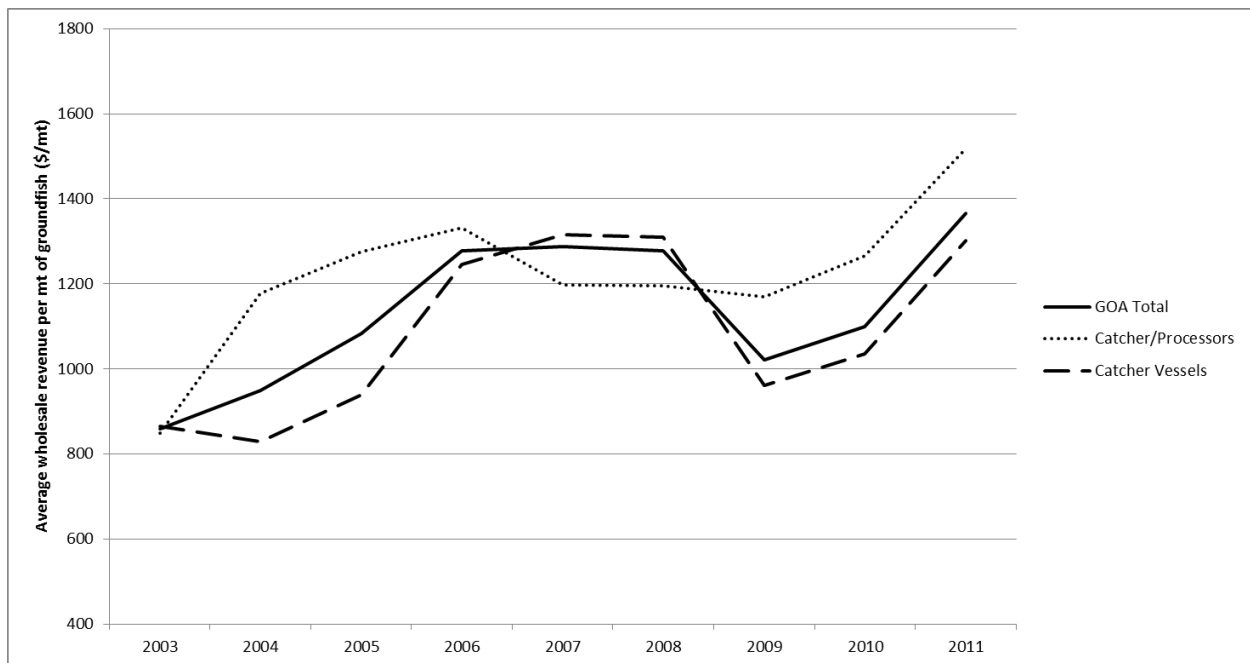


**Figure 4-3 Annual average wholesale revenue per mt (2010 dollars) of GOA non-pollock groundfish harvest by trip target, inflation-adjusted trend from 2003 through 2011**

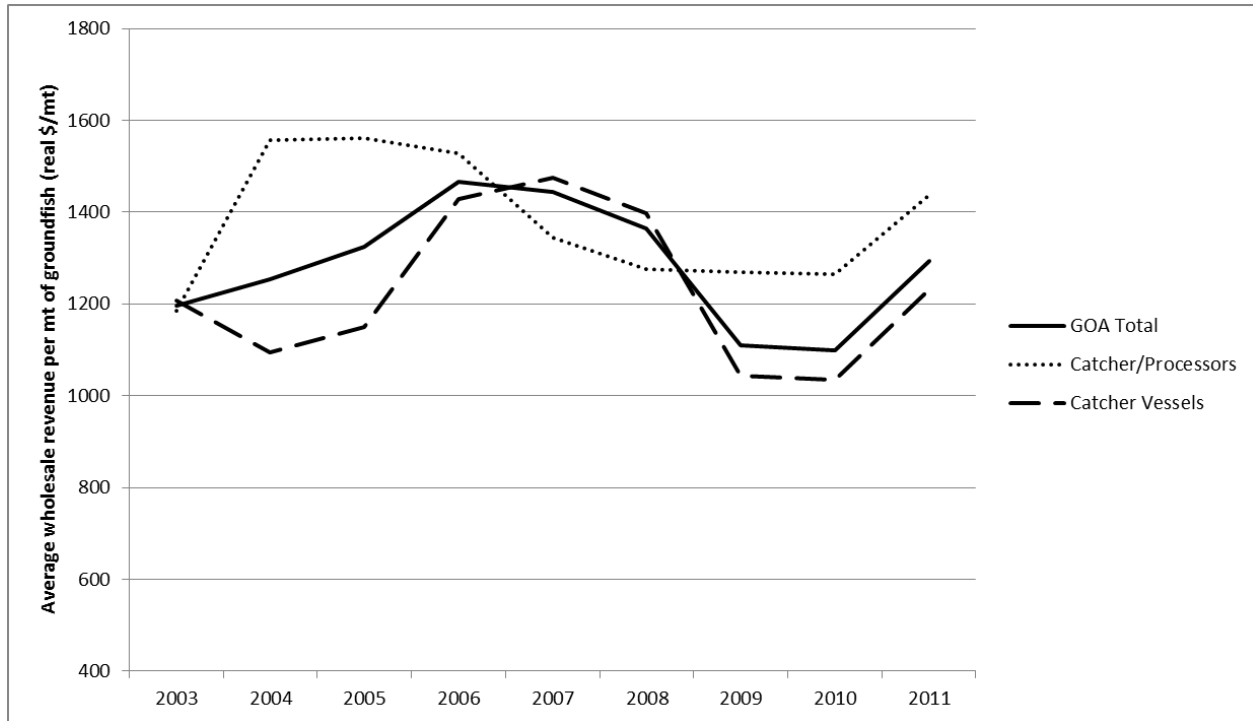


Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive\_ENCOAR\_PROD

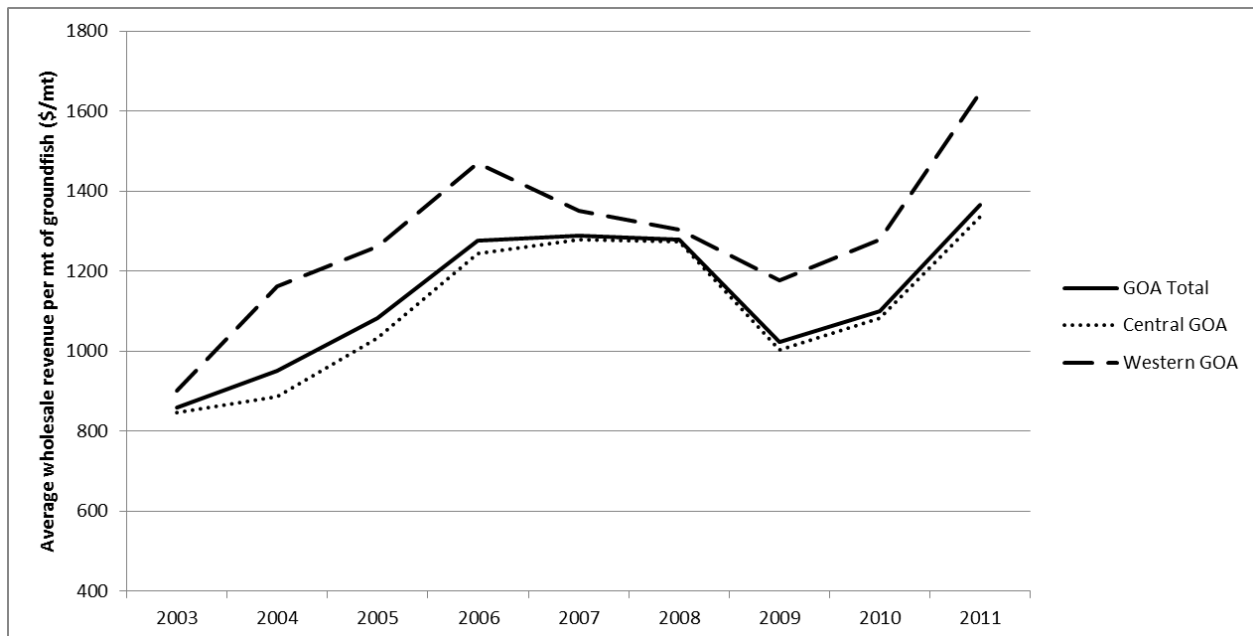
**Figure 4-4 Annual average wholesale revenue per mt of GOA non-pollock groundfish harvest by operational type, nominal value from 2003 through 2011**



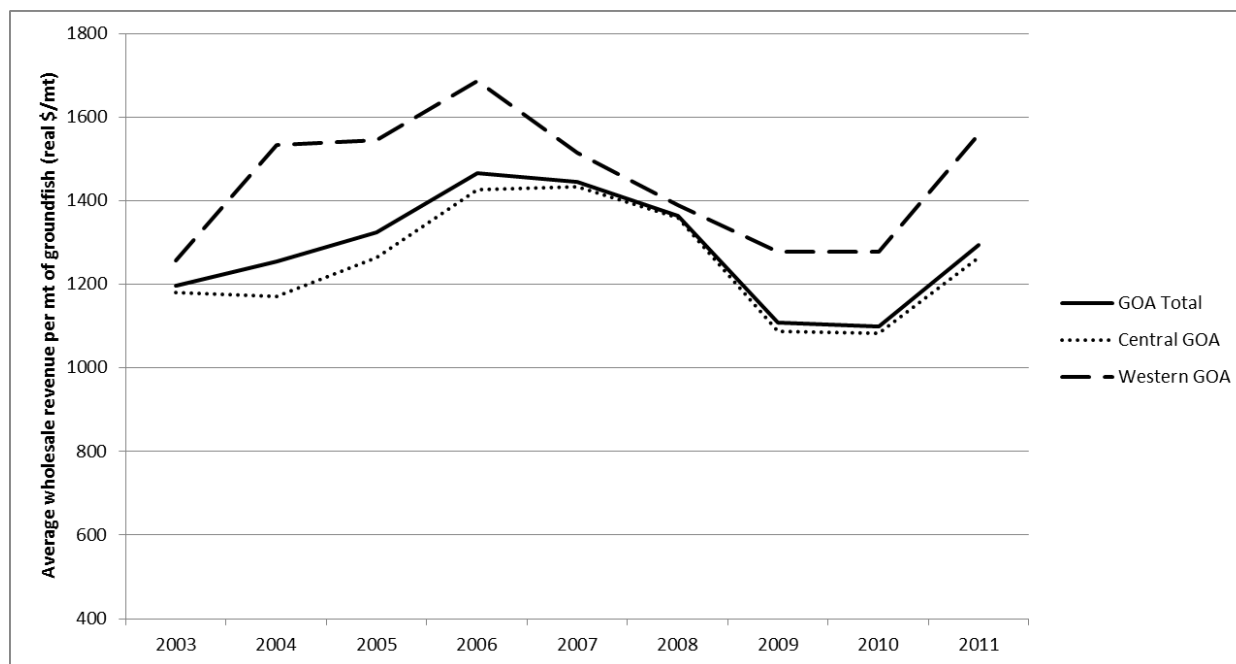
**Figure 4-5 Annual average wholesale revenue per mt (2010 dollars) of GOA non-pollock groundfish harvest by operational type, inflation-adjusted trend from 2003 through 2011**



**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 (2010 dollars) 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) 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 fishing 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.

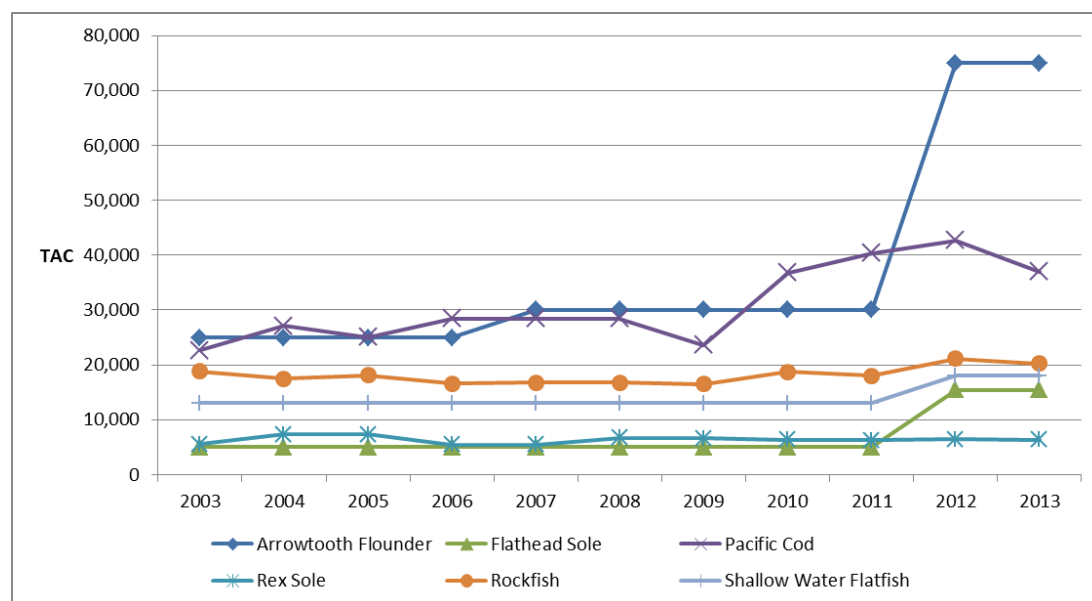
- Pacific cod is reported by inshore and offshore components, where, generally, inshore indicates catcher vessel prosecution and offshore indicates catcher/processor prosecution. Through 2011, GOA CVs received 90% of Pacific cod TAC and CPs received 10%. This remains the case in the Eastern GOA (outside 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, pelagic shelf rockfish, dusky rockfish, northern rockfish, rougheye rockfish, shortraker rockfish, thornyhead rockfish, and "other rockfish" (which includes slope rockfish, yellowtail rockfish, widow rockfish, and demersal shelf rockfish). Directed fisheries exist for Pacific ocean perch, northern rockfish, and dusky rockfish.<sup>28</sup> 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 Rockfish 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. The figures reflect a substantial increase in TAC for several GOA flatfish species in 2012 (arrowtooth flounder, flathead sole, and shallow water flatfish). The large gap between TAC and ABC that had existed prior to 2012 was a hold-over from years before halibut PSC was managed through seasonal mortality limits. During that time, industry had requested lower flatfish TACs as a measure to slow halibut mortality enough to prosecute late year fisheries, where halibut was likely to be a constraint. As arrowtooth flounder evolved into a viable target fishery, harvest levels increased to the point where a TAC closure was a legitimate concern. The Central GOA trawl fleet approached its arrowtooth flounder TAC in 2011. With the new system of halibut PSC management obviating the need to use TAC as a halibut safeguard, the Council recommended higher flatfish TACs in 2012.<sup>29</sup> Rex sole TACs did not increase, as they were already set at a level equal to ABC.

<sup>28</sup> Beginning with the final 2012 and 2013 groundfish harvest specifications for the GOA, the directed fishery for pelagic shelf rockfish (PSR) was changed by SSC, AP, and Council recommendation. Widow rockfish and yellowtail rockfish were moved to the "other rockfish" species group, and dusky rockfish began receiving treatment as a directed fishery, as the PSR species group had been treated previously. The rationale for this action is discussed in the preamble to the proposed 2012 and 2013 groundfish harvest specifications for the GOA (76 FR 79620, December 22, 2011).

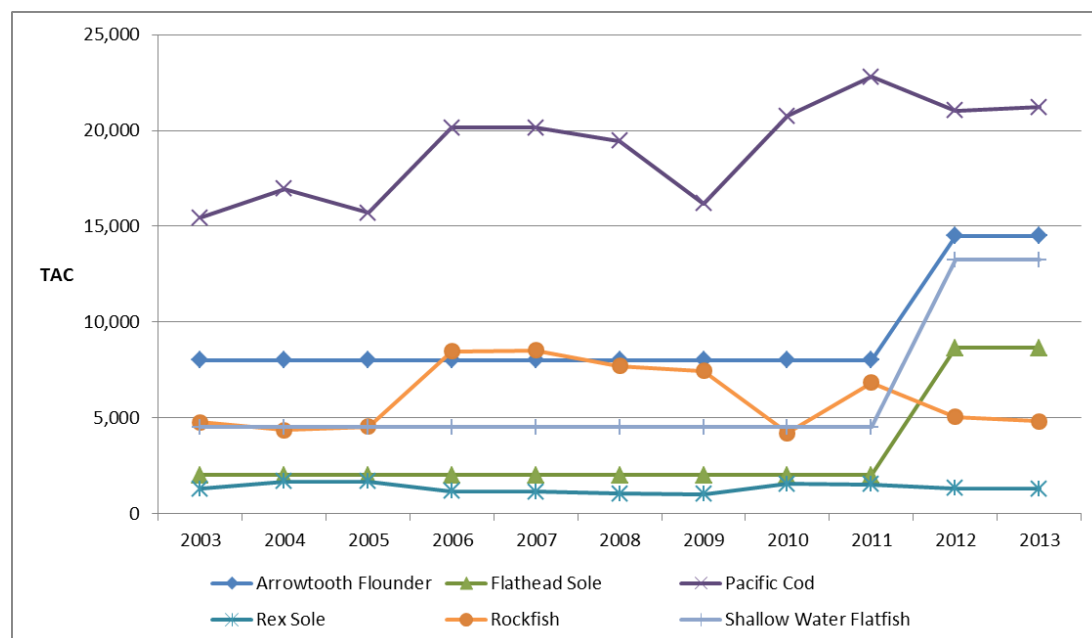
<sup>29</sup> Personal communication with Julie Bonney, Alaska Groundfish Data Bank (April 2013).

**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 through 2011. This information develops a preliminary notion of which fisheries are typically prosecuted to the fullest extent allowed (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 under current regulations are typically constrained by Pacific halibut PSC, or are secondary species fished under MRAs. The typically observed seasonal effect of halibut PSC as a groundfish harvest constraint is further detailed in

Section 4.4.8, and potential interactions between co-existing PSC limits for both halibut and Chinook salmon are explored in the impact analysis for the action alternative (Section 4.7).

Pacific cod CV TAC has ranged from around 20,000 mt to 42,000 mt in the Central GOA, and 14,000 mt to 23,000 mt in the Western GOA. The Central GOA inshore TAC was exceeded in five of the nine years from 2003 through 2011 (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 area's inshore component was between 75% and 100% of TAC in the five other years considered. The Pacific cod CP TAC ranged from around 1,700 mt to 4,000 mt in the Central GOA, and 1,500 mt 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 through 2011 was harvested close to the limit, annually, ranging from 83% to 98% of the allocated amount.

Participants in the GOA rockfish trawl fisheries harvest directed rockfish species, as well as other "secondary species," which are allocated in the Central GOA under the Rockfish Program. During the 2003 through 2011 period, directed fisheries existed 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 levels 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. The "other rockfish" species group (slope rockfish and demersal shelf rockfish, at the time) 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 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 at between 60% and 95% of TAC. Western GOA secondary species fisheries, with low TAC levels (40 mt to 600 mt), experienced more variability in utilization. "Other rockfish" species were overharvested from 2003 through 2005, and from 2009 through 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.

Arrowtooth flounder TAC has been exceeded in the Central (2006) and Western (2003) GOA in one year each. The arrowtooth flounder TAC in the Western GOA was steady at 8,000 mt until 2011, and less than 40% of this total was harvested in each year since 2004. Western GOA TAC was increased to 14,500 mt in 2012. The Central GOA TAC increased from 25,000 mt to 30,000 mt in 2008, and dramatically

increased to 75,000 mt in 2012. Through 2011, the Central GOA arrowtooth TAC was exceeded in one year and harvested at over 75% of TAC in four additional years.

In the Central GOA, shallow water flatfish harvest did not exceed 70% of the 13,000 mt TAC set throughout the 2003 through 2011 period, and was more typically less than 50%. Western GOA TAC was set at 4,500 mt; harvest reached no greater than 17% of available TAC, and was more typically less than 10%. Shallow water flatfish TAC levels also increased in 2012, and now set at 18,000 mt in the Central GOA and 13,250 mt in the Western GOA.

Utilization of flathead sole TAC was similarly low across the GOA. Central GOA flathead sole harvest did not exceed 70% of the 5,000 mt TAC, set throughout the analyzed period. Western GOA harvest was even lower, at no more than 41% of the TAC of 2,000 mt. In 2012, flathead sole TAC levels increased to 15,400 mt in the Central GOA, and 8,650 mt in the Western GOA.

Rex sole fisheries have not exceeded 70% of the 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 mt and 7,500 mt during this period, while Western GOA TAC ranged from 1,000 mt to 1,700 mt. The rex sole fisheries did not experience the same 2012 TAC level increase that was noted in the other GOA flatfish fisheries.

In general, GOA groundfish species are underutilized, in terms of harvest as a percentage of allowable catch. The amount of groundfish harvested is most often constrained by the existing PSC limits for halibut, rather than TAC limits; this is particularly the case in the flatfish fisheries and in the B season for Pacific cod. As such, recent increases in flatfish TAC levels are not indicative of greater groundfish harvest levels. Greater detail on the interaction between seasonal halibut PSC limits and groundfish harvest patterns is provided in Section 4.4.8.

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

##### **4.4.8.1 GOA groundfish prosecution, 2007 through 2011**

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 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 amount of limited PSC species allowance that remains at the time of a trip.

This analysis uses years 2007 through 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 through Table 4-30 illustrate the annual distribution of each GOA non-pollock trawl target species’ aggregate catch from 2007 through 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 total

aggregate GOA non-pollock trawl harvest, and as a proportion of harvest at the considered Chinook salmon PSC apportionment group levels.

#### 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 limit 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. In 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, and that 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.

The 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 31 as 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 through 2011 harvest (approximately 1.5%) in October. Secondary rockfish species – shortraker rockfish, roughey 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 “prohibited” 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 from 2007 through 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. The Central GOA accounted for 95% of Gulf-wide rex sole harvest, and 93% was taken by the CP sector. As a result, the Central GOA CP sector is the sector of interest in this fishery.

From 2008 through 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 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 from 2007 through 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. Seventy-one percent 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. Seventy-seven percent 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 through 2011 (Gulf-wide)**


TARGET	MONTH												% of TOTAL GOA HARVEST
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
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 through 2011**


TARGET	MONTH												% of Subarea Harvest	% of TOTAL GOA HARVEST
	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 through 2011**

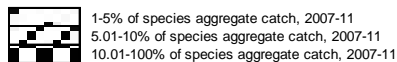
TARGET	MONTH												% of Operational Type Harvest	% of TOTAL GOA HARVEST
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
CP	Arrowtooth Flounder												25%	8%
	Flathead Sole												4%	1%
	Pacific Cod												1%	0%
	Rex Sole												14%	5%
	Rockfish												55%	19%
	Shallow Water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



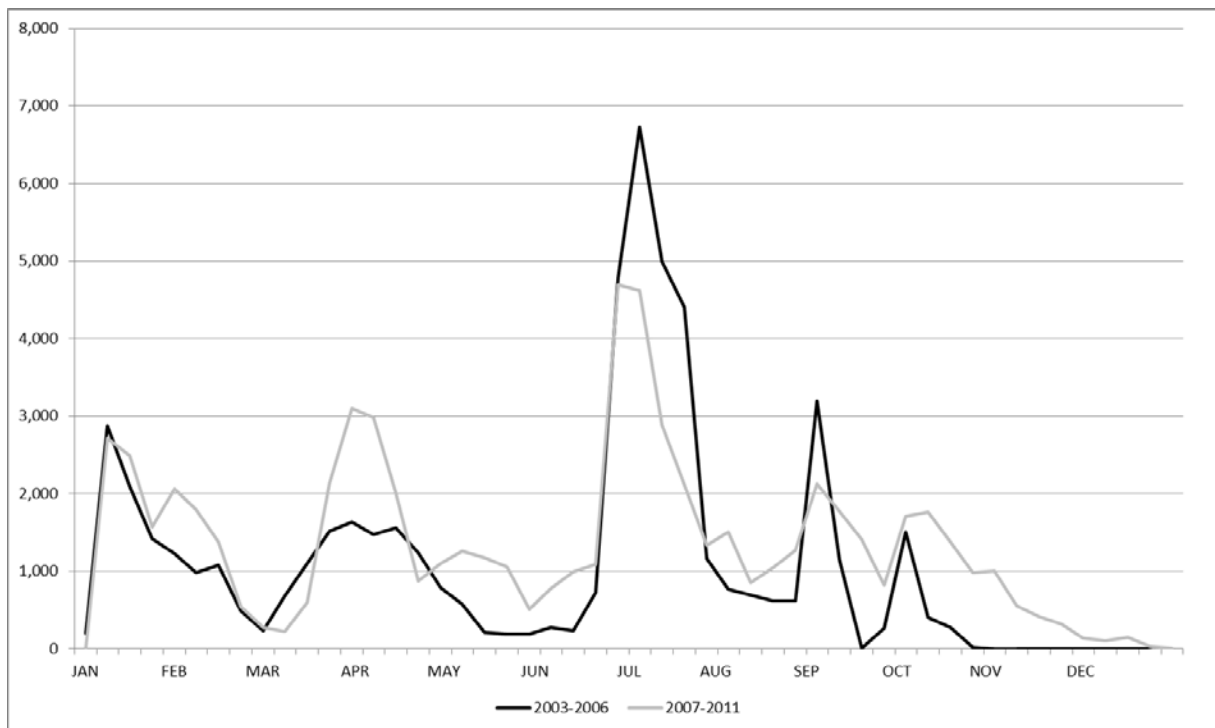
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA

#### 4.4.8.2 Pacific halibut PSC limits in the GOA trawl fishery

As noted above, halibut PSC limits have played a critical role in both the timing of GOA groundfish harvest, and in the fishery's overall ability to harvest groundfish at or near specified TAC levels. Under current regulations, the GOA trawl gear sector operates under a halibut PSC mortality limit that is apportioned over five seasons, and further divided between shallow-water and deep-water groundfish species complexes. Of the target species examined in this analysis, the shallow-water complex includes Pacific cod, flathead sole, and shallow water flatfish, while the deep-water complex includes rockfish, arrowtooth flounder, and rex sole. Halibut PSC closures for the shallow-water complex also impact the directed fisheries for pollock, Atka mackerel, and skates; shallow-water closures typically exempt participants fishing in the Central GOA Rockfish Program, and vessels fishing for pollock with pelagic trawl gear in the portions of the GOA that are open to that type of directed pollock fishing. Deep-water closures also impact the directed fisheries for deep water flatfish, but exempt Rockfish Program participants.

Figure 4-10 illustrates the impact of halibut PSC closures on total GOA groundfish harvest. Halibut PSC limits were a significant constraint between 2003 and 2006, which partially explains the low aggregate harvest levels seen during the spring flatfish season and late in the calendar year; directed fisheries did not open during the final calendar quarter of 2004 and 2005. The effect of halibut PSC on overall GOA groundfish fishery activity is especially relevant to this action, when considering alternatives that may base Chinook salmon PSC apportionments on historical harvest or PSC, as past halibut-related closures surely account for some of the difference in Chinook PSC and groundfish harvest between the years captured in a 10-year and a 5-year history.

**Figure 4-10 Seasonal GOA groundfish harvest, 2003 through 2006 and 2007 through 2011**



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA

Table 4-31 describes the apportionment of halibut PSC to the GOA groundfish trawl fisheries for the 2013 fishing year. Currently, the GOA trawl gear sector faces a PSC limit of 1,973 mt of halibut mortality. In June 2012, the Council took final action to progressively reduce the halibut PSC limit over a three-year implementation plan. The action is currently pending Secretarial approval, and would begin in 2014, at the earliest, using the 1,973 mt mortality limit as a baseline. The GOA trawl sector would ultimately face a halibut PSC limit of 1,705 mt in the third year after implementation and in subsequent years.

**Table 4-31 Final 2013 apportionment of Pacific halibut PSC trawl limits**

Season	Percent	Amount (mt)		
		Total	Shallow-water Complex	Deep-water Complex
January 20 - April 1	27.5%	543	444	99
April 1 - July 1	20.0%	395	99	296
July 1 - September 1	30.0%	592	197	395*
September 1 - October 1	7.5%	148	148	Any remainder
October 1 - December 31	15.0%	296	Unapportioned	
<b>Total</b>	<b>100%</b>	<b>1,973</b>		

\* Vessels participating in cooperatives in the Central GOA Rockfish Program will receive 191 mt of the third season (July 1 through September 1) deep-water complex halibut PSC apportionment.

Source: NMFS Alaska Region, [http://alaskafisheries.noaa.gov/sustainablefisheries/specs13\\_14/goatable15.pdf](http://alaskafisheries.noaa.gov/sustainablefisheries/specs13_14/goatable15.pdf).

Noting the exemptions listed above, the halibut PSC closures in the GOA groundfish trawl fisheries from 2007 through 2012 are described below, according to the halibut PSC seasons listed in Table 4-31. At the broadest level of generalization, halibut PSC mortality typically closed the deep-water complex directed fisheries (excepting the Rockfish Program) from late April through the end of June, and closed the shallow-water complex directed fisheries during September.

The apportioned mortality allowance for the first halibut PSC season (January 20 – April 1) triggered only one deep-water complex closure (March 2009), and two shallow-water complex closures (March 2008, and very late March 2012). Sideboarded Amendment 80 vessels were closed out of the shallow-water complex fisheries earlier in 2008 and 2012.

Deep-water complex directed fisheries were closed for halibut mortality from late April through the end of June, during the second halibut PSC season, for all years since 2008; these fisheries closed from mid-May through June in 2007. Shallow-water complex directed fisheries only experienced second season halibut PSC closures in 2007, 2008, and 2012.

The third halibut PSC seasonal allowance similarly triggered shallow-water complex fishery closures during the season's latter half in 2007, 2008, and 2012. Third season deep-water complex fisheries were closed for halibut PSC during August 2007 and 2012. Rockfish (Pilot) Program vessels were closed out of non-program fisheries in July of 2007 and 2011. These sideboard closures only applied to CPs in the shallow-water complex fisheries; for the deep-water complex, they applied to both CPs and CVs during July 2007, and only to CVs in 2011.

The shallow-water complex fisheries consistently experienced halibut PSC closures in the fourth halibut PSC season, throughout the 2007 through 2012 period, with intermittent 12 hour to 48 hour reopenings to aid in fully harvesting shallow-water TACs. Deep-water fisheries were only closed for halibut mortality during September in 2008.

The fifth halibut PSC seasonal allowance is not apportioned between the shallow- and deep-water species complexes. GOA groundfish trawl fisheries have not been closed for halibut mortality after October 1 since 2008. The fisheries experienced short closures and reopenings during 2007 and 2008, and in both cases they reopened after unused halibut PSC was reapportioned from the Rockfish Pilot Program in mid-November.

#### **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 (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, one can achieve 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 through 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.

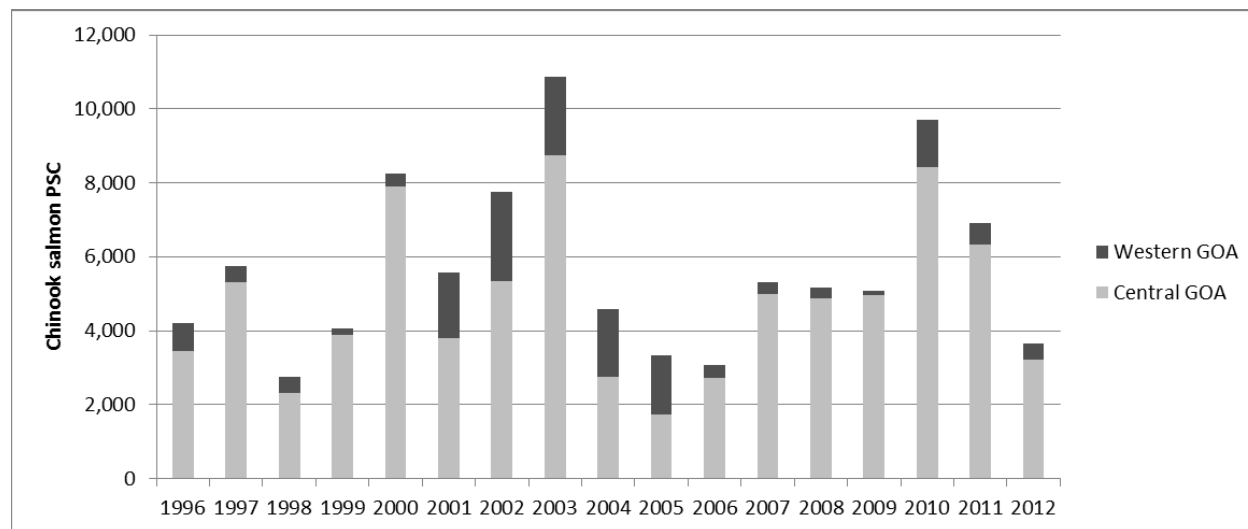
In October 2010, the Council took final action on Amendment 76 to the GOA Groundfish FMP, to restructure the Observer Program for vessels and processors (NPFMC 2010c). The final rule to implement the restructured program took effect for a portion of the 2013 fishing year. The new Observer Program made 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.<sup>30</sup>

Fishing trips in the Central GOA accounted for 84% of PSC during the 1996 through 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. The only year in which Central and Western GOA PSC were comparable was 2005. 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 4-11 Annual estimated Chinook salmon PSC in non-pollock groundfish fisheries, 1996 through 2012**



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

<sup>30</sup> 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.

#### 4.4.9.3 Chinook salmon PSC by Alternative 2 apportionment group and target species

During the 2003 through 2011 time period, GOA non-pollock trawl fisheries averaged 6,001 Chinook salmon PSC annually.<sup>31</sup> 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 through 2011 average PSC levels reported in Table 4-32 through Table 4-35 are not an exact match to the 10-year averages used to calculate the Alternative 2 PSC apportionments reported in Table 2-1. The 2002 data were excluded because they pre-date the implementation of NOAA's Catch Accounting System and rely 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 4-32 presents yearly PSC data for GOA non-pollock groundfish trawl targets in descending order of average annual PSC.

**Table 4-32 Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries, 2003 through 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	PSC	1,889	1,336	1,112	884	462	307	5,991
Avg.	%	31%	22%	19%	15%	8%	5%	100%

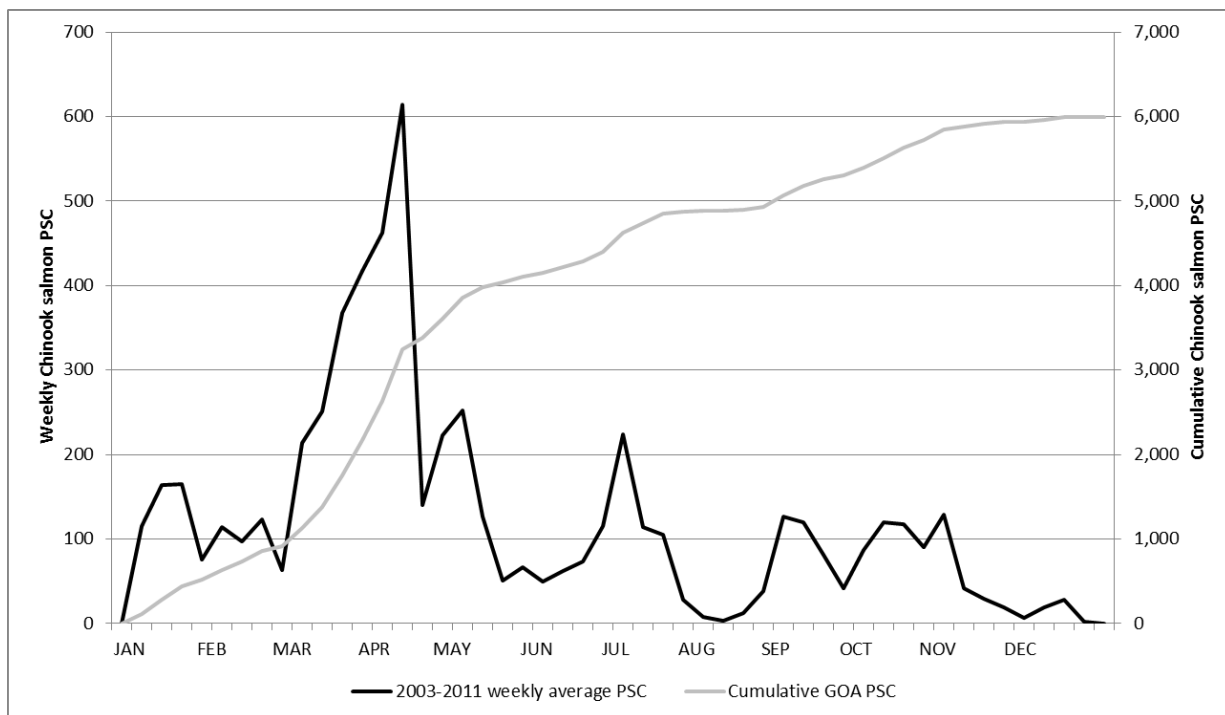
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

Figure 4-12 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

<sup>31</sup> 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.

week, over the 2003 through 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) 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 (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 PSC does not correspond to an increase in arrowtooth target harvest levels.

**Figure 4-12 Time distribution of Gulf-wide Chinook salmon PSC, 2003 through 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 through 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 4-33 presents yearly PSC data for the principal GOA non-pollock groundfish trawl fisheries, by regulatory area, in descending order of average annual PSC.



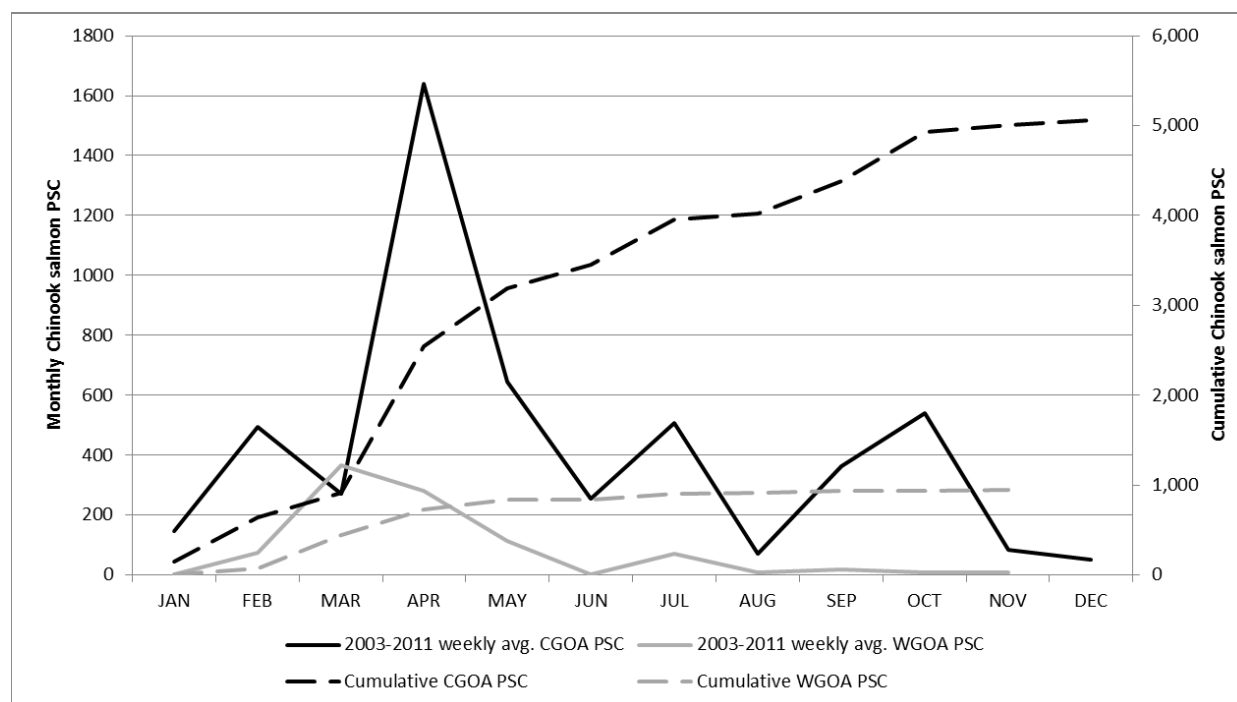
**Table 4-33 Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries, by regulatory area, 2003 through 2011**

		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	5,047
Avg.		%	55%	19%	14%	8%	5%	0%	100%	27%	25%	20%	15%	9%	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 4.4.10). 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 4-13 Time distribution of Central GOA and Western GOA Chinook salmon PSC, 2003 through 2011**



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 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 through 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). Trips targeting arrowtooth flounder accounted for 69% of the PSC recorded during this time of year; 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 (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 4-12), 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 through 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. The CP sector recorded 74% of Chinook salmon PSC in the flathead sole fisheries, 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 4-34 presents yearly PSC data for GOA non-pollock groundfish trawl fisheries by operational type sector, in descending order of average annual PSC.

**Table 4-34 Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries, by operational type, 2003 through 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%

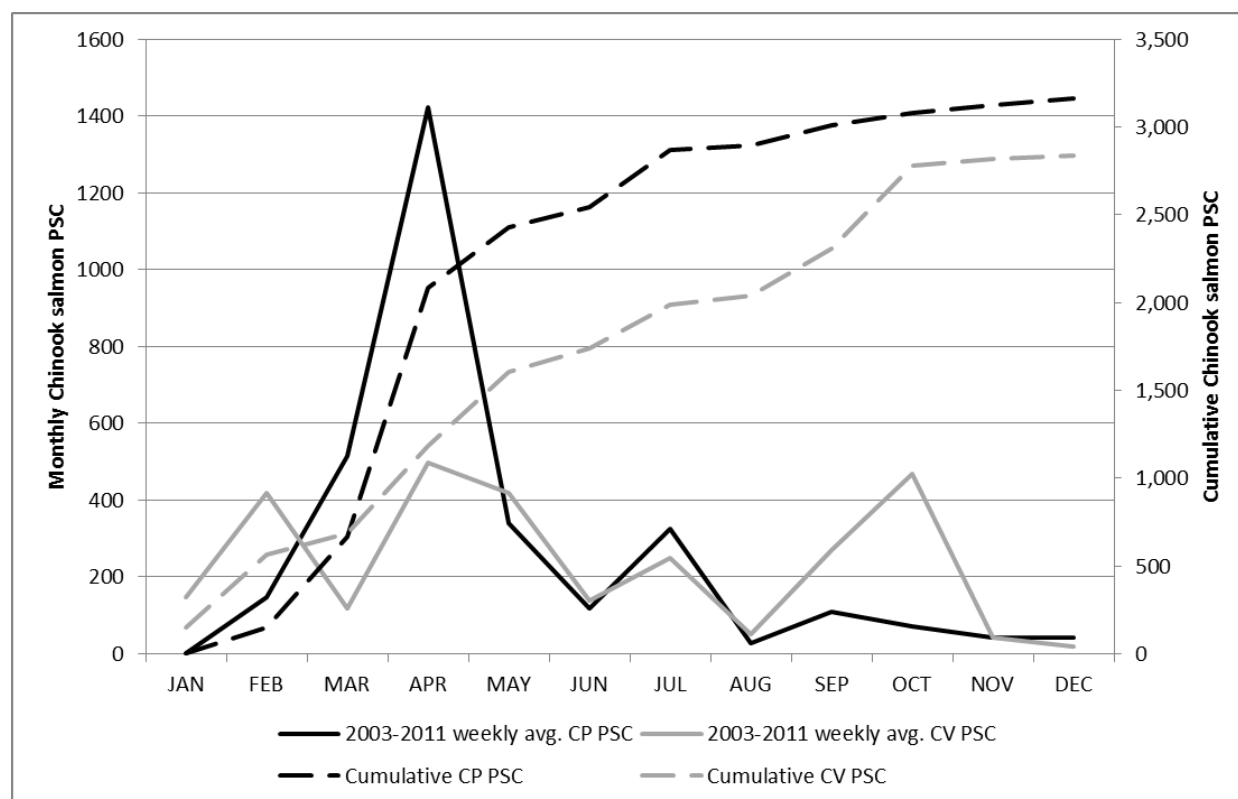
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

Figure 4-14 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 through 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 4-14 Time distribution of GOA catcher/processor and catcher vessel Chinook salmon PSC, 2003 through 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 through 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 4-35 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 was 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 PSC 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 4-35 Chinook salmon PSC for principal GOA non-pollock groundfish trawl target fisheries, by regulatory area and operational type, 2003 through 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 4-15 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 through 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.

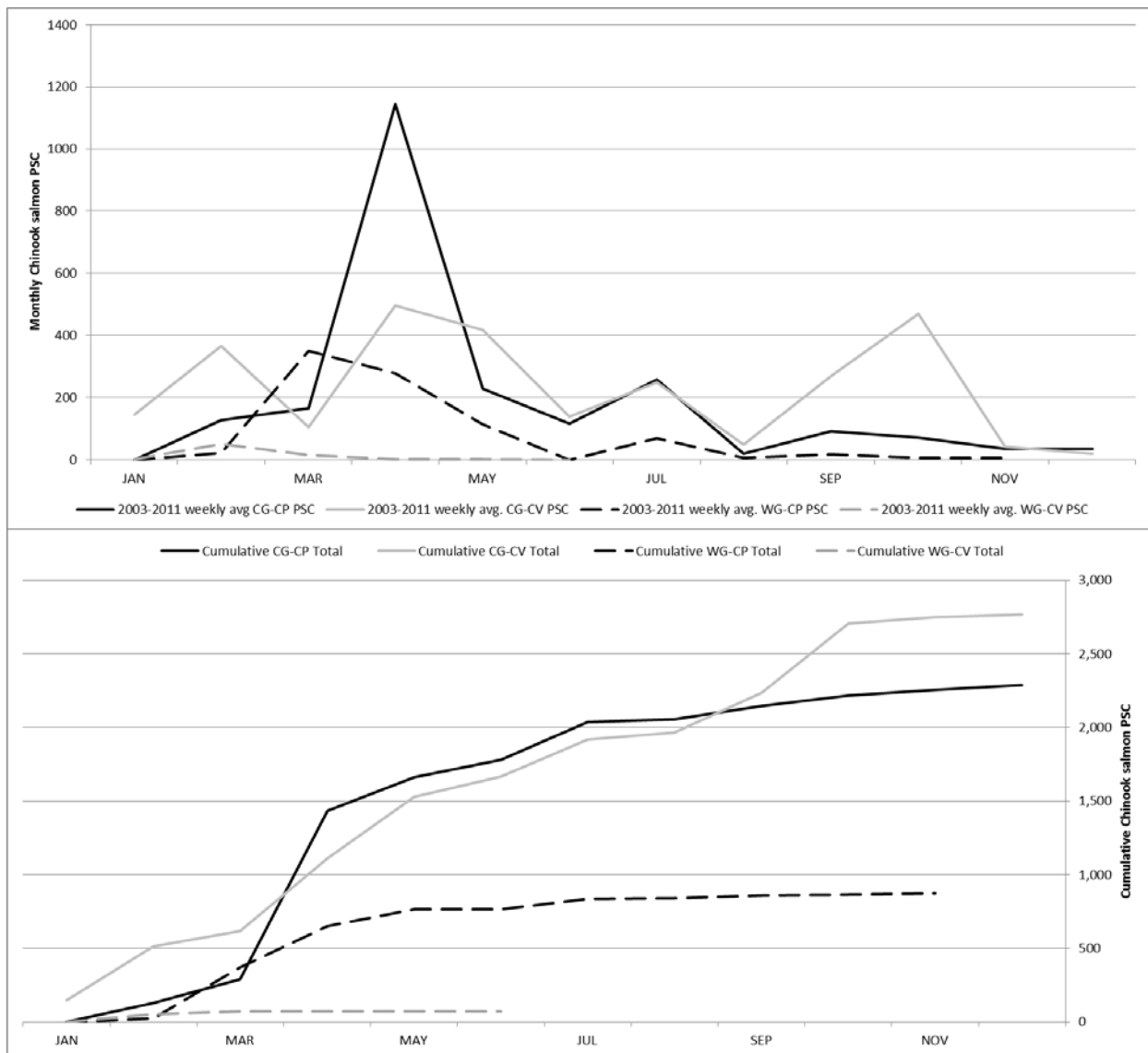
Central GOA CVs typically recorded the highest Chinook salmon PSC levels during the earliest and latest portion of the year. As is typically the case, January and February PSC (Weeks 3 through 8) are driven by the Pacific cod A-season. The uptick in Central GOA CV PSC in March (Weeks 9 through 11) come 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 Chinook 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), Chinook PSC in the Central GOA CP sector comes primarily from trips targeting rex sole. Arrowtooth trips contribute a similar amount of Chinook 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 Chinook 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 Chinook PSC; arrowtooth trips generally comprise the greatest proportion of Central GOA CP harvest from the late summer through the fall.

Chinook 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 Chinook 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 4-15 Time distribution of GOA catcher/processor and catcher vessel Chinook salmon PSC within each regulatory area (Central and Western GOA), 2003 through 2011**



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

#### 4.4.10 Central GOA Rockfish Program

From 2003 through 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% of rockfish-related PSC.<sup>32</sup>

The purpose and need drivers of the Rockfish Pilot Program (RPP)<sup>33</sup> identified fishery participants' limited ability to minimize prohibited species catch under the previous limited entry management

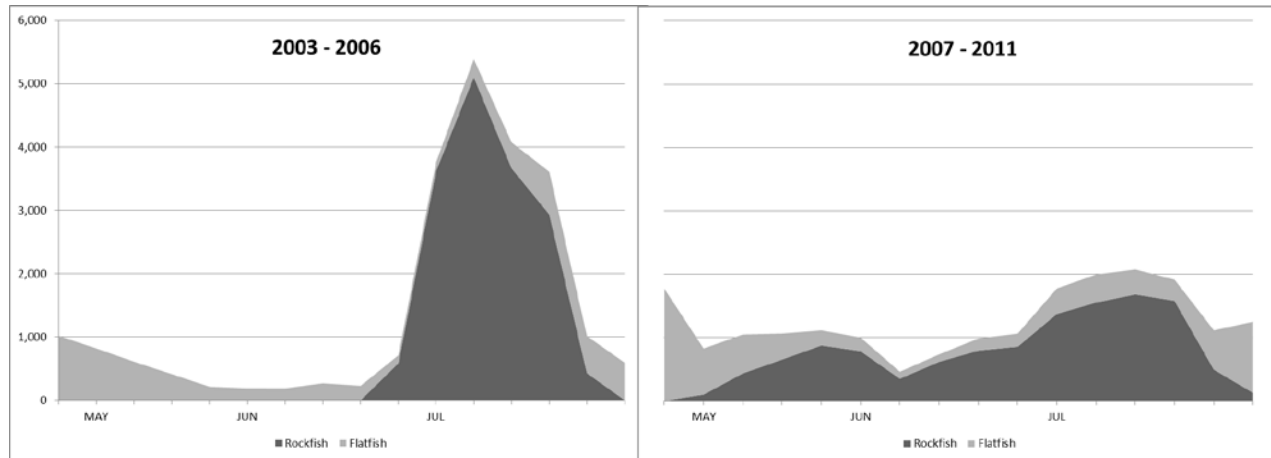
<sup>32</sup> If pollock trips are also considered, rockfish trips accounted for 17% of GOA groundfish harvest and 5% of Chinook salmon PSC.

<sup>33</sup> Established under Amendment 68 to the Gulf of Alaska FMP.



structure. The RPP, which was replaced by the Rockfish Program (RP)<sup>34</sup> after the RPP's sunset in 2011, established a cooperative management structure under 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 trends in Chinook salmon PSC. Implementation of the RPP in 2007 increased the length of the rockfish trawl season, increased the gross weight delivered to processors during May and June, and helped drive a shift from non-pelagic to semi-pelagic trawl gear (Figure 4-16).<sup>35</sup>

**Figure 4-16 Seasonal distribution of harvest (mt) on trips targeting rockfish and flatfish, before and after 2007**



The gear shift, which was at least partially an effort to reduce constraining halibut PSC mortality, may have contributed to higher levels of Chinook salmon PSC. Figure 4-17 illustrates the post-RPP increase in Chinook salmon PSC. From 2007 through 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.

For the years since the implementation of the RPP, it is possible to report groundfish harvest and Chinook salmon PSC for trips that are identified as occurring under the Program's cooperative management structure. The data reported above provide a sense of the relative size and importance of fishing activity targeting rockfish in the Central GOA, but may include catch by non-cooperative members and does not capture Program trips that are recorded under a different target species in the Catch Accounting System. The data in Table 4-37 and Table 4-38 (below) report only the fishing activity that occurred within the program, *including* those trips that were designated ex post with a non-rockfish target. Figure 4-17 illustrates this distinction, which is small but important for precision when considering alternatives that may apportion Chinook salmon PSC directly to the Rockfish Program.

<sup>34</sup> Established under Amendment 88 to the Gulf of Alaska FMP.

<sup>35</sup> 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 to fish earlier in the Bering Sea (when BS salmon encounter was lower), and improving product value by having fresh, well-handled rockfish product available for a greater portion of the year (see Figure 4-2 in Section 4.4.6.3, and Figure 4-16).

**Table 4-36 Number of vessels making landings under the Rockfish (Pilot) Program, 2007 through 2012**

Year	CP	CV	Total
2007	1	25	26
2008	2	25	27
2009	2	24	26
2010	4	24	28
2011	4	23	27
2012	5	28	33

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA, data compiled by AKFIN in Comprehensive\_PSC and other Catch Accounting sources.

**Table 4-37 Chinook salmon PSC recorded on Rockfish (Pilot) Program trips, 2007 through 2012**

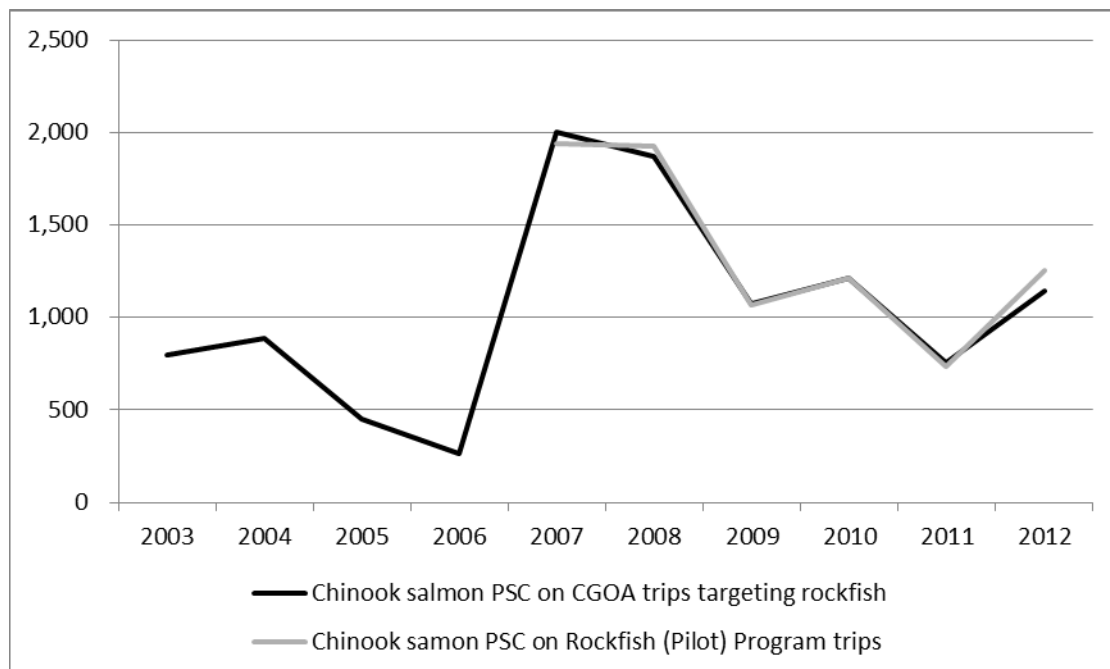
	2007	2008	2009	2010	2011	2012	Average	
Catcher Vessels	*	*	*	965	397	817	847	62%
Catcher/Processors	*	*	*	248	340	439	510	38%
<b>CG Rockfish Program Total</b>	<b>1940</b>	<b>1929</b>	<b>1068</b>	<b>1213</b>	<b>736</b>	<b>1256</b>	<b>1357</b>	<b>100%</b>

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

**Table 4-38 Groundfish harvest (mt) recorded on Rockfish (Pilot) Program trips, 2007 through 2012**

	2007	2008	2009	2010	2011	2012	Average	
Catcher Vessels	*	*	*	9,602	8,561	11,973	9,218	67%
Catcher/Processors	*	*	*	6,105	5,836	9,061	4,578	33%
<b>CG Rockfish Program Total</b>	<b>10,444</b>	<b>10,836</b>	<b>10,360</b>	<b>15,707</b>	<b>14,397</b>	<b>21,034</b>	<b>13,796</b>	<b>100%</b>

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA.

**Figure 4-17 Chinook salmon PSC associated with the Central GOA rockfish fishery, 2003 through 2012**

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

Since the implementation of cooperative management in the Central GOA rockfish fishery, Program participants have averaged a total of 1,357 Chinook salmon PSC per year. Table 4-39 reports the average annual Chinook PSC recorded on Rockfish (Pilot) Program trips for each calendar month, by operational harvest type. Most Chinook salmon encounters occur during the May to July period, when harvest is most

intense. From 2007 to 2012, CVs harvested 62% of their average annual RP-related groundfish during May and June, while CPs harvested 75% of their average annual RP-related groundfish during July. More information on PSC rates in the Rockfish Program is provided in Section 4.4.11.

**Table 4-39 Average monthly Chinook salmon PSC recorded on Rockfish (Pilot) Program trips, 2007 through 2012**

	MAY	JUN	JUL	AUG	SEP	OCT	NOV	Total
CP		168	280	23	39			510
CV	485	265	40	6	44		3	843
<b>Total</b>	485	433	319	29	83		3	1,352

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

#### 4.4.10.1 Catcher Vessel Sector of the Central GOA Rockfish Program

This subsection provides additional information that is specific to the CV fleet of the GOA non-pollock trawl fishery, as broken out into two sub-sectors: the CV sector of the Central GOA Rockfish Program, and all other CV activity. In its final preferred alternative, the Council chose to make a separate Chinook salmon PSC apportionment to the RP CV sector, and also chose to include a provision whereby remaining Chinook PSC allowance amounts could be rolled over from the RP CV sector to other CV non-pollock fisheries on October 1. In view of this selection, it is important to understand the seasonal distribution of CV activity and Chinook PSC encounter in the RP fishery. It is equally important to understand that many vessels participate in both of these CV “sub-sectors” in a given year, though some do not. In evaluating the inclusion of such a provision, the Council considered whether or not some vessels in the GOA CV fleet would experience a benefit or a cost relative to other CVs. A public review draft of that analysis was presented to the Council in December 2013; the regulatory impact of allowing a rollover is addressed in 4.9 of this document. Relevant background information is provided below.

##### Participation

Twenty-one vessels made landings in the Rockfish Program in each year from 2007 through 2012; one additional vessel participated in the RP during the only year that it trawled in the GOA (2012). Ten vessels spent some years in the RP, some in the non-RP fishery, and other years inactive. Sixty-one vessels made a GOA groundfish landing at some point since 2007, but never fished in the Rockfish Program.

Many participants in GOA trawl fisheries are members of cooperative programs, including the Central GOA Rockfish Program and the Bering Sea pollock cooperative program (American Fisheries Act, or AFA). Sixty-two CVs were active during the 2012 fishing year. Thirty-five of those vessels were members of a Central GOA Rockfish Program cooperative, though only 28 actually made Rockfish Program landings (Table 4-40).<sup>36</sup> Eighteen CVs active in 2012 were also part of the AFA pollock fleet, all of them Rockfish Program participants. For 2013, 43 vessels were listed as members of one of the seven CV cooperatives in the Rockfish Program. Seventeen of these co-op members hold endorsements for the AFA pollock fishery in the Bering Sea. Twenty-three GOA CVs endorsed to trawl in the Central or Western GOA held AFA endorsements, but are not enrolled in RP cooperatives. In addition to AFA membership, Table 4-41 shows the other trawl and non-trawl endorsements held on vessels in the GOA CV fleet. Not surprisingly, all 46 vessels<sup>37</sup> eligible for the Rockfish Program are endorsed to trawl in the Central GOA. The table shows that not all RP eligible vessels can trawl in the Bering Sea. The 20 Bering Sea trawl endorsements held by RP eligible vessels include the 17 AFA members, and three that are

<sup>36</sup> The RP quota that was allocated to inactive vessels is typically fished on other vessels within the vessel's cooperative.

<sup>37</sup> Noting that only 43 vessels are listed on 2013 Rockfish Program cooperative rosters, it is apparent that several vessels declined to join a cooperative. This could be a decision not to fall under Rockfish Program sideboards.

endorsed for Bering Sea non-pollock activity. GOA trawl-endorsed vessels that cannot participate in the Rockfish Program generally have access to a greater variety of other fisheries; most notable among these are the Western GOA Pacific cod pot fishery, and the BSAI trawl fisheries.

**Table 4-40 Number of catcher vessels making landings in the GOA non-pollock trawl fishery, number making landings under the Rockfish (Pilot) Program**

	<b>Total CVs</b>	<b>RP CVs</b>
<b>2007</b>	63	25
<b>2008</b>	65	25
<b>2009</b>	59	24
<b>2010</b>	52	24
<b>2011</b>	53	23
<b>2012</b>	62	28

**Table 4-41 Other endorsements held by GOA catcher vessels, by Rockfish Program eligibility, 2013**

	<b>Rockfish Program</b>	<b>Non-Rockfish Program</b>
<b>CGOA Trawl</b>	46	71
<b>WGOA Trawl</b>	17	81
<b>CG_CV_PCOD_HAL</b>	0	2
<b>CG_CV_PCOD_POT</b>	3	4
<b>CG_CV_PCOD_JIG</b>	0	0
<b>WG_CP_PCOD_POT</b>	0	1
<b>WG_CV_PCOD_HAL</b>	0	0
<b>WG_CV_PCOD_POT</b>	0	31
<b>WG_CV_PCOD_JIG</b>	0	1
<b>AI Trawl</b>	0	30
<b>BS Trawl</b>	20	54
<b>AI_CV_PCOD_HAL</b>	0	1
<b>AI_CV_PCOD_POT</b>	0	0
<b>BS_CV_PCOD_HAL</b>	0	0
<b>BS_CV_PCOD_POT</b>	0	1

"HAL" = hook-and-line  
Source: RAM LLP file

### Harvest

Rockfish Program CVs accounted for 67% of total catch within the Program, averaging 9,201 mt per year (Table 4-42). The balance of Program harvest is taken by CPs, of which there have been far fewer participating vessels. The RP CV's share of total RP harvest was closer to 80% from 2007 through 2009, and has ranged between 57% and 61% in the three most recent years for which data are available. Rockfish Program CVs account for about 21% of the CV sector's average annual groundfish harvest (44,665 mt). This proportion has been consistent since 2007, with a spike up to 28% in 2012.

**Table 4-42 Groundfish harvest (mt) recorded on Rockfish (Pilot) Program CV trips, 2007 to 2012**

<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Average</b>
8,268	8,774	8,132	9,602	8,472	11,959	9,201

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA.

Within the CV sector, Rockfish Program activity accounts for the majority of groundfish harvest between May and July, then falls off precipitously in mid-August as effort switches to pollock, Pacific cod, and flatfish (Table 4-43).

**Table 4-43 Proportion of CV non-pollock groundfish harvest occurring under the Rockfish Program, by month, during the 2007 through 2012 period**

	MAY	JUN	JUL	AUG	SEP	OCT	NOV
RP CVs	66%	82%	49%	21%	17%	10%	21%
Non-RP CVs	34%	18%	51%	79%	83%	90%	79%

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA.

From 2007 through 2012, 98% of the catch (by weight) taken on Rockfish Program trips was delivered to Kodiak. Deliveries to Kodiak also accounted for 98% of the gross first wholesale value derived from RP harvest. Annual data cannot be presented due to confidentiality restrictions, as small amounts were delivered to three other communities during some years. The other communities receiving RP deliveries to shore-based processors during this period were Sand Point, Akutan, and Seward.

#### Chinook salmon PSC

Since the implementation of the Rockfish Pilot Program in 2007, the Program's CV sector has taken an average of roughly 850 Chinook salmon PSC per year (Table 4-37). This amounts to 14% of all GOA non-pollock trawl Chinook PSC, and 27% of Chinook PSC encountered in the CV fisheries. Annual PSC levels reflect a gradual reduction in Chinook encounter in the RP CV sector after several years of experience under the Program. Several factors may have contributed to lower PSC levels in the sector: realization of the apparent trade-off between halibut and Chinook salmon encounter; heightened awareness and prioritization of Chinook PSC avoidance; and more experience in managing fishing effort within a cooperative model. However, speculating on the cause of past trends is beyond the scope of this analysis, and six years is a relatively short sample of history for establishing any sort of trend in a fishing outcome – Chinook PSC – that has proven both variable and unpredictable.

Table 4-44 provides an important basis for understanding the approximate monthly and seasonal demand for Chinook salmon PSC in the RP CV sector. CV Chinook salmon encounter in the GOA non-pollock trawl fishery is greatest from the late spring through the early summer, and peaks again in the fall. From 2007 through 2012, arrowtooth flounder and rex sole trips make up 99% of the Chinook PSC taken in April. CVs fishing under the Rockfish Program and targeting rockfish species account for 80% of the Chinook PSC taken in May and June over the same set of years. Of the Chinook taken on non-RP trips during these months, 70% are caught during trips targeting arrowtooth flounder, with most of the remainder taken on shallow water flatfish trips; non-RP trips were credited with a negligible amount of Chinook PSC in the month of June. Non-RP trips account for 96% of the Chinook PSC taken during September and October; the September Chinook PSC occurred primarily on trips targeting Pacific cod (B season), while October PSC occurred mostly in flatfish fishery (56% shallow water flatfish, 27% arrowtooth flounder) and on trips targeting Pacific cod (17%). Roughly half of the Chinook salmon encountered on Rockfish Program trips during September occurred on trips that were classified in Catch Accounting as having targeted Pacific cod, with the remainder taken on trips targeting rockfish. The RP CV sector has historically recorded very low levels of Chinook PSC after September; this late-year period captures the potential “rollover” dates that are analyzed in this document for shifting remaining RP PSC limit allowances into the non-Rockfish Program CV fisheries (Alternative 2, Option 4, Suboption 2).

**Table 4-44 Average monthly Chinook salmon PSC in the CV sector, by Rockfish Program activity, 2007 through 2012**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Non-RP CV	64	82	112	672	178	0	6	26	202	784	78	29
RP CV					485	265	40	6	44	< 1	3	
<b>Total</b>	<b>64</b>	<b>82</b>	<b>112</b>	<b>672</b>	<b>663</b>	<b>265</b>	<b>46</b>	<b>32</b>	<b>246</b>	<b>784</b>	<b>81</b>	<b>29</b>

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC.

Chinook salmon PSC rates in the RP and non-RP sectors of the CV fleet are captured in Table 4-48 through Table 4-50, in the following section. PSC rates in the Rockfish Program have generally declined over the 2007 through 2012 period. PSC rates in the RP fishery tend to track with the amount of harvest activity, while rates in the non-RP sector tend to be highest during times of the season when flatfish fishing predominates.

#### Seasonality of Rockfish Program and non-Rockfish Program activity

The range of potential actions considered in this document could affect the amount of Chinook salmon PSC allowance that is available to the respective sectors of the GOA CV fleet at different times during the year. This is specifically the case where the Council makes a separate apportionment of Chinook PSC to the RP CV sector and allows some amount of any remaining PSC limit to be rolled over on a given date to support other CV activity, as it has done in its final preferred alternative (see Section 4.3). As such, analyzing the PSC avoidance constraints of each alternative requires an understanding of what activity (participation, harvest, and PSC) historically occurs before and after key dates in the calendar year, particularly towards the end of the year when the potential Chinook PSC rollover dates are proposed.

Thirty-three CVs have never reported landing of non-pollock groundfish species on or after October 1; only one of those vessels ever participated in the Rockfish Program, and that vessel did so in only one year. Of those 33, 19 fished in the fall, but only for pollock, and 14 made no landings of any type in the late-year months. By contrast, most CVs that participate in the Rockfish Program were active in the fall fisheries. Table 4-45 shows the total number of vessels that made RP landings in each year, the number of those same vessels that continued fishing past September, and the number of vessels that made landings in each GOA non-pollock target fishery after September. Note the annual variability in the high-value Pacific cod fall fishery. Years with low active vessel counts are the result of TAC closures that occurred in September or early October. For example, in 2010, the inshore sector of the Central GOA Pacific cod fishery closed on September 13, and the inshore sector of the Western GOA closed on October 13; thus, it is not surprising to find that RP CVs had low participation in the Western GOA regulatory area. Excluding pollock, shallow water flatfish accounted for the most harvest weight for the RP CVs on or after October 1, averaging 1,900 mt over the 2007 through 2012 period. The arrowtooth flounder and rex sole fishery brought in the second most (1,330 mt per year), followed by Pacific cod (850 mt), and rockfish species (650 mt).

**Table 4-45 Rockfish Program-affiliated CV participation in GOA non-pollock fisheries, on or after October 1**

Year	Total # Active RP Catcher Vessels	# RP CVs Active Oct. 1 or After	# Vessels Active On/After Oct. 1 -- Target Fishery					
			Rockfish	Pacific Cod	Arrowtooth/Rex	Shallow Water Flatfish	Flathead Sole	Sablefish & Other
2007	25	20	9	6	5	15		
2008	25	24	4	20	5	17	*	*
2009	24	21	6	3	7	19	3	*
2010	24	18	7		10	11		*
2011	23	22	4	18	8	4	*	*
2012	28	25	4	13	9	18		

\* denotes confidential data

The RP CV sector makes around 85% of its non-pollock landings prior to October 1. No vessels were identified that harvested groundfish *only* after October 1. From 2007 through 2012, the last RP landing of the year has occurred in mid-November. RP trips brought in an average of 800 mt of groundfish harvest per year between October 1 and mid-November. This amount ranged between roughly 300 mt and 1,800 mt in different years; the highest value was an outlier, and the six-year median post-September catch was closer to 650 mt. Groundfish harvest for the sector was greater in November than in October for only one year.

Chinook salmon PSC taken on RP trips occurred almost entirely in the months prior to October 1. In the non-RP CV sector, average annual PSC before October 1 was 1,343 Chinook salmon. After September, the non-RP CV sector averaged 891 Chinook. It should be noted that there was substantial annual variation around these period averages.

From 2007 through 2011, no more than 15% of all GOA gross first wholesale revenue to shoreside processors was generated from harvest, including pollock, taken after October 1. Looking only at non-pollock activity during that time period, the Rockfish Program CV sector generated between 10% and 15% of its shoreside wholesale revenues during the late-year months. The non-RP non-pollock sector displayed more variation in its post-September revenues from year to year, likely due to dependency upon pollock among those vessels. In two years, post-September non-pollock revenues accounted for less than 10% of total non-RP CV revenues. Relative dependence on the revenue generated from late-year trawl activity does not appear to differ by whether the CV's LLP was registered at an Alaska or a non-Alaska address.

The vast majority of CV harvest that occurred after July was delivered to shoreside processors in Kodiak, including all harvest in the RP CV sector. The non-RP CV sector delivered very small amounts of catch taken on October trips targeting Pacific cod to Sand Point and Seward; each community received October non-pollock deliveries in only one of the analyzed years. The catch delivered to Sand Point was taken in the Western GOA, and the catch delivered to Seward was taken in the Central GOA. Further details cannot be provided due to confidentiality restrictions.

#### 4.4.11 Rates of Chinook Salmon PSC in GOA Non-pollock Fisheries

In considering the Chinook salmon PSC action for the pollock fishery (Amendment 93), the Council recognized that the GOA trawl fisheries have highly variable Chinook PSC rates. 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. While not necessarily indicative of total Chinook salmon PSC, a rate provides a measure of frequency or intensity for a given area, harvest sector, or time period.

For this analysis, PSC rates are calculated in a manner that weights the relevant week-ending date (WED) records by the amount of fishing activity that took place. For example, when calculating the PSC rate for

a given harvest sector, the sum of Chinook salmon PSC for all WED records in that sector is divided by the sum of all groundfish harvest (mt) in the same WED records. This method is preferable to averaging the Chinook PSC/mt ratios for the set of records. Doing so would effectively weight each WED record equally, potentially allowing records that account for a small amount of the sector's total fishing activity to bias the sector's overall PSC rate. Note that the PSC rates reported here are derived from weekly estimates of catch and PSC from NMFS CAS. These PSC rates are not the same PSC rates as those used within CAS to estimate PSC for management.

#### 4.4.11.1 PSC Rate Trends by Year

The historical Chinook salmon PSC rates reported here focus on annual average rates, and average rates for a given calendar month during a set of years (Table 4-46). Rates impute nothing about the relative “value” of a unit of groundfish or a Chinook salmon taken as PSC. Instead, rates are simple arithmetic ratios.

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-year 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 performance 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 trends.

**Table 4-46 Annual Chinook salmon PSC rates for all GOA non-pollock target fisheries**

	Year									Period Average		
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2003-2011	2003-2006	2007-2011
Total GOA	0.18	0.09	0.06	0.05	0.08	0.07	0.08	0.14	0.10	<b>0.10</b>	0.10	0.09
Central GOA	0.18	0.07	0.04	0.06	0.10	0.08	0.09	0.14	0.10	<b>0.10</b>	0.09	0.10
Western GOA	0.19	0.22	0.16	0.03	0.02	0.02	0.01	0.13	0.07	<b>0.10</b>	0.15	0.05
GOA CP	0.24	0.16	0.14	0.07	0.14	0.12	0.10	0.20	0.11	<b>0.14</b>	0.15	0.14
GOA CV	0.13	0.07	0.02	0.04	0.06	0.05	0.07	0.11	0.09	<b>0.07</b>	0.06	0.07
CGOA CP	0.26	0.06	0.09	0.10	0.24	0.19	0.17	0.22	0.12	<b>0.16</b>	0.13	0.19
CGOA CV	0.14	0.07	0.02	0.04	0.06	0.05	0.07	0.11	0.09	<b>0.07</b>	0.07	0.08
WGOA CP	0.21	0.28	0.27	0.02	0.03	0.02	0.01	0.16	0.07	<b>0.12</b>	0.19	0.06
WGOA CV	0.10	0.01	0.01	0.04	0.00	0.02	0.01	0.00	0.05	<b>0.03</b>	0.04	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.

Gulf-wide, the annual Chinook salmon PSC rate ranged between 0.05 and 0.18 during the analyzed period (Table 4-46). 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 5.5 mt in the highest PSC year.

Table 4-47 lists average PSC rates by trip target for the entire analyzed period and for the five most recent years. Flathead sole, arrowtooth flounder, and rex sole trips recorded the highest PSC rates over the entire period, and rates generally decreased in recent years. Rockfish trips were among the targets where PSC rates increased, which may be linked to the increased halibut avoidance measures in 2007 and 2008, noted in Section 4.4.10 and apparent in Figure 4-18 and Figure 4-20. On its own, the rex sole target fishery would have recorded the highest average PSC rate; however, trips targeting arrowtooth flounder and rex sole are combined here, and in later discussion, as participants have reported that the two species are



generally targeted together.<sup>38</sup> Analyzing these two targets separately may be misleading, as the attribution of a trip target to one species or another may largely be a function of the Catch Accounting System.

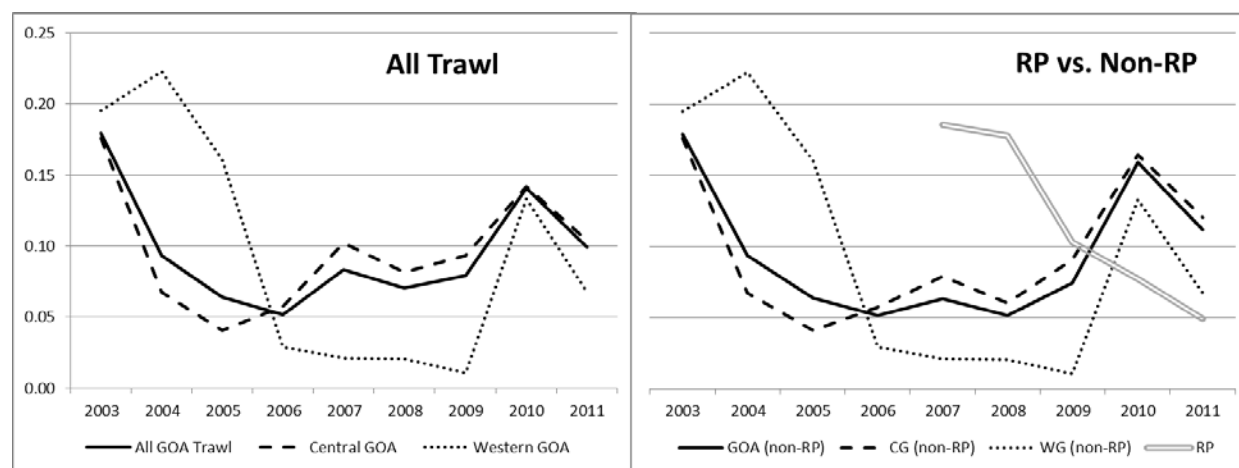
**Table 4-47 PSC rate by GOA non-pollock target species, 2003 through 2011 & 2007 through 2011**

Target	2003-2011	2007-2011
Flathead Sole	0.24	0.10
Arrowtooth & Rex Sole	0.17	0.15
Pacific Cod	0.07	0.04
Shallow Water Flatfish	0.06	0.08
Rockfish	0.05	0.07

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.

In the Western GOA, Chinook salmon PSC rates averaged over the 2007 through 2011 period tend to be lower than PSC rates for the 2003 through 2006 period. The opposite appears true for the Central GOA, where PSC rates have generally increased.<sup>39</sup> Figure 4-18 plots average Chinook salmon PSC rates for each regulatory area, by year. The right-hand panel treats Chinook PSC recorded on Rockfish Program trips separately, and illustrates the relative PSC rates of RP and non-RP fishing in the early years of the Program and the more recent years. As discussed in Section 4.4.10, higher PSC rates in the early RP years may have been associated with halibut avoidance measures, while the subsequent decline could be the result of improved cooperative management capacity (though the RP PSC rate did increase to 0.06 in 2012 – primarily driven by the CV sector). Table 4-48 shows yearly trends in average Chinook salmon PSC rates, with RP trips held out separately, which may inform the Council’s consideration of Alternative 2, Option 4 in this action.

**Figure 4-18 Yearly average Chinook salmon PSC rates in Central and Western GOA non-pollock fisheries (2003 to 2011)**



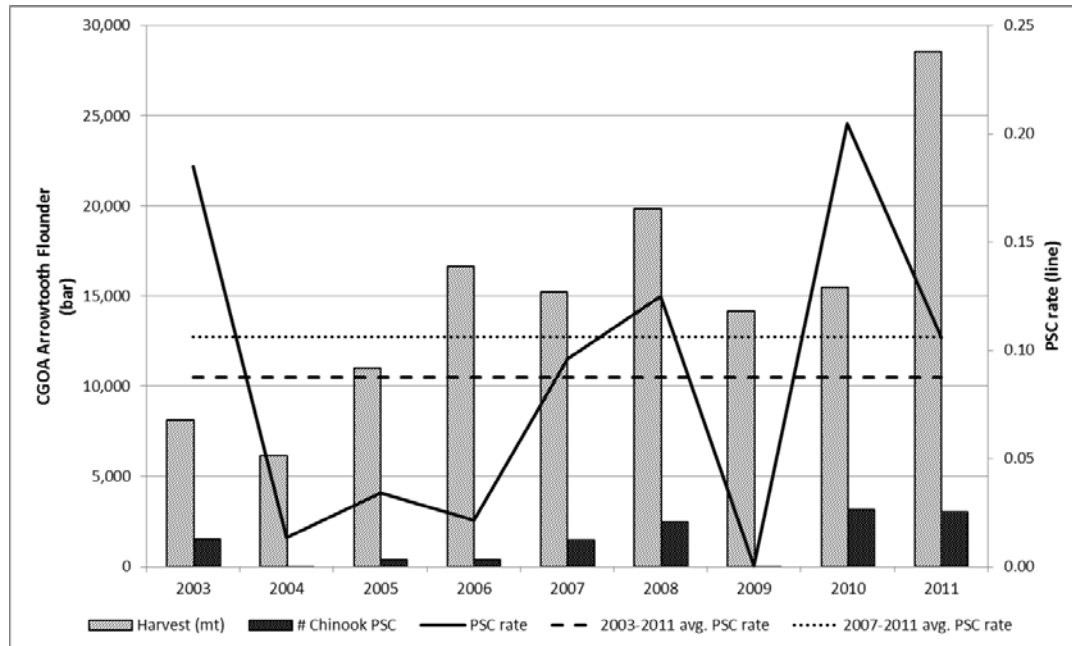
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_PSC, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive\_BLEND\_CA.

<sup>38</sup> The fact that arrowtooth flounder and rex sole are often targeted simultaneously is evident in the seasonal harvest distribution of target species, presented in Table 4-27 and Table 4-28.

<sup>39</sup> Industry representatives familiar with the Central GOA CV sector have noted, anecdotally, that some increase in Chinook PSC rates since 2010 may be attributable to recent voluntary fleet-managed catch sharing plans for the C season pollock fishery (October). It has been suggested that pollock fishermen who are not in a race may opportunistically switch targets to Pacific cod or flatfish – if directed fishing is open – thus creating the possibility for a trip containing Chinook salmon PSC to be counted in the non-pollock targets, whereas the Catch Accounting System would normally have recorded it as a pollock trip. The analysts offer this note as relevant background concerning the prosecution of GOA groundfish fisheries, and not as causal explanation of increasing non-pollock Chinook PSC rate trends in this sector.

To illustrate the wide variation in annual PSC rates, Figure 4-19 provides harvest and Chinook salmon PSC trends for Central GOA arrowtooth flounder trips, 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 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-year and nine-year historical periods. Recognizing that target harvest and Chinook PSC levels are not directly correlated, one should exercise caution in drawing conclusions from a superficial inspection of rates.

**Figure 4-19 Central GOA arrowtooth flounder target trips: harvest, Chinook salmon PSC and PSC rate, 2003 through 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.

**Table 4-48 Chinook salmon PSC rates by Rockfish (Pilot) Program participation, 2007 through 2011**

	Rockfish Program	Year					Period Average	
		2007	2008	2009	2010	2011	2007-2011	2008-2011
Total GOA	N	0.06	0.05	0.07	0.16	0.11	0.09	0.10
	Y	0.19	0.18	0.10	0.08	0.05	0.12	0.10
CP	N	0.08	0.12	0.10	0.26	0.13	0.14	0.15
	Y	*	*	*	0.04	0.06	0.21	0.09
CV	N	0.05	0.02	0.06	0.11	0.10	0.07	0.07
	Y	0.06	0.19	0.10	0.10	0.04	0.10	0.11

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 4-49 Chinook salmon PSC rates on Rockfish (Pilot) Program trips, by month, 2007 through 2012**

	MAY	JUN	JUL	AUG	SEP	OCT	NOV	7 mo. Average
RP Catcher Vessel Trips	0.16	0.10	0.03	0.01	0.06	0.00	0.01	0.05
All GOA RP Trips	0.16	0.14	0.07	0.03	0.10	0.00	0.01	0.07

**Table 4-50 Chinook salmon PSC rates on non-Rockfish Program trips, by month, 2007 through 2012**

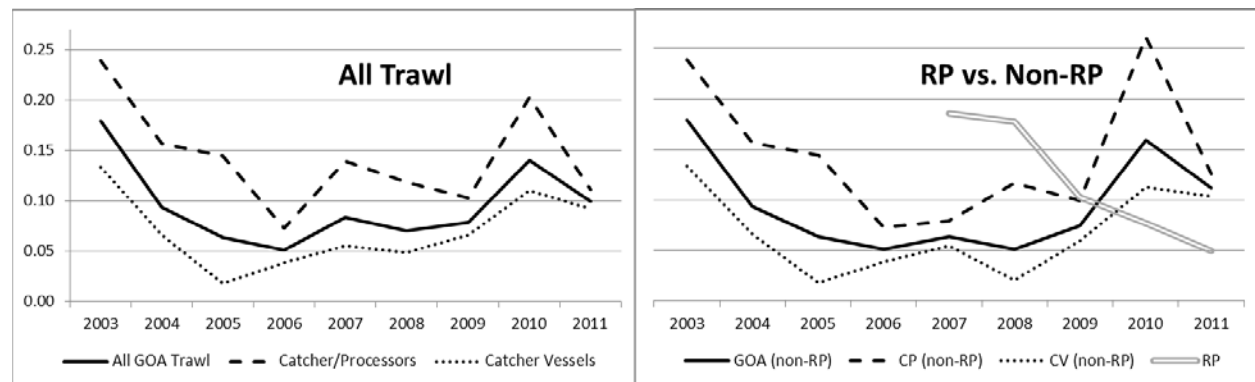
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	12 mo. Average
Non-RP Catcher Vessels	0.02	0.01	0.04	0.10	0.11	0.00	0.00	0.01	0.05	0.19	0.07	0.13	0.06
CGOA CVs	0.02	0.02	0.04	0.10	0.11	0.00	*	0.01	0.05	*	0.07	0.13	0.06
WGOA CVs	0.01	0.01	0.02				*			0.02			0.00
Total GOA Non-RP	0.02	0.03	0.08	0.21	0.12	0.01	0.02	0.02	0.07	0.15	0.10	0.22	0.09

Notes: \* indicates confidential data; "Total" includes both CV and CP records.

From a Gulf-wide perspective, the catcher/processor sector recorded higher Chinook salmon PSC rates and displayed greater variability across years (Figure 4-20). CP vessels recorded an average annual PSC rate of 0.14 from 2003 through 2011, and from 2007 through 2011. The sector's highest rates of Chinook salmon encounter occurred in 2003 (0.24) and 2010 (0.20), which were both high PSC years (Table 4-46). 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 0.07 from 2003 through 2011, and from 2007 through 2011, with no years in excess of 0.13 Chinook salmon per metric ton of non-pollock groundfish harvest. Higher average Chinook PSC rates for CP vessels persist when looking at operational types within each regulatory area (Table 4-46).

The right-hand panel of Figure 4-20 breaks out RP trips, resulting in lower PSC rates for non-RP fishing in 2007 and 2008. The change in PSC rates is more noticeable for non-RP CVs, as CVs make up the bulk of the RP fleet (Table 4-36). Average annual PSC rates for RP trips cannot be reported on the operational type level, as the low number of CPs participating in the RP make CP PSC rates confidential from 2007 through 2009.

**Figure 4-20 Yearly average PSC rates in GOA non-pollock fisheries, by operational harvest type (2003 through 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.

Harvest sector PSC rates over the 2008 through 2011 period were not substantially different from the 2007 through 2011 period; CPs recorded a rate of 0.13 Chinook salmon per metric ton of groundfish, and CVs had a rate of 0.08. The 2008 through 2011 time period merits a note, as 2008 was the first year of implementation for Amendment 80 cooperatives in the CP sector. Noting this small difference is not meant to dismiss the potential for Amendment 80 cooperative relationships to develop into an effective tool for PSC avoidance, merely that no significant effect was apparent in data from the early program years.

Comparing the Chinook salmon PSC rates of GOA CPs and CVs presents an analytical challenge in two key respects. First, the CP and CV harvest sectors experience different levels of observer coverage. The restructured Observer Program requires all CPs to have 100% observer coverage when fishing in the

GOA.<sup>40</sup> This analysis does not attempt to determine whether carrying an observer affects the reported PSC rate. Nevertheless, it should be acknowledged that unobserved fishing activity at least presents an opportunity to discard PSC at sea. This, and other differences in sampling procedures, is further discussed in Chapter 5.

The second, more fundamental, reason is that the two operational type sectors prosecute the GOA groundfish fisheries for different primary targets, at different times, and in different locations. Some target species, such as Pacific cod, are primarily harvested by only one sector of the trawl fleet – CVs, in this example. CVs, which are allocated 90% of the GOA Pacific cod TAC, derive over 30% of their total harvest from this target fishery that has produced relatively lower levels of Chinook encounter compared to flatfish (Table 4-32 and Table 4-33). CPs derive 39% of their groundfish harvest from the relatively Chinook salmon intense arrowtooth flounder and rex sole fisheries (Table 4-19).

It is not common for CPs and CVs to be targeting the same groundfish species in the same reporting area at the same time, which would be ideal for comparing Chinook salmon intensity across sectors, while assuming that other determinant background factors are similar. Perhaps the only case that is somewhat suitable for comparison is the targeting of arrowtooth flounder and rex sole in the Central GOA during April.<sup>41</sup> In 2010 and 2011, combined, April trips targeting Central GOA arrowtooth flounder and rex sole accounted for 42% of the total Chinook salmon PSC taken in all GOA groundfish trawl fisheries over those two years (April CV trips targeting these species accounted for 40% of total CV PSC, and April CP trips targeting these species accounted for 45% of total CP PSC). For these Central GOA fisheries in these years, CPs recorded a Chinook PSC rate of 0.56, compared to the CV rate of 0.28. Unfortunately, this superficial comparison breaks down when noting that CPs target these species primarily in Area 620, while CVs fish primarily in Area 630. Ultimately, there is an attribution problem that prevents one from concluding that CPs fish with an inherently higher PSC rate. In other words, it is not possible to say whether Chinook PSC rates are higher in Area 620 because mainly CPs fish there, or if CPs have higher PSC rates because they mainly fish in Area 620.

#### **4.4.11.2 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 fishery closure dates. In addition, if retrospective analysis of the 2003 through 2011 and 2007 through 2011 periods indicates that GOA non-pollock groundfish fisheries would likely close earlier under a PSC hard cap, PSC for each target fishery in the weeks and months coming after that predicted closure could provide a measure of potential Chinook salmon savings (i.e., subject to rollover schemes).

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 groundfish catch (where one unit is a metric ton of target species harvest). In view of this fact, it is also useful to look back at the monthly distribution of target harvest from 2007 through 2011 described in Section 4.4.8. In doing so, the following notes bear mention:

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<sup>40</sup> Though it is not required, Amendment 80 CPs fishing in the GOA will occasionally carry two observers (200% coverage). This may occur when a CP plans to fish in the Bering Sea and in the GOA on the same trip, without returning to port. A CP may elect to keep 200% observer coverage in the GOA as a means to avoid possible logistical delays when dropping off or picking up personnel.

<sup>41</sup> The analysts chose to examine only the Central GOA (subareas 620 and 630) because the Western GOA arrowtooth flounder and rex sole fishery is a low-volume fishery that is only prosecuted by CPs. The years 2010 and 2011 were selected because CVs were not targeting arrowtooth flounder and rex sole in Area 620 during April of 2008 and 2009.

- Gulf-wide –
  - 29% of non-pollock groundfish harvest occurred in July, when average PSC rates were low (0.04) compared to the average annual rate (0.09);
  - only 0.3% of non-pollock harvest occurred in December, when average PSC rates were high (0.30) compared to the average annual rate (0.09);
  - 14% of non-pollock groundfish harvest occurred in April, when average PSC rates (0.23) were well above the average annual rate (0.09);
- Seventy percent of Western GOA occurred in February and July (21% in February and 49% in July), when average PSC rates (0.03 in February and 0.02 in July) were near the average annual rate (0.04);
- In the catcher/processor sector –
  - 54% of harvest occurred in July, when average PSC rates (0.04) were low compared to the average annual rate of 0.13;
  - the 0.00 average PSC rate in January was recorded during a month that accounted for only 0.07% of sector non-pollock groundfish harvest.

Table 4-51 includes three panels of 2007 through 2011 average monthly PSC rates for each harvest sector that could potentially receive a PSC apportionment under Alternative 2. The first panel draws from all GOA groundfish trips; the second panel draws from all groundfish trips that were not part of the Rockfish (Pilot) Program; and the third panel shows monthly PSC rates derived from RP trips. Due to the small number of active vessels, only rates for CPs participating in the RP in July are non-confidential. The average PSC rate reported for each potential Chinook PSC apportionment subdivision (row) is weighted by the number of records in each month, meaning that not all months contribute equally to the average.

The following notes relate 2007 through 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 0.20, nearly twice the average annual rate of 0.11 for arrowtooth. Trips targeting arrowtooth in May incurred an even higher PSC rate of 0.24, 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 0.04. Fifty-eight percent of Pacific cod harvest occurs at the A-season opening in January and February, when PSC rates are 0.02 and 0.03, respectively. A further 8% of average annual harvest occurs in March, before the A-season closure; these trips incurred a higher PSC rate of 0.07. Thirty-one percent of annual Pacific cod harvest occurs in September and October when the B-season opens. The average September PSC rate was 0.06 and the average rate for October was 0.11, both above the average annual rate.

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 (0.15 and 0.28, respectively). Trips occurring during these months accounted for 25% of total harvest (5% in September and 20% in October, when the rate was three and one-half times the annual average rate).

**Table 4-51 Monthly average Chinook salmon PSC rates for all GOA non-pollock target fisheries, 2007 through 2011**

All GOA Trips													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average
Total GOA	0.02	0.04	0.11	0.23	0.16	0.12	0.04	0.02	0.06	0.14	0.11	0.30	<b>0.09</b>
Central GOA	0.02	0.04	0.11	0.22	0.17	0.12	0.05	0.02	0.06	0.14	0.10	0.30	<b>0.11</b>
Western GOA	0.01	0.03	0.10	0.34	0.03		0.02	0.02	0.00	*	*		<b>0.04</b>
Catcher/Processors	0.00	0.32	0.31	0.47	0.16	0.37	0.04	0.02	0.12	0.04	0.23	*	<b>0.13</b>
Catcher Vessels	0.02	0.01	0.03	0.12	0.16	0.08	0.02	0.01	0.05	0.18	0.06	0.15	<b>0.07</b>
CGOA CP	*	0.41	0.30	0.49	0.29	0.37	0.06	0.02	0.13	0.04	0.21	*	<b>0.18</b>
CGOA CV	0.02	0.01	0.04	0.12	0.16	0.08	*	0.01	0.05	*	0.06	0.15	<b>0.08</b>
WGOA CP	*	0.18	0.32	0.34	0.03		0.02	0.02	0.00	0.00	*		<b>0.05</b>
WGOA CV	*	0.01	0.02				*			0.02			<b>0.02</b>

Non-Rockfish (Pilot) Program Trips													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average
Total GOA	0.02	0.04	0.11	0.23	0.13	0.01	0.02	0.02	0.07	0.15	0.13	0.30	<b>0.09</b>
Central GOA	0.02	0.04	0.11	0.22	0.14	0.01	0.01	0.02	0.07	0.16	0.11	0.30	<b>0.10</b>
Western GOA	0.01	0.03	0.10	0.34	0.03		0.02	0.02	0.00	0.00	*	*	<b>0.04</b>
Catcher/Processors	0.00	0.32	0.31	0.47	0.16	0.28	0.02	0.02	0.12	0.04	0.23	*	<b>0.13</b>
Catcher Vessels	0.02	0.01	0.03	0.12	0.11	0.00	0.01	0.01	0.05	0.20	0.08	0.15	<b>0.07</b>
CGOA CP	*	0.41	0.30	0.49	0.29	0.28	0.01	0.02	0.13	0.05	0.21	*	<b>0.19</b>
CGOA CV	0.02	0.01	0.04	0.12	0.11	0.00	*	0.01	0.05	*	0.08	0.15	<b>0.07</b>
WGOA CP	*	0.18	0.32	0.34	0.03		0.02	0.02	0.00	0.00	*		<b>0.05</b>
WGOA CV	*	0.01	0.02				*			0.02			<b>0.02</b>

CGOA Rockfish (Pilot) Program Trips													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average
Total GOA					0.19	0.15	0.08	0.02	0.03	0.00	0.01		<b>0.11</b>
Catcher/Processors						*	0.10	*		*			<b>0.14</b>
Catcher Vessels					0.19	0.10	0.04	0.01	0.03	0.00	0.01		<b>0.10</b>

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.

\*Confidential data

Overall, trips targeting rockfish have recorded an annual average Chinook salmon PSC rate of 0.07. Twenty-six percent of harvest occurred in May and June when PSC rates were high (0.20 and 0.16, respectively). Sixty-one percent of harvest occurred in July when the PSC rate was much lower (0.04). During the Rockfish Pilot Program years, declared RP trips incurred a Chinook PSC rate of 0.12. RP PSC rates in May and June were also 0.20 and 0.16, and the rate for July was 0.08. These numbers are upwardly influenced by high RP PSC rates in 2007 and 2008. Trips taken outside of the RP that ended up designated with a rockfish target had an average annual Chinook PSC rate of only 0.02; for these trips, June was an outlier with an average monthly PSC rate of 0.22.

NMFS generally makes inseason management decisions based on weekly catch reports. For each analyzed year, Table 4-52 lists the highest weekly Chinook salmon PSC records for the considered sectors of the GOA non-pollock trawl fishery. These figures give a sense of the target fisheries that are associated with the largest one week spikes in Chinook salmon encounter, as well as the magnitude of a high PSC event. Section 5.2.1.1 notes that NMFS would consider PSC limits that are less than the historical highest weekly rate for the managed fishery to be too small to manage inseason.

**Table 4-52 Maximum weekly Chinook salmon PSC, by year**

<b>GOA</b>			
	Max PSC	Month	Primary Target
2003	1,467	April	Arrowtooth/Rex sole
2004	716	March	Flathead sole
2005	786	March	Arrowtooth/Rex sole
2006	587	April	Arrowtooth/Rex sole
2007	607	September	Pacific cod
2008	1,547	March	Arrowtooth/Rex sole
2009	714	October	Shallow water flatfish
2010	1,572	April	Arrowtooth/Rex sole
2011	1,780	April	Arrowtooth/Rex sole

<b>Central GOA</b>			
	Max PSC	Month	Primary Target
2003	853	February	Pacific cod
2004	473	September	Pacific cod
2005	329	July	Rockfish
2006	582	April	Arrowtooth/Rex sole
2007	607	September	Pacific cod
2008	1,532	April	Arrowtooth/Rex sole
2009	714	October	Shallow water flatfish
2010	1,462	April	Arrowtooth/Rex sole
2011	1,765	April	Arrowtooth/Rex sole

<b>Catcher/Processors</b>			
	Max PSC	Month	Primary Target
2003	1,443	April	Arrowtooth/Rex sole
2004	710	March	Flathead sole
2005	768	March	Arrowtooth/Rex sole
2006	433	April	Arrowtooth/Rex sole
2007	515	June	Rockfish
2008	1,408	April	Arrowtooth/Rex sole
2009	619	April	Arrowtooth/Rex sole
2010	929	April	Arrowtooth/Rex sole
2011	642	April	Arrowtooth/Rex sole

<b>Western GOA</b>			
	Max PSC	Month	Primary Target
2003	746	April	Arrowtooth/Rex sole
2004	713	March	Flathead sole
2005	768	March	Arrowtooth/Rex sole
2006	111	February	Pacific cod
2007	125	February	Pacific cod
2008	105	April	Arrowtooth/Rex sole
2009	107	July	Rockfish
2010	840	April	Arrowtooth/Rex sole
2011	173	July	Rockfish

<b>Catcher Vessels</b>			
	Max PSC	Month	Primary Target
2003	824	February	Pacific cod
2004	473	September	Pacific cod
2005	270	February	Arrowtooth/Rex sole
2006	225	February	Pacific cod
2007	490	April	Arrowtooth/Rex sole
2008	680	May	Rockfish
2009	714	October	Shallow water flatfish
2010	651	April	Arrowtooth/Rex sole
2011	1,223	April	Arrowtooth/Rex sole

#### 4.4.11.3 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, 0.04, 0.10, 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 fishing 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 less than 0.01 in February, when 13% of 2007 through 2011 area harvest was taken. Conversely, trips targeting arrowtooth recorded a PSC rate of 0.19 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 close to zero, the September PSC rate was 0.01, and the October rate was 0.11. May and December PSC rates were relatively high (0.30 and 0.30, respectively), but May harvest accounted for only 4% of total 2007 through 2011 harvest, while December harvest was negligible, illustrating the previous point regarding seemingly random high Chinook salmon encounters.

Rex sole, also a high-PSC rate species Gulf-wide, are targeted primarily by CPs. Rex sole trips recorded a 0.39 annual average rate of Chinook PSC in the Central GOA. July and August, which accounted for 22% of area rex sole harvest, where low PSC rate months (0.01 and 0.08, respectively). All other harvest months, excepting January, recorded high PSC rates (0.24-0.61) with little correlation to the total amount harvested.

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 0.04. Rates were low in the early months (0.02) and above the average in the region's later harvest months (0.06 and 0.11).

Chinook PSC rates in the Central GOA rockfish fishery were highest in the early season harvest months (0.20 in May and 0.16 in June). The rate dropped to 0.06 in July, which covered the largest proportion of harvest at 46%. PSC rates remained below the annual average rate of 0.10 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 (i.e., an annual average rate of 0.08, with higher rates in September, 0.15, and October, 0.28).

Flathead sole, which had been identified as a high-PSC rate species in the previous Gulf-wide section, recorded only a 0.09 PSC rate in the Central GOA. Excepting March, the 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.

#### 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). On the other hand, Western GOA Pacific cod trips – mainly CVs – encountered low PSC rates in January and February (0.01 and 0.03, together accounting for 73% of harvest) and relatively high rates of Chinook salmon in some heavy harvest months (0.09 PSC rate in March, covering 26% of harvest). Western GOA CP arrowtooth flounder trips recorded high PSC rates in the heavy harvest month of April (an average of 0.26 over the 2007 through 2011 period), but had near-zero PSC rates during August and October when harvest combined to account for 20% of total arrowtooth catch in the area. 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 Chinook salmon PSC rates for July through September were near-zero; harvest in those months made up 63% of the area total.



#### 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.<sup>42</sup> 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. Average prices for ancillary products, such as cheeks, chins and heads, are not reported for the at-sea processing sector. Non-pollock groundfish delivered by CVs to onshore processors or stationary floating processors are processed into 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), kiritimi (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 through 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.<sup>43</sup> Prices per pound reflect the price for a pound of marketed product, as opposed to the product value per round pound of harvest. Table 4-53 shows the product-type breakdown of prices for non-pollock groundfish products that were processed at-sea (CP vessels). Table 4-54 show average prices for the products generated at shoreside operations (onshore and stationary floating processors). 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, it is reasonable to present these prices for background purposes.

**Table 4-53 Product prices for at-sea processing by catcher/processors active in the Gulf of Alaska, 2008 through 2011**

Species	Product	Average Price (\$/lb)
Pacific Cod	H&G	1.13
	Whole fish	0.55
	Roe	0.79
Rockfish	H&G	0.94
	Whole fish	0.93
Rex Sole	H&G	0.59
	Whole fish	0.95
Flathead Sole	H&G	0.64
	H&G w.Roe	1.00
	Whole fish	0.43
Flatfish	H&G	0.62
	H&G w.Roe	0.84
	Whole fish	0.41
Arrowtooth Flounder	H&G	0.58

Source: ADFG Commercial Operators Annual Report, data compiled by AKFIN in Comprehensive\_ENCOAR\_PROD

<sup>42</sup> 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.

<sup>43</sup> Price data provided by AKFIN

**Table 4-54 Product prices for shoreside processors active in the Gulf of Alaska, 2008 through 2011**

Species	Product	Average Price (\$/lb)	Species	Product	Average Price (\$/lb)
<b>Rockfish</b>	Whole fish	0.977	<b>Flatfish</b>	Whole fish	0.508
	Whole (bled)	0.989		Fillet	1.974
	Fillet	3.232		Kirimi	0.856
	H&G	1.743		H&G	0.651
	Gutted	1.609		H&G w.Roe	0.709
	Kirimi	1.339		Surimi	0.900
	Fish Meal	0.370		Roe	0.430
	Surimi	1.360		Fish Meal	0.464
	Roe	1.317		Ancillary	0.100
	Ancillary	0.719	<b>Flathead Sole</b>	Whole fish	0.476
<b>Pacific Cod</b>	Whole fish	0.597		Fillet	2.126
	Whole (bled)	0.603		Kirimi	0.681
	Fillet	2.932		H&G	0.535
	H&G	1.393		H&G w.Roe	0.725
	Gutted	1.838		Surimi	0.926
	Kirimi	1.200		Fish Meal	0.328
	Salted & Split	1.643		Roe	0.430
	Fish Oil	1.364		Ancillary	0.180
	Minced	0.933	<b>Arrowtooth Flounder</b>	Whole fish	0.617
	Surimi	0.897		Fillet	1.061
	Fish Meal	0.600		Kirimi	0.653
	Roe	0.896		H&G	0.517
	Ancillary	0.864		H&G w.Roe	0.902
<b>Rex Sole</b>	Whole fish	0.935		Surimi	0.833
	Fillet	2.106		Fish Meal	0.328
	H&G	0.689		Ancillary	0.341
	Fish Meal	0.328	<b>Atka Mackerel</b>	Whole fish	0.900
				Fish Meal	0.306

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<sup>44</sup>, 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. 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.

<sup>44</sup> <http://www.tax.alaska.gov/programs/programs/index.aspx?60620>

- 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<sup>45</sup> 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. Forty-six different vessels processed non-pollock groundfish outside of the 3-mile limit between 2003 and 2011, inclusive. 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 processed products 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 through 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, inclusive, are listed in Table 4-55. The table reports the municipalities' populations, raw fish tax rates, 2011 reported raw fish tax revenues for all species, and an estimated 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.

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<sup>45</sup> 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.

**Table 4-55 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 commercial 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 resources that are utilized by the processing operations.

The reported aggregate raw fish tax of \$48,596 paid by processors to Aleutians East Borough 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.<sup>46</sup>

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

<sup>46</sup> Other shallow water flatfish include Alaska plaice, starry flounder, sand sole, butter sole, and English sole.

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' world supply, product prices may be tied to TAC in the North Pacific region. For other species, the share of the world product attributable to the North Pacific 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.<sup>47</sup> By the middle of last decade, the U.S. supplied more than two-thirds of the world's 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 fillets 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's Pacific cod production – roughly 69% in 2010. The shift from fillets to H&G is attributed to increased exports to China, where H&G product is further 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 process the fish while they are fresh, and the fact that most trawl caught fish come from inshore areas where the cod can be infested with parasitic codworms (causing shoreside processors to incur 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. Since 2008, increases in demand for healthy, sustainably caught whitefish have increased demand for "Alaska cod". 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 Alaska product comes from BSAI fisheries. In any event, an assessment of demand for these 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. Inadequate data from other countries and a lack of uniformity in flatfish species grouping for landings

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<sup>47</sup> 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.

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 American waters are the predominant source of world product.<sup>48</sup>

Yellowfin and rock sole compete with substitute flatfish products from revitalized New England flatfish fisheries. Demand for Alaska yellowfin sole 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, thus far, 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-processors 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 sole 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 fisheries off Alaska. 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

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<sup>48</sup> AFSC notes that scientific and industry literature makes reference to Russian 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 (drift and set), seines, fish wheels, and long lines. Alaska Department of Fish & Game (ADF&G) reports that harvest by subsistence and personal use fishermen averaged 167,000 fish from 1994 through 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 through 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.<sup>49</sup>

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. After escapement needs, 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.<sup>50</sup>

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, utilizing the best available biological data. The

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<sup>49</sup> <http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main>; <http://www.adfg.alaska.gov/index.cfm?adfg=chinook.uses>

<sup>50</sup> <http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management>

division works closely with the ADF&G Division of Sport Fisheries in the conduct of both management and research activities.

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 within 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.<sup>51</sup> 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.<sup>52</sup> Under the Magnuson-Stevens Act, the Federal Government has management authority for the majority of groundfish fisheries, three to two hundred nautical miles offshore, and Pacific halibut fisheries from the shoreline, seaward to 200 nautical miles.

At present, there are no GOA non-pollock groundfish trawl fisheries occurring in state waters that accrue against the State of Alaska’s guideline harvest level (GHL). The only state waters GOA trawl fishery that is managed under the GHL is the Prince William Sound pollock fishery. Other groundfish fisheries that occur in state waters are managed as parallel fisheries, and harvest accrues against the Federal TAC.

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

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<sup>51</sup> [http://www.fish.washington.edu/research/highseas/known\\_range.html](http://www.fish.washington.edu/research/highseas/known_range.html)

<sup>52</sup> The State of Alaska manages salmon and crab under delegated Federal FMP authority, subject to compliance with MSA requirements.



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](http://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 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 4-56 summarizes commercial Chinook salmon harvest and ex-vessel value (in nominal dollars) for the period considered throughout this analysis.

**Table 4-56 Alaska commercial Chinook salmon harvest and ex-vessel value (2003 through 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 designated nonsubsistence areas.

The Joint Board is required to identify “nonsubsistence areas,” where “dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community” (AS 16.05.258(c)). The BOF may not authorize subsistence fisheries in nonsubsistence areas. Personal use fisheries provide opportunities for harvesting fish with gear other than rod and reel in nonsubsistence areas. The Joint Board has identified Ketchikan, Juneau, Anchorage-Matsu-Kenai, Fairbanks, and Valdez as nonsubsistence areas (5 AAC 99.015). Persons may participate in personal use or recreational harvests for “subsistence” purposes within nonsubsistence use areas, but such “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](http://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 that 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](http://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](http://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 (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 4-57 reports Alaska's total and regional sport harvest of Chinook salmon for recent years.

**Table 4-57 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
<b>Alaska Total</b>	<b>132,257</b>	<b>133,328</b>	<b>117,644</b>	<b>128,107</b>

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 of this proposed Chinook PSC action. 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](http://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.<sup>53</sup> This is the most recent publicly available report, published and revised in June 2012.

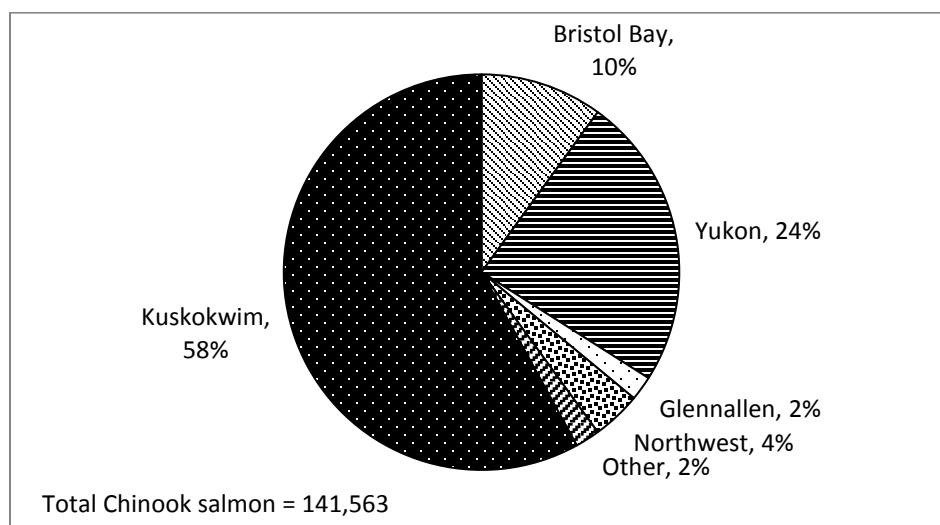
The amount of Chinook salmon harvested for subsistence use and the portion of subsistence Chinook salmon harvested relative to other species of salmon varies greatly by region. Twelve subsistence fishing areas are defined in the state of Alaska: Northern, Northwest, Yukon, Kuskokwim, Bristol Bay, Aleutian Islands, Alaska Peninsula, Chignik, Kodiak, Cook Inlet, Prince William Sound/Copper River, and Southeast.<sup>54</sup> 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%).

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<sup>53</sup> <http://www.adfg.alaska.gov/techpap/TP373.pdf>

<sup>54</sup> See Figure 1-1 of the Alaska Subsistence Salmon Fisheries 2009 Annual Report (p. 5) for a map of the Alaska subsistence areas.

**Figure 4-21 Alaska subsistence Chinook salmon harvest by area, 2009**



#### 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 of Agriculture implemented a duplicate regulatory program to assure the rural subsistence priority is applied under ANILCA on Federal lands. As a result, beginning in 1990, the state and Federal governments both provide subsistence uses on Federal public lands and waters in Alaska, which covers about 230 million acres or 60% of the land within the state.<sup>55</sup> In 1992, the Secretaries of the Interior and of Agriculture established the Federal Subsistence Board and ten Regional Advisory Councils to administer the responsibility. The Board's composition includes a chair, appointed by the Secretary of the Interior with concurrence of the Secretary of Agriculture; the Alaska Regional Director, U.S. Fish and Wildlife Service; the Alaska Regional Director, National Park Service; the Alaska State Director, Bureau of Land Management; the Alaska Regional Director, Bureau of Indian Affairs; and the Alaska Regional Forester, U.S. Department of Agriculture Forest Service.

Through the Federal Subsistence Board, these agencies participate in developing regulations which establish the program structure, determine which Alaska residents are eligible to take specific species for subsistence uses, and establish seasons, harvest limits, methods and means for subsistence take of species in specific Federal areas. The Regional Advisory Councils provide recommendations and information to the Federal Subsistence Board; review proposed regulations, policies, and management plans; and provide a public forum for subsistence issues. Each Regional Advisory Council consists of residents representing subsistence, sport, and commercial fishing and hunting interests.

<sup>55</sup> The U.S. Supreme Court has ruled that ANILCA's use of "in Alaska" refers to the boundaries of the State of Alaska and concluded that ANILCA does not apply to the outer continental shelf region (*Amoco Prod. Co. v. Village of Gambell*, 480 U.S. 531, 546-47 (1987)). However, NMFS aims to protect such uses pursuant to other laws, such as the National Environmental Policy Act and the Magnuson-Stevens Act.

#### 4.5.5 Pacific Salmon Treaty

Overview information on the Pacific Salmon Treaty can be found at:

[http://www.psc.org/about\\_treaty.htm](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 (among others) for over a century. Intercepting fisheries were identified through research conducted by the U.S. and Canada 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).
- 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 4-58 Overview of Alaskan Chinook salmon stock performance, 2012.**

Chinook salmon stock	Total run size?	Escapement goals met? <sup>a</sup>	Subsistence fishery?	Commercial fishery?	Sport fishery?	Stock of concern?
Bristol Bay	Below average	0 of 1 <sup>b</sup> (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 <sup>c</sup>	Yes, with restrictions	Restricted in Northern District and Eastside set gillnets in Central District	Various restrictions including complete closure	6 stocks of concern
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

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> 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, No Action

Selecting the no action 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 close 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.<sup>56</sup> While the fisheries would not close due to Chinook salmon PSC, 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.

<sup>56</sup> 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 varied greatly between 2003 and 2012. Figure 4-22 illustrates the annual record of Chinook salmon PSC by year and by sector, for all GOA groundfish trawl trips. The figure also reflects the total annual PSC rate (number of Chinook salmon PSC per mt of non-pollock groundfish) which is not a perfect predictor of the annual PSC total, but does generally track with PSC levels over this sample of years. For this set of annual data, annual harvest and PSC have a correlation coefficient of 0.28, and one can compare years where PSC rates are similar, but annual PSC is not (see 2006 and 2012). Studies of salmon PSC rates in the Bering Sea concluded that rates were highly variable across a number of factors beyond the timing, location, and duration of fishing effort; these factors include water temperature, location, and salmon abundance by year and season (Ianelli, 2010). The data analyzed in this document also show seasonal variation in estimated PSC rates throughout the year. A published report that reviewed earlier PSC patterns found that Chinook salmon PSC occurred in every week during which groundfish were prosecuted (Witherell, 2002).

**Figure 4-22 Estimated Chinook salmon PSC in the GOA non-pollock groundfish fisheries, 2003 through 2012**

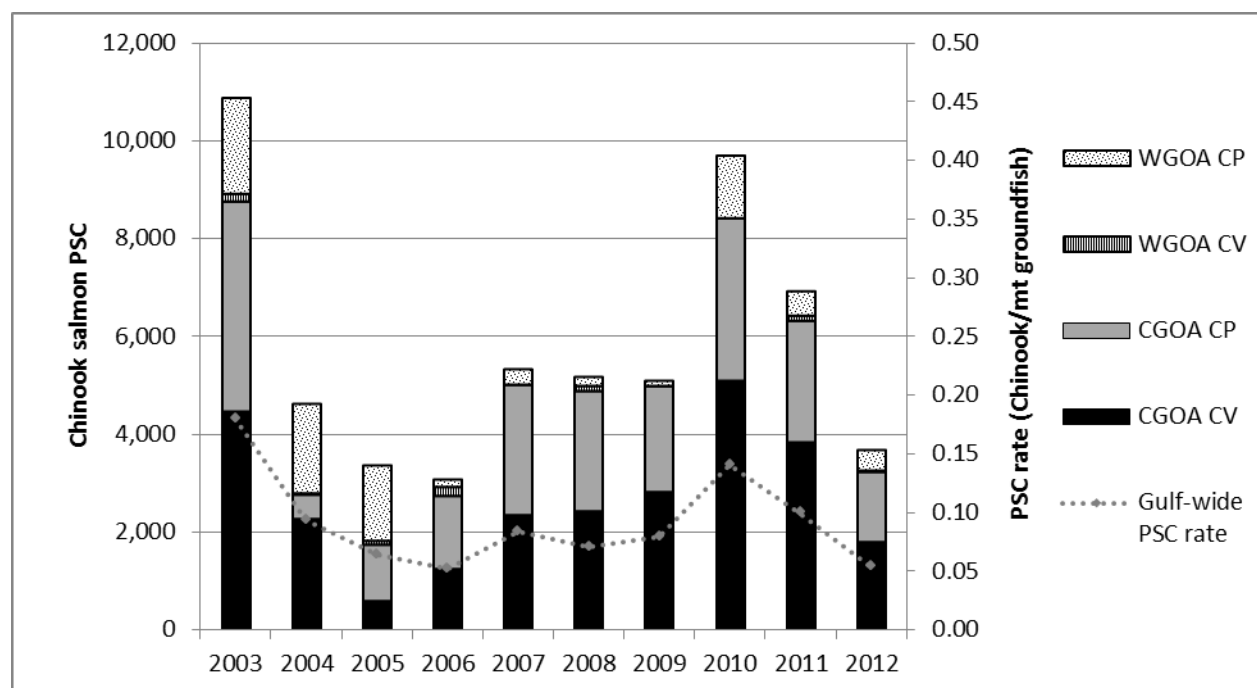


Table 4-59 through Table 4-62 report 2003 through 2011 average annual non-pollock groundfish trawl harvest, Chinook salmon PSC, and Chinook PSC rate (by GOA trip target) for the regulatory areas and/or operational harvest sectors to which this action could apportion Chinook PSC allowances. These figures summarize the recent historical disposition of non-pollock trawl harvests and Chinook salmon PSC in the GOA. Trips that are declared as part of the Rockfish Pilot Program (2007 through 2011) are included in these summary data, and pulled out separately in Table 4-63.

**Table 4-59 Average annual GOA non-pollock harvest, Chinook salmon PSC, and PSC rate by trip target, 2003 through 2011**

TARGET	2003 through 2011 annual average		
	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Rockfish	20,813	1,112	0.05
Arrowtooth Flounder	16,451	1,889	0.12
Pacific Cod	13,055	884	0.07
Shallow Water Flatfish	7,389	462	0.06
Rex Sole	2,873	1,336	0.46
Flathead Sole	1,271	307	0.24

**Table 4-60 Average annual trip target non-pollock harvest, Chinook salmon PSC, and PSC rate, by regulatory area, 2003 through 2011**

	TARGET	2003 through 2011 annual average		
		Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Central GOA	Rockfish	15,178	1,035	0.07
	Arrowtooth Flounder	14,998	1,374	0.09
	Pacific Cod	9,913	754	0.08
	Shallow Water Flatfish	7,341	460	0.06
	Rex Sole	2,620	1,291	0.49
	Flathead Sole	839	132	0.16
Western GOA	Rockfish	5,635	77	0.01
	Arrowtooth Flounder	1,453	516	0.35
	Pacific Cod	3,142	130	0.04
	Shallow Water Flatfish	48	2	0.03
	Rex Sole	253	45	0.18
	Flathead Sole	432	175	0.41

**Table 4-61 Average annual trip target non-pollock harvest, Chinook salmon PSC, and PSC rate, by operational harvest type, 2003 through 2011**

	TARGET	2003 through 2011 annual average		
		Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
CP	Rockfish	11,656	426	0.04
	Arrowtooth Flounder	5,880	1,103	0.19
	Pacific Cod	444	84	0.19
	Shallow Water Flatfish	319	8	0.02
	Rex Sole	2,746	1,305	0.48
	Flathead Sole	872	229	0.26
CV	Rockfish	9,157	686	0.07
	Arrowtooth Flounder	10,571	786	0.08
	Pacific Cod	12,611	800	0.06
	Shallow Water Flatfish	7,070	454	0.06
	Rex Sole	128	31	0.24
	Flathead Sole	399	79	0.20

**Table 4-62 Average annual trip target non-pollock harvest, Chinook salmon PSC, and PSC rate, by regulatory area and operational harvest type, 2003 through 2011**

	TARGET	2003 through 2011 annual average		
		Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
Central GOA CP	Rockfish	6,060	349	0.06
	Arrowtooth Flounder	4,429	594	0.13
	Pacific Cod	231	17	0.08
	Shallow Water Flatfish	276	7	0.02
	Rex Sole	2,492	1,259	0.51
	Flathead Sole	449	55	0.12
Central GOA CV	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
	Rockfish	9,118	686	0.08
	Arrowtooth Flounder	10,569	780	0.07
	Pacific Cod	9,682	737	0.08
	Shallow Water Flatfish	7,065	454	0.06
	Rex Sole	128	31	0.24
	Flathead Sole	390	77	0.20
Western GOA CP	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
	Rockfish	5,596	77	0.01
	Arrowtooth Flounder	1,451	509	0.35
	Pacific Cod	213	67	0.31
	Shallow Water Flatfish	43	1	0.03
	Rex Sole	253	45	0.18
	Flathead Sole	423	174	0.41
Western GOA CV	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
	Pacific cod	2,929	63	0.02

**Table 4-63 Average annual trip target non-pollock harvest, Chinook salmon PSC, and PSC rate for Rockfish Pilot Program trips, by operational harvest type, 2007 through 2011**

	TARGET	2007 through 2011 annual average		
		Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
CP	Rockfish	3,619	503	0.14
	Arrowtooth Flounder	*	*	*
CV	TARGET	Harvest (mt)	Chinook salmon PSC	PSC rate (# Chinook/mt)
	Rockfish	7,937	834	0.11
	Other	462	13	0.03

\* "Other" includes trips that were recorded in CAS as targeting arrowtooth flounder, Pacific cod and shallow water flatfish

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, though flatfish TACs increased in 2012 (Figure 4-8 and Figure 4-9).

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 mortality levels are exceeded.

These closures could reduce harvests from the Gulf. Since halibut-related closures would be seasonal – affecting the periods of the fishing year when halibut PSC rates are high – they could affect not only total harvest, but also the distribution of harvest throughout the year. While these closures have the potential to reduce Chinook PSC, they would not affect Chinook PSC in the Central Gulf Rockfish Program fishery, as cooperatives in that fishery have exclusive halibut PSC apportionments in addition to rockfish allocations.

Selecting the no action 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 fishery dependent 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 allowable 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 on halibut PSC in the nearer-term. 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 under review here have taken steps to reduce Chinook PSC in the absence of a regulatory limit. To date, some groundfish participants have undertaken 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 no action alternative, fishermen who are members of voluntary harvest cooperatives could still utilize the tools of coordinated action. Under the current limited access management structure, an influx of vessels that are not party to voluntary avoidance measures could reduce the amount of TAC available to those salmon-avoiding vessels. The Council has heard testimony expressing some concern about the future viability of voluntary Chinook avoidance. Recent fishery activity suggests that participation in GOA groundfish fisheries has increased due to speculation about other potential management strategies that may allocate quota, of an undetermined type, according to historical participation (see Table 5-1). This influx of fishing pressure could compound other pressures to disregard Chinook PSC rates, as participants’ shares of the catch would be eroded by the additional 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 4-17). Industry representatives indicate that the increase may have been related to gear changes, meant to avoid halibut PSC, and a CV rockfish season opening that allowed vessels to harvest fish earlier than normal, to avoid delivery conflicts while stabilizing 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. Again, this competitive disadvantage may be exacerbated by the increased harvest participation associated with a race for catch history. In the Rockfish Program, share allocations insulate participants from that risk.

Table 4-64 summarizes average annual Chinook salmon PSC for the most recent five years of available data, 2008 through 2012. Estimated Chinook PSC in 2012 was 3,632 fish, which falls within the range of

PSC levels observed in the GOA non-pollock trawl fishery during the analyzed period that ends in 2011. Table 4-65 presents similar information for Chinook salmon PSC usage prior to June 1<sup>st</sup>. These figures provide a reasonable point of reference by which to assess how constraining an apportioned PSC hard cap might be, noting that this analysis does not treat PSC levels from past years as an accurate predictor of future Chinook salmon encounter. Each table breaks out PSC that occurred on trips that were, or were not, declared as fishing under the Central GOA Rockfish Program. Because the most recent, or best available, data on 2012 PSC levels falls within the range of annual Chinook encounters that have been used throughout the iterative revisions of this analysis, the analysts continue to use the period ending in 2011 as an adequate characterization of Chinook PSC in the regulated fisheries.

**Table 4-64 Average annual Chinook salmon PSC usage, 2008 through 2012**

	All Trips	Non-RP Trips	RP Trips
Total GOA	6,109	4,874	1,235
Central GOA	5,570	4,335	1,235
Western GOA	539	539	
Catcher/Processors	2,888	2,568	320
Catcher Vessels	3,221	2,307	914
Central GOA CP	2,391	2,071	320
Central GOA CV	3,179	2,264	914
Western GOA CP	497	497	
Western GOA CV	43	43	

**Table 4-65 Average Chinook salmon PSC usage prior to June 1<sup>st</sup>, 2008 through 2012**

	All Trips	Non-RP Trips	RP Trips
Total GOA	3,759	3,205	554
Central GOA	3,447	2,893	
Western GOA	312	312	
Catcher/Processors	2,057	2,057	
Catcher Vessels	1,702	1,148	554
Central GOA CP	1,787	1,787	
Central GOA CV	1,660	1,105	554
Western GOA CP	269	269	
Western GOA CV	43	43	

Under the status quo, full retention of all salmon PSC is not required. In the absence of a full retention requirement, restructured Observer Program, implemented in 2013, 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 considers the impacts of the range of Chinook salmon PSC limits that the Council considered. Analysis of Alternative 2 is retrospective. Given the variation in harvest, annual Chinook salmon PSC (illustrated in Table 4-15 and Figure 4-22), 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 of each threshold limit. Direct impacts include avoided Chinook PSC and forgone groundfish harvest (and the associated revenue) that might arise from early seasonal closures triggered by attainment 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 non-pollock groundfish processing revenue and available hours of employment at groundfish processing facilities, reduced groundfish products available to consumers, reduced groundfish skipper and crew employment and 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. These may include, but are not limited to, salmon harvesting and processing employment impacts and revenues; Chinook sport and charter fishing employment, revenue, and secondary economic impacts – including both market and non-market sources; cultural and food benefits accruing to subsistence users; Chinook escapement and ESA-related benefits. 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 the biological data to assess the origin of Chinook salmon caught in GOA trawl nets is lacking. 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 likely to modify their behavior in order to reduce their Chinook salmon PSC rate. With no behavior change, some GOA fisheries are predicted to close earlier than in recent years, once Chinook 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 encounters have been highly variable and unpredictable, in both time and space, the analysts note that avoidance measures could be unreliable or inconsistent in their effectiveness. Therefore, the analysts believe that any overstatement of forgone non-pollock groundfish 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 also consider that behavior changes often impose a cost. These could include increased variable costs associated with relocating away from areas of high Chinook salmon encounter (fuel, ice, time), or increased fixed costs associated with capital investment in any salmon excluding gear that may be developed in the future.<sup>57</sup> It is also possible that Chinook PSC avoidance behaviors could exacerbate other PSC avoidance performance, especially Pacific halibut PSC avoidance.

On the other hand, a retrospective analysis could potentially underestimate the cost of PSC closures if future non-pollock groundfish catch – in terms of TAC limits and utilization – was to increase. Under the status quo, the primary harvest constraint is halibut PSC. Future improvement in managing halibut PSC could make the historical trawl harvest levels used in this analysis seem low. By extension, forgone harvest levels that are based on a halibut-constrained fishery would also seem low. If the value of the

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<sup>57</sup> 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.

groundfish fishery grows in the future, early closures on Chinook salmon PSC would have a more costly effect than they currently do, in terms of lost opportunity. The converse is also true (i.e., if Chinook PSC “avoidance” increases in importance, for any number of economic, political, or ecological reasons, failure to close trawl fisheries responsible for excessive Chinook PSC losses may impose a net welfare loss on society). Recent TAC history (Figure 4-8 and Figure 4-9) was stable or only moderately increasing from 2003 to 2011. Pacific cod TAC began increasing in 2009, but has since leveled off. Rockfish has been stable throughout the analyzed period. Flatfish TACs increased in 2012, but harvest levels have not displayed a similar rise, and are not likely to do so in the near-term given the possibility of further reductions in halibut PSC limits. Upward trends in Pacific cod TAC (in both the Central and Western GOA) provide the most likely *potential* concern for this type of underestimation, as Pacific cod TACs are both generally increasing and well-utilized.<sup>58</sup> Additional information on recent TAC history can be found in Section 4.4.7.

In general, 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 non-pollock groundfish harvest and revenue trends.

#### **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 Chinook salmon PSC avoidance is unsuccessful and the fishing season is closed prior to either harvesting all available TAC or reaching a PSC limit on a different species, such as halibut.

Below, the report reviews the key target harvest species and seasonal catch distribution for each operational harvest type (CP and CV) in each regulated subarea (Central and Western GOA). This information aids in understanding which target fisheries might experience less effort if participants adopt a PSC-reducing strategy, or which are likely to receive increased effort if participants adopt a defensive position and increase effort over a shortened season (further discussion of 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 area endorsements to trawl for groundfish. License and participation information reflect 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 in Section 4.7.3.

Next, the analysts provide a high-level overview of how apportioning a PSC limit according to either a 5- or a 10-year historical period differently shapes the timing and number of simulated fishery closures during the analyzed period (2003 through 2011). In addition to the length of the basis period, the Council considered whether to apportion PSC allowances in accordance with either historical Chinook salmon PSC usage, or GOA non-pollock groundfish harvest. In its final recommendation, the Council has recommended the use of historical Chinook salmon PSC over a 5-year period.

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<sup>58</sup> 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.

The following numbered subsections 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. In general, forgone harvest impacts and forgone revenue impacts are strongly correlated. Harvest and gross revenue display 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. For shorthand reference, Table 4-66 reports the 2011 average first wholesale value of GOA non-pollock groundfish species. For analysis, though, it is critical to note that the estimates of forgone wholesale revenue provided in the following sections are based on season-specific harvest and wholesale revenue records from the analyzed historical period. For example, where the analysis provides an estimate of forgone groundfish revenue due to a CP sector closure from April to May, the sector's historical revenue for that portion of the "characteristic year" (see explanation in Section 4.7.1.2) is *not* based on an aggregated average value per metric ton of CP-caught groundfish multiplied by historical catch; using such an aggregated average would lump in the value of species that are not typically caught by the CP sector during that period, such as rockfish. Rather, the gross wholesale revenues associated with each retrospectively simulated closure period are derived from the historically representative catch composition of a particular subdivision of the fishery (e.g., CP sector) at a particular time of year (e.g., April and May).

In 2011, rockfish and Pacific cod generated higher wholesale revenue per metric ton in the Central GOA than in the Western GOA, while flatfish generated higher per unit revenue in the Western GOA. 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. These comparisons align with expectations, as the Pacific cod is a key target fishery for the CV sector, while CPs demonstrate a relatively greater focus on flatfish in the GOA non-pollock trawl fisheries.

**Table 4-66 2011 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

Note: First wholesale prices are reported at the trip target level; flatfish includes arrowtooth flounder, shallow water flatfish, rex sole, and flathead sole.

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 estimate the date in each year when the non-pollock groundfish trawl fisheries would have been closed under a Chinook PSC limit. Any harvest recorded in weeks following that simulated closure would have been forgone by the fisheries subject to the limit, or apportionment of the limit. Similarly, any Chinook salmon PSC recorded in the post-closure weeks would not have occurred. Chinook salmon PSC that occurred after a retrospective closure date is referred to as "salmon savings." Section 4.7.1.2 discusses the caveats associated with performing a retrospective impact analysis, in specific reference to participants' likelihood to alter their pattern of participation under a hard cap, and the annually variable effect of halibut PSC closures that was present during the analyzed historical period.



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. The recommending authority's 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 per unit cost in forgone harvest. However, this is difficult to assess without better 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.

The Council considered a range of levels at which to set an annual total Chinook salmon PSC limit for the GOA non-pollock trawl fishery. The Gulf-wide cap levels analyzed in this report were 5,000, 7,500, 10,000 and 12,500 Chinook salmon per year. The selected option under Alternative 2 was 7,500, and would apply jointly to all trawlers in the Central and Western GOA fisheries. The options proposed various schemes for apportioning the total GOA PSC limit to subdivisions of the GOA fishery and fleet. The Council also considered options to sub-apportion a user group's allowable Chinook salmon PSC limit over different periods of the fishing year. The Council arrived at a final recommendation to set a seasonal limit for Chinook PSC use in the CP sector prior to June 1. This limit is a seasonal maximum, but is not an apportionment; Chinook PSC that is not taken by the CP sector prior to June 1 remains available to the sector for the latter portion of the year.

The Council has the ability to select some of the four Alternative 2 Options in conjunction. The Council's December 2012 motion, included in Section 2 of this report, specifies which options could be selected together. Setting aside the size of the total GOA Chinook PSC limit and the choice of method for basing PSC limit apportionment on historical activity – by PSC usage or by groundfish harvest, and by 5-year history or by 10-year history – the Council has defined 12 different scenarios for analysis. These paths are summarized in Table 4-67. The analysis of Alternative 2 is organized according to these 12 potential end-points.

**Table 4-67 Options and combined options to be considered under Alternative 2**

	Scenario	Description
Gulf-wide PSC limit	No Option selected	PSC limit shared by all operational types, across all affected areas
	Option 3	PSC limit shared by all operational type sectors, across all regulated areas; only a portion of the annual PSC limit can be used prior to June 1
	Option 4	Some PSC is set aside for the CG Rockfish Program; the remainder of the total GOA PSC limit is shared by all operational type sectors, across all regulated areas
	Options 3 & 4	Some PSC is set aside for the CG Rockfish Program; the remainder of the total GOA PSC limit is shared by all operational type sectors, across all regulated areas; only a portion of the annual limit can be used prior to June 1
PSC limit apportioned by user group	Option 1	PSC limit divided between the Central GOA and Western GOA fisheries
	Options 1 & 4	Some PSC is set aside for the CG Rockfish Program; the remainder of the total GOA PSC limit is divided between the Central GOA and Western GOA fisheries
	Option 2	PSC limit divided between the CP and CV sectors
	Options 2 & 3	PSC limit divided between the CP and CV sectors; only a portion of the annual limit can be used prior to June 1
	Options 2 & 4	Some PSC is set aside for the CG Rockfish Program; the remainder of the total GOA PSC limit is divided between the CP and CV sectors
	Options 2, 3 & 4	Some PSC is set aside for the CG Rockfish Program; the remainder of the total GOA PSC limit is divided between the CP and CV sectors; only a portion of the annual limit can be used prior to June 1
	Options 1 & 2	PSC limit divided between the Central GOA and Western GOA fisheries, and subdivided between the CP and CV sectors within each area
	Options 1, 2 & 4	Some PSC is set aside for the CG Rockfish Program; the remainder of the total GOA PSC limit is divided between the Central GOA and Western GOA fisheries, and subdivided between the CP and CV sectors within each area

**4.7.1.1 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.<sup>59</sup> 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

<sup>59</sup> 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 4.4.10 for further detail.

2011, 27 also landed BSAI groundfish, 8 also landed Western GOA groundfish, and 3 were active in both GOA regulatory areas *and* the BSAI. Forty-six of the 47 vessels active in 2011 participated in the Central GOA pollock fishery. Fourteen of the 15 active vessels who participated exclusively in the Central GOA 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. Thirteen of the 14 vessels that were active in 2011 participated in the Western GOA pollock fishery. Most harvesters who fished exclusively 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 accounted for the greatest proportion of the sector's average annual PSC. Rockfish trips accounted for the most significant percentage of harvested weight. This sector's rockfish fishery primarily occurs in June and July (Weeks 24 and 31), owing to harvesters' demonstrated preference to prosecute 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 held endorsements for the Bering Sea (15 were also permitted 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 Central GOA CPs that were active 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 due to 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 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 Chinook salmon 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. Nineteen Western GOA CPs made non-pollock groundfish landings from 2003 through 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.

**Basing apportionment on either a 5-year or 10-year history of Chinook salmon PSC usage or non-pollock groundfish harvest**

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 4-68 summarizes the percentage of the hard cap apportioned to each user group, under the different options that the Council considered for an apportionment basis. For this analysis, the 10-year historical period includes 2002 through 2011, and the 5-year period includes years 2007 through 2011.

Entries in Table 4-68 that include Option 4, which apportions a segment of the total GOA Chinook salmon PSC limit directly to the Central GOA Rockfish Program (RP), reflect the historical division of PSC or harvest that occurred on all trips that are not flagged as part of the RP in NMFS Catch Accounting System. The records that are eliminated by removing RP trips from the historical data pool all come from the Central GOA, all occurred during the 2007 through 2011 time period, and were primarily from the CV sector's history pool. As such, the apportionment percentages based only on non-RP trips end up shifting slightly more of the PSC allowance toward the Western GOA and CP sectors.

**Table 4-68 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%

Selecting groundfish harvest instead of PSC usage as the basis for apportionment, under either historical time frame, makes the greatest difference in scenarios that involve Option 2 – dividing the PSC limit by operational type sector. The CP sector would have to prosecute the GOA non-pollock fishery with 15% fewer allowable Chinook salmon PSC, if harvest history serves as the basis for apportionment. On the surface, it may seem that apportioning the hard cap by historical PSC usage “rewards” sectors that fished

with higher rates of Chinook salmon per metric ton of groundfish harvest. While this may be true in effect – as the likelihood of a CP sector closure increases under a groundfish history apportionment scheme – the Council weighed this policy decision in view of the fact that estimated CP and CV PSC rates are hard to compare; refer to Section 4.4.11.1 for more discussion on differing rates of observer coverage and the lack of a sufficient test case where CPs and CVs prosecuted the same target fishery in the same time and space.

#### **4.7.1.2 Methodology for impact analysis**

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 through 2011. Because this analysis is retrospective, and participants were not under a PSC cap at the time, regulatory impacts must be viewed with the caveat that fishermen did not alter their behavior to avoid Chinook salmon and forestall PSC-related fishery closures; as such, the figures reported in this analysis might be viewed as a moderate overestimation of maximum impacts. Chinook salmon interception is an unpredictable event, and annual groundfish harvest – both on aggregate and by target fishery – vary from year to year. Moreover, the effect of halibut PSC limits on aggregate GOA and target-specific groundfish harvest varies from year to year. 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 through 2011. These closure dates are then applied to the weekly 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 level for each calendar week, as it occurred in each of the 9 analyzed years. Figure 4-23 illustrates the seasonal distribution of non-pollock groundfish harvest in the characteristic year. In order to estimate the effects of a closure under each apportionment scenario, the closure weeks that were retrospectively simulated on 2003 through 2011 records are applied to the characteristic fishing year Chinook PSC and groundfish harvests. The resulting salmon savings and forgone harvest estimates reflect the regulatory impact 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 – 62,438 mt and 6,008 Chinook salmon.

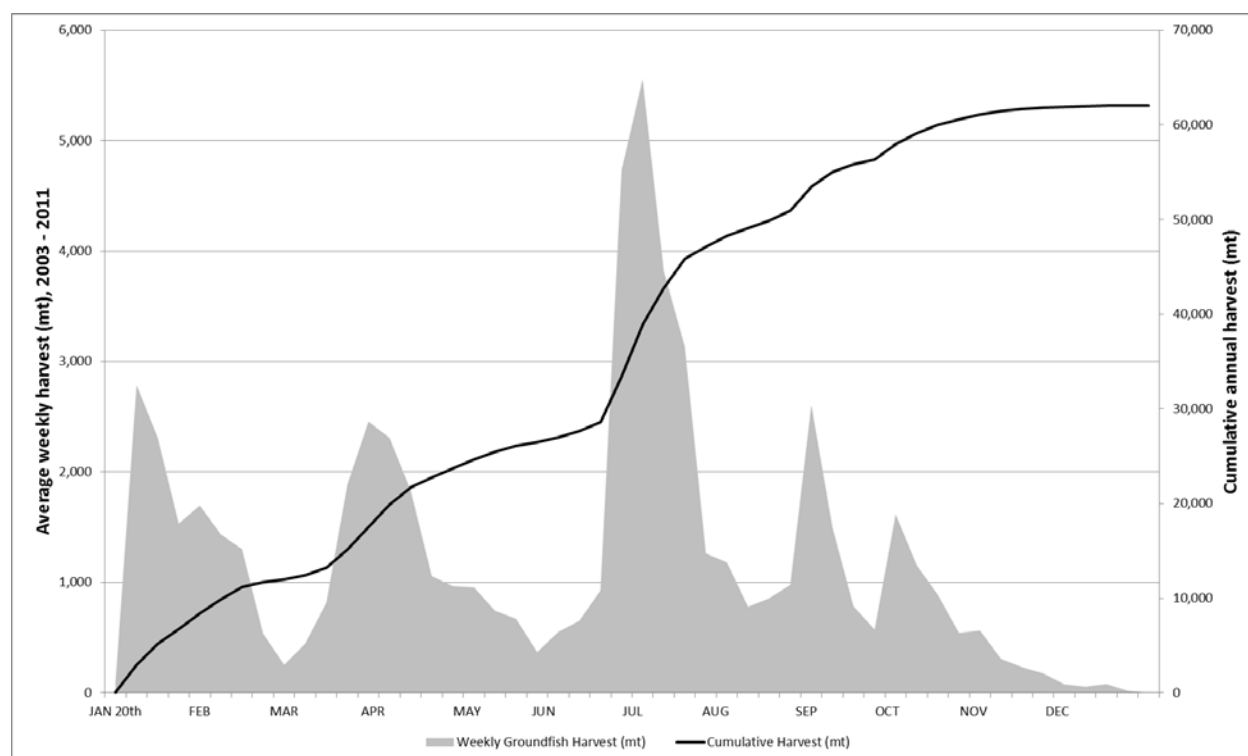
Analysts elected to rely on a “characteristic fishing year” for two reasons. First, the use of a characteristic fishing year allows analysts to present estimated salmon savings and forgone groundfish harvests for all years and options without being restricted by confidentiality limitations. Confidentiality issues would prevent the disclosure of estimated impacts for a large number of weeks as a result of relatively few vessels participating in some of the non-pollock target fisheries at certain times. 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 the effect of annually variable factors on retrospectively estimated impacts. Such key factors include Chinook PSC estimates, the seasonal distribution of target harvest, and the variable timing and impact of halibut PSC-related closures. Because of this variability, simply relying on past simulated closures to identify the range of likely future outcomes may overstate or understate expected salmon savings and forgone harvest. For example, some apportionment scenarios may only have triggered a simulated fishery closure during one or two of the analyzed historical years (most likely the years with high overall Chinook salmon PSC, or with high PSC levels in the early months of the year). Because annual harvest and PSC display no stable trend, simulated

forgone harvest and salmon savings for a given year are not necessarily reliable indicators of future expected outcomes for the apportionment scenario being analyzed. Many factors could make one year exceptional from harvest and PSC conditions in the future; using measures of central tendency to construct a characteristic fishing year absorbs some of this variability. The same logic supports the use of the full 2003 through 2011 period to construct the characteristic year. While some aspects of seasonal harvest distribution shifted following the 2007 implementation of the Rockfish Pilot Program (see Figure 4-10 in Section 4.4.8.2), a larger sample of fishing years is still preferable to absorb more of the annual variation in other determinant factors, such as environmental conditions, market conditions, and seasonal halibut PSC closures.

As a corollary to the second point described above, using a characteristic fishing year also circumvents an analytical problem where potential impacts under one apportionment scenario are based on the fishing history of a particular year, while impacts under another scenario are based upon a different year or a set of years. Again, using measures of central tendency to define a typical year increases the validity of comparing option, or bundle of options, to another based on estimated impacts.

**Figure 4-23 Seasonal harvest distribution in the characteristic fishing year**



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 in order to prevent or forestall a non-pollock groundfish closure; (2) harvesters could standdown from 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. Participants may be limited in their ability to adjust inseason behavior according to these strategies. Limiting factors include, among others, seasonal TAC allocations for Pacific cod (described in Section 4.4.7), competitive disincentives to coordinate temporary standdowns, and seasonal Pacific halibut PSC limits (which are not apportioned separately to the CP and CV sectors). The behavioral response aspects of shared PSC limits are further discussed in Section 4.7.3.

#### 4.7.1.3 Options resulting in a Gulf-wide Chinook salmon PSC limit

Alternative 2 could result in 12 different end-points (selected options, or combination of options), four of which would result in a Chinook salmon PSC limit that is shared across all participants in the segment of the GOA trawl fishery that is regulated by this action. These end-points, listed in Table 4-67, include: selecting Alternative 2 with no options, selecting Option 3, selecting Option 4, and selecting Options 3 and 4 together.

##### 4.7.1.3.1 No Option Selected

The GOA non-pollock trawl fishery, including all affected management areas and harvest sectors, recorded around 6,000 Chinook salmon PSC per year from 2003 through 2011. By that measure of central tendency, one might conclude that the only considered PSC limit that could be regularly expected to close the fishery is 5,000 Chinook salmon per year. However, this analysis has noted throughout that annual Chinook PSC levels are highly variable and unpredictable. Noting this, the analysts present maximum potential impacts, as determined by calculating the dates of fishery closures that would have occurred during the analyzed period, had the considered cap levels been in place. The magnitude of the maximum impact is estimated by evaluating the avoided PSC and forgone harvest that would have been realized if such a closure occurred in the characteristic year.

**Table 4-69 Estimated maximum potential impacts under a Gulf-wide PSC limit**

PSC Limit	# Years with PSC closure	Earliest Closure Week	Impact	GOA Total		Forgone Harvest (mt) and Chinook savings (# fish) by species											
						Rockfish		Pacific Cod		Rex Sole		Shallow Water		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
12,500	0	None	Foregone Harvest	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Chinook Savings	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10,000	1	Early Sept.	Foregone 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%
7,500	2	Mid May	Foregone 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%
5,000	6	Late April	Foregone 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%

Table 4-69 summarizes the impacts under the earliest simulated closure dates for each considered GOA PSC hard cap level. During the analyzed period, GOA non-pollock harvest in the key target fisheries averaged around 60,000 mt per year. The smallest cap level, 5,000 Chinook salmon, would have triggered a closure at some point in six of the nine analyzed years, including each of the five most recent years. A late-April closure would have precluded around two-thirds of average annual groundfish harvest, and would have prevented 56% of average annual Chinook PSC. The fact that an April closure prevents only 56% of PSC reflects the fact that a large portion of annual Chinook salmon PSC occurs in the early-year fisheries – primarily Pacific cod, arrowtooth flounder, and rex sole. By comparison, a fall closure would preclude around one-fifth of average annual harvest and Chinook PSC, primarily impacting the Pacific cod B season and the fall shallow water flatfish fishery (both Central GOA fisheries). Note that a fall closure precludes only 26% of average annual shallow water flatfish harvest, but prevents 74% of the average annual Chinook PSC that occurs on trips targeting shallow water flatfish; this type of spread in the two impact metrics indicates that targeting shallow water flatfish is more Chinook-intensive later in the year.

The direct impact on the value of the fishery can be gauged by comparing the forgone harvest weights listed above to the 2011 first wholesale values reported in Table 4-66. Applying target-specific first wholesale values (\$/mt), the analysts estimate maximum forgone wholesale gross revenue to be around \$66 million under a 5,000 Chinook salmon PSC limit, around \$62 million under a 7,500 PSC limit, and around \$14 million under a 10,000 PSC limit. No direct gross revenue loss to groundfish harvesters is estimated for a 12,500 Chinook salmon PSC limit, as a fishery closure is unlikely to occur in all but the most extreme PSC year. The analysts emphasize that these figures only capture direct gross revenue impacts from groundfish that is not harvested. Indirect costs may be incurred through altered fishing behavior or investment in PSC-reducing technology. Variable operating costs, such as fuel and other consumables, would be reduced if vessels are inactive, due to a closure. Other indirect costs to the fishing economy of a shortened season could include reduced gross revenue for fishery supporting businesses and wages paid to processing employees; these items are further discussed in Section 4.7.4.

Closures that may occur under the higher considered cap levels are likely to occur later 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 greater effect on total PSC.

Selecting a PSC limit with a low perceived probability of closing the fishery, such as the 12,500 Chinook hard cap, may still impact the fishery relative to the status quo (no cap at all). Simply having a limit in place may cause some participants to alter their fishing behavior. Participants may take action to avoid Chinook PSC, especially as the fleet approaches a PSC limit. The extent to which a looming cap affects behavior may vary, depending on the fleet's confidence in its ability to manage a small amount of available PSC allowance; sectors of the fleet that participate in voluntary or programmatic cooperatives may behave differently than those that are characterized by individual operations competing to harvest groundfish prior to a closure. Inseason changes to patterns of participation may be more dramatic in years where a large amount of Chinook salmon encounter occurs early in the year, effectively putting the fleet on notice. Potential behavior changes under a Chinook PSC limit are further discussed in Section 4.7.3.

#### **4.7.1.3.2 Option 3 – Seasonal PSC Limit Prior to June 1**

Option 3 would limit Chinook salmon PSC usage to no more than 50% or 66% of the selected total annual hard cap before June 1. In effect, Option 3 would create a seasonal sub-limit that has the potential to trigger a fishery closure if it is exceeded. Option 3 does not, however, apportion the annual PSC limit to the pre- and post-June 1 time periods. Chinook salmon PSC allowance amounts that remain as of June 1, roll into the PSC allowance that was held back in order to support fisheries that occur later in the year. Option 3 is intended to help achieve the Council's objective of ensuring that sufficient Chinook salmon PSC allowance is available to open the summer rockfish fisheries, regardless of unpredictable PSC spikes that may occur in the early part of the year.

Over the most recent five years of available data (2008 through 2012), the GOA non-pollock trawl fisheries recorded an average of 3,759 Chinook salmon PSC between the start of the fishing year and June 1 (Table 4-65). This represents the best available information, and is in line with the figure used for impact analysis – an annual average of 4,030 Chinook salmon prior to June 1 from 2003 through 2011. Assuming away all year-to-year variability in early-year PSC, one could conclude that a pre-June PSC closure is unlikely under an annual Gulf-wide PSC limit of 10,000 or 12,500. Using similar logic, a spring closure would be unlikely under a 7,500 annual PSC limit, if up to 66% of the cap can be taken before June 1.



**Table 4-70 Seasonal PSC sub-limits and simulated closure results (2003 through 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

In some years, Chinook salmon PSC may be more heavily weighted toward the early months. Moreover, years with high early-season PSC are not always the years with the highest annual PSC total. Annual Chinook PSC was roughly similar in 2004 and 2008 (~550 fish difference), but 1,500 more Chinook salmon were taken prior to June in 2008 than in 2004. Chinook PSC was 2,000 fish greater in 2007 than in 2005 or 2006, but 1,000 fewer Chinook had been taken in 2007 entering June. For this reason, the analysts again estimate potential impacts by applying closure dates derived from the actual fishing history of the analyzed period to the characteristic fishing year.

Prior to June 1, key target harvest in the GOA non-pollock fisheries averaged around 26,000 mt per year. The smallest total GOA PSC limit, 5,000 Chinook salmon, triggered closures as early as mid-February and early March. In the characteristic year, such closures would result in the loss of 15,000 mt to 19,000 mt of groundfish harvest that occurred prior to June 1. The earliest closures triggered under higher GOA PSC limits fell between early April and mid-May; generating a direct harvest impact ranging from 12,800 mt to 2,400 mt of groundfish. Taking these years in aggregate, the non-pollock harvest that occurred prior to June consisted of roughly 35% Pacific cod (A season) and 45% arrowtooth flounder and rex sole. The percentage of pre-June harvest recorded on trips targeting rockfish increased from 6% of the total to 10% when considering only 2007 through 2011, which is when the CV sector moved its rockfish season up from July to early May under the Rockfish Pilot Program.

One can roughly gauge the maximum potential gross revenue impact on groundfish harvests using the aggregate first wholesale value per metric ton figure of \$1,400 (including all targets). A mid-February closure would result in a groundfish gross revenue loss on the order of \$27 million; an early April closure would cause around \$18 million in forgone gross revenue; and a mid-May closure would generate a loss of around \$3.5 million in gross receipts.

Closures that occur after March would mainly affect the arrowtooth flounder and rex sole target fishery, which is a relatively low value fishery, though the prices for these species' products have increased in recent years to the point where the wholesale value of their product forms is comparable to other flatfish (Table 4-53 and Table 4-54). Moreover, these targets are important to maintaining processing volume and crew employment in between the Pacific cod and rockfish seasons. It should also be noted that participants are likely to shift their seasonal pattern of participation in certain target fisheries according to which fishery is most valuable, all else equal. If the non-pollock fishery was closed in May, under Option 3, it is probable that the CV sector would simply open its rockfish season on June 1, instead of early May. This would not be without cost, but it is probably an overstatement of the impact to conclude that harvesters would simply forgo that month's portion of the relatively valuable rockfish fishery.

#### **4.7.1.3.3 Option 4 – PSC Carve-out for the Central GOA Rockfish Program**

Option 4 would apportion some amount of the total annual GOA Chinook salmon PSC limit directly to the Central GOA Rockfish Program. As a result, the non-Rockfish Program segment of the GOA non-pollock trawl fishery would operate under a smaller hard cap. The first three considered carve-out levels

would consist of a 1,500 Chinook salmon PSC limit, a 2,500 Chinook PSC limit, or a 3,500 Chinook limit, and that amount would be apportioned between the CP and CV sectors of the RP on the same proportional basis that was selected for the preferred alternative (52% to the CV sector and 48% to the CP sector). The fourth carve-out scenario would only apply in combination with Alternative 2, Option 2, where the GOA hard cap is apportioned between the CP and CV sectors. This scenario would take 1,200 Chinook PSC from the total GOA CV limit and apportion it to the CV sector of the Rockfish Program. The Council included the fourth RP carve-out scenario at the time of its initial preferred alternative (June 2013), and instructed staff to analyze the impact of its incorporation as a trailing action. The Council selected this fourth scenario to be included in its final preferred alternative in December 2013.

**Because the selected format of the carve-out – the fourth scenario – was never intended to be combined with the many permutations of Alternative 2 options that were not selected in June 2013, this report does not walk through the potential impact of combining the selected carve-out with the other apportionment options that were not selected.** Rather, analysis of the fourth carve-out scenario is limited to its interactions with the initial and final preferred alternatives; this is included in Section 4.9 and Appendix 2.

In any case, the size of the RP carve-out has a fairly simple impact on the non-RP fisheries; larger carve-outs result in less Chinook salmon PSC allowance available to support the non-RP fisheries. On the other hand, Chinook PSC that is recorded on trips within the Program are not credited against the non-RP remainder of the GOA hard cap. In general, however, reducing the size of the non-RP PSC limit brings those fisheries closer to the cap size where they are susceptible to PSC events that can trigger closures. This is even more so the case when the non-RP PSC limit is apportioned between multiple areas or sectors (as when Options 1 & 4 or Options 2 & 4 are selected together, for example). The Council considered whether it would be *de facto* prioritizing “fully funding” the historical Chinook salmon PSC usage in the Rockfish Program fishery, or managing the risk of mid-year closures to the non-RP fishery. In seeking the best available balance, the Council considered various forms of a suboption to balance these competing priorities with a “rollover” of residual amounts of Rockfish Program PSC to support other non-pollock groundfish fisheries. The rollover suboption is further discussed below in Section 4.7.1.3.3.3, and under the final preferred alternative in Section 4.9.

From 2007 through 2012, average annual Chinook salmon PSC use in the RP has been 1,357 fish. The highest single year PSC total was 1,940 Chinook (in 2007), and the lowest was 736 Chinook (in 2011). An undivided 2,500 or 3,500 Chinook PSC limit for the RP would not have been exceeded in any of the six historical years. A 1,500 Chinook salmon PSC limit would have closed the RP fishery in the first two years of the Program. Section 4.4.10 provides additional discussion of why RP PSC might have spiked in 2007 and 2008, and what programmatic learning may have occurred since then. With the caveat that putting too much analytical stock in the first two years of a new program is risky, the data show that a 1,500 Chinook hard cap would have closed the RP fishery in late June or early July during those years. Were such a closure to have occurred in the characteristic RP fishery year (based on 2007 through 2012), participants could have lost the opportunity to harvest between 7,000 mt and 8,000 mt of groundfish<sup>60</sup>, and around 400 Chinook salmon would not have been lost to PSC. For comparison, average annual RP harvest was 12,050 mt from 2007 through 2011. The economic, ecological, and cultural values associated with the avoided Chinook salmon losses cannot be estimated currently, but must be acknowledged in assessing these tradeoffs.

Rockfish Program cooperative members may have a greater ability to coordinate harvest in order to minimize Chinook salmon PSC. Delaying harvest until low-PSC rate periods, such as July, is a more

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<sup>60</sup> Trips flagged as participating in the Rockfish Program do not solely consist of rockfish species catch. Other targets appearing in the Catch Accounting System data include Pacific cod, arrowtooth flounder, shallow water flatfish, sablefish, and Atka mackerel.

viable approach to PSC management in a catch share fishery with a direct allocation of halibut PSC mortality, whereas a race to harvest before a PSC closure occurs is a more likely response in a limited access fishery with more vessels and less coordination. RP participants may shift the timing of their participation more dramatically if a RP PSC cap is perceived to pose a constraint. CVs are more likely to delay RP participation, as CPs already tend to target rockfish in July. While shifting harvest patterns to prevent a fishery closure would seem to preserve fishing gross revenues, participants may bear the opportunity cost of forgoing their typical July gross revenue streams. Many RP CVs also participate in the Bering Sea AFA pollock fishery, which opens on June 10; some CVs also operate as tender vessels in July. If the RP CV fleet feels that fishing in July is the only way to stay under a constraining PSC cap, they may have to trade off tendering revenues, or incur the additional operational cost of transiting to the Bering Sea in June and then returning to the GOA in July. Losses of Chinook salmon to PSC impose costs to both commercial and non-commercial users, as well. Therefore, avoided Chinook PSC mortality will result in benefits to those users. Numerical estimates of these values cannot currently be made, due to data limitations, but they do exist.

#### 4.7.1.3.3.1 Impacts on the Non-Rockfish Program Fishery

Because Option 4 directly apportions some amount of the total GOA Chinook salmon PSC limit to the Rockfish Program, it is necessary to consider how the rest of the GOA trawl fishery might fare under a reduced PSC limit. While the amount of the total hard cap apportioned to the non-RP fishery would be lower, Chinook salmon caught on RP trips would not be debited against the non-RP fishery's PSC allowance. This could be a benefit to the non-RP fishery in years when the RP fleet encounters a large number of Chinook salmon, though that has only been the case in a few years.

Table 4-64 indicates that the non-RP fishery recorded an annual average of 4,874 Chinook salmon PSC from 2008 through 2012 (the most recent five years of data available). This amount of Chinook salmon would have closed the fishery under a total GOA PSC limit of 5,000 with any of the considered carve-outs for the Rockfish Program; it also would have closed the fishery under a total Chinook PSC limit of 7,500 with a 3,500 Chinook salmon carve-out for the Rockfish Program.

**Table 4-71 Simulated closures for the GOA non-Rockfish Program fishery (2007 through 2011), under Option 4**

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

Table 4-71 describes the Chinook salmon PSC limit available to the non-RP fishery under the considered levels of Rockfish Program carve-outs. The table also lists the number of years, from 2007 through 2011, in which the non-RP fishery would have closed under these limits. Earlier years are not considered as this option relates specifically to a program that was established in 2007. As such, an outcome that resulted in five years with a closure means that the non-RP fishery would have been directly impacted in every analyzed year. This occurs twice in the table – when either a 2,500 Chinook or a 3,500 Chinook RP carve-out is applied to a GOA fishery with a total Chinook salmon PSC limit of 5,000. The earliest simulated closures occurred around the same time, but it bears mention that the latest of the five closures occurred much earlier under a 3,500 Chinook cap RP carve-out (mid-May as opposed to mid-October). This should

indicate that the larger RP carve-out *is more probable* to adversely impact the non-RP fishery in a manner that is significant.

The following maximum potential harvest impacts are derived by applying the closure dates listed in Table 4-71 to a characteristic year constructed to typify the 2007 through 2011 period, in which total non-RP groundfish harvest was 55,600 mt. A non-RP fishery closure triggered in early April could result in roughly 42,000 mt of forgone groundfish harvest; a late April closure could result in roughly 34,000 mt of forgone harvest; a mid-September closure could preclude roughly 11,000 mt of harvest; an early October closure could preclude roughly 7,500 mt of harvest; and a late October closure could preclude roughly 2,300 mt of harvest, all else equal.

The non-RP fishery recorded 5,070 Chinook salmon PSC in the 2007 through 2011 characteristic year. The amount of Chinook salmon PSC that occurred in the weeks following the closures in Table 4-71 (avoided PSC) ranges from 4,500 Chinook salmon for an early April closure, to 500 salmon for a late October closure.

The GOA non-RP fleet does target rockfish, as well as both the Pacific cod seasons and flatfish targets throughout the year. Noting this, general gross revenue impacts, as measured at the first wholesale level (i.e., initial processed product) are estimated using the aggregated 2011 wholesale value per metric ton (\$1,400). The gross revenue impact of the forgone harvest levels described above ranges from \$3.2 million to \$60 million. The economic value attributable to avoided Chinook PSC mortality cannot currently be estimated with available data.

#### **4.7.1.3.3.2 Suboption 1 – Divide Rockfish Program PSC between the CP and CV sectors**

The Council considered a suboption (Suboption 1) that divides the RP carve-out between the CP and CV sectors in the Program. If the PSC is divided, the Council’s December 2012 motion stipulates that it would be apportioned in accordance with each sector’s historical Chinook salmon PSC usage (during RP trips) from 2007 through 2012. For reference, Table 4-37 shows each sector’s annual Chinook salmon PSC in the Rockfish Program.<sup>61</sup> Under Suboption 1, the CP sector would receive 38% of the annual PSC apportionment, and the CV sector would receive 62%. Table 4-72 summarizes the PSC apportionments to each sector under each of the three considered carve-out cap levels.

**Table 4-72 Apportioned Rockfish Program PSC limit under Option 4, Suboption 1**

<b>Total RP PSC Limit</b>	<b>CP Limit</b>	<b>CV Limit</b>
1,500	563	937
2,500	939	1561
3,500	1314	2186

As part of this suboption, each LLP holder would receive an allocation of Chinook salmon PSC that is a percentage of the sector’s total PSC allowance; the percentage would be determined by the license’s proportion of the sector’s target rockfish catch, as it was determined at the Program’s initial allocation. An individual LLP’s PSC allocation would then accrue to its respective RP cooperative. The proportion of the total RP quota pool that is allocated to the LLPs in each sector is quite similar to the sector PSC apportionment percentages. LLPs associated with CPs account for 40% of the quota share, and LLPs on CVs account for 60%. Membership rosters in RP cooperatives can be fluid from year to year; Table 4-73

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<sup>61</sup> Each sector experienced one year since 2007 during which annual Chinook salmon PSC usage was dramatically higher than the period average. These high PSC years occurred in different years (CPs in 2007, CVs in 2008). The actual numbers are redacted in this document, as the low number of CP vessels in the Rockfish Program prior to 2010 trigger confidentiality restrictions.

lists the amount of Chinook salmon PSC that would be available to each co-op – as they existed in 2011 – under Suboption 1.

The co-ops within each sector performed similarly to one another in regard to Chinook salmon PSC, and the co-ops that would receive small PSC allowances based on 2011 membership (for example, CV 1 and CV 5) did not experience more simulated closures than did the others. The CP co-ops each recorded one year (2007) that would have closed out their season under any apportioned RP CP hard cap level. Each of the CV co-ops would have been closed under the apportioned 1,500 Chinook hard cap in 2008. If, instead, each LLP's average annual Chinook PSC (from 2007 through 2012) is credited to its cooperative, the data show that CP and CV co-ops would only have experienced closures under an apportioned 1,500 Chinook PSC limit. CP Chinook PSC was high enough in 2007 to bring both of the co-ops' average annual PSC over their individual share of the 1,500 Chinook salmon cap in three of six years. Each of the CV co-ops' average annual Chinook PSC would have exceeded their share of the 1,500 Chinook cap in one year. These were considered in view of the notion that cooperatives may have additional tools available to manage a small PSC limit. These tools may include enhanced communication and/or catch sharing plans that could reduce the incentive to race for target harvest at the cost of actively avoiding Chinook salmon. The Council considered how small an allocation of Chinook salmon PSC is too small to manage, noting that some of these co-op level hard caps are small enough to be encountered in one haul.

**Table 4-73 Chinook PSC cap on each Rockfish Program Co-op (2011 rosters) under Option 4, Suboption 1**

<b>Catcher-Processors</b>					<b>PSC Allowance (by RP Limit)</b>		
<b>Co-op</b>	<b># LLPs</b>	<b># Vessels</b>	<b>%CP_QS</b>	<b>%TotalQS</b>	<b>1,500</b>	<b>2,500</b>	<b>3,500</b>
CP 1	3	3	47%	19%	267	446	624
CP 2	8	7	53%	21%	296	493	690
TOTAL	11	10	100%	40%	563	939	1,314

<b>Catcher Vessels</b>					<b>PSC Allowance (by RP Limit)</b>		
<b>Co-op</b>	<b># LLPs</b>	<b># Vessels</b>	<b>%CV_QS</b>	<b>%TotalQS</b>	<b>1,500</b>	<b>2,500</b>	<b>3,500</b>
CV 1	3	3	2%	1%	20	34	47
CV 2	6	6	13%	8%	122	203	285
CV 3	10	9	16%	9%	147	245	343
CV 4	9	8	25%	15%	234	390	546
CV 5	2	2	4%	3%	41	68	96
CV 6	11	10	28%	17%	264	440	616
CV 7	5	5	12%	7%	108	180	253
TOTAL	46	43	100%	60%	937	1,561	2,186

#### **4.7.1.3.3.3 Suboption 2 – Roll over a portion of unused Rockfish Program Chinook salmon PSC to support fall non-pollock trawl fisheries**

As noted in the introduction to the analysis of Alternative 2, Option 4, the Council recognizes that making a separate apportionment of Chinook salmon PSC to the Rockfish Program requires a balance between giving reasonable assurance that the RP fishery can be opened, but not doing so at the cost of significantly increasing the likelihood that non-RP fisheries will be closed on Chinook PSC.

The various forms of a RP rollover are captured in the description of alternatives (Section 4.3). Those rollover alternatives include:

- (a) no rollover;
- (b) Alternative 2, Option 4, Suboption 2 from the Council's initial set of alternatives; and
- (c) the four action alternatives (Alternatives 2 through 5) from the trailing analysis reviewed by the Council in October and December 2013 (NPFMC 2013).

The remainder of this subsection, and what follows throughout Section 4.7.1, considers the rollover as it was described in the Council's alternatives leading up to the June 2013 final action on the initial preferred alternative. This version of the rollover – listed above as (b) – stipulates that if the RP fishery has not used its full Chinook salmon PSC limit as of October 1, some portion of the remainder will be rolled back into the general GOA Chinook PSC limit pool. Both the CP and CV sectors of the RP fishery would participate in the rollover. All but 200, 300, or 400 of the PSC cap remaining as of October 1, would roll over to other fall non-pollock trawl fisheries. The amount that is not rolled over (200, 300, or 400) could be used to support RP trips that occur later in the year.

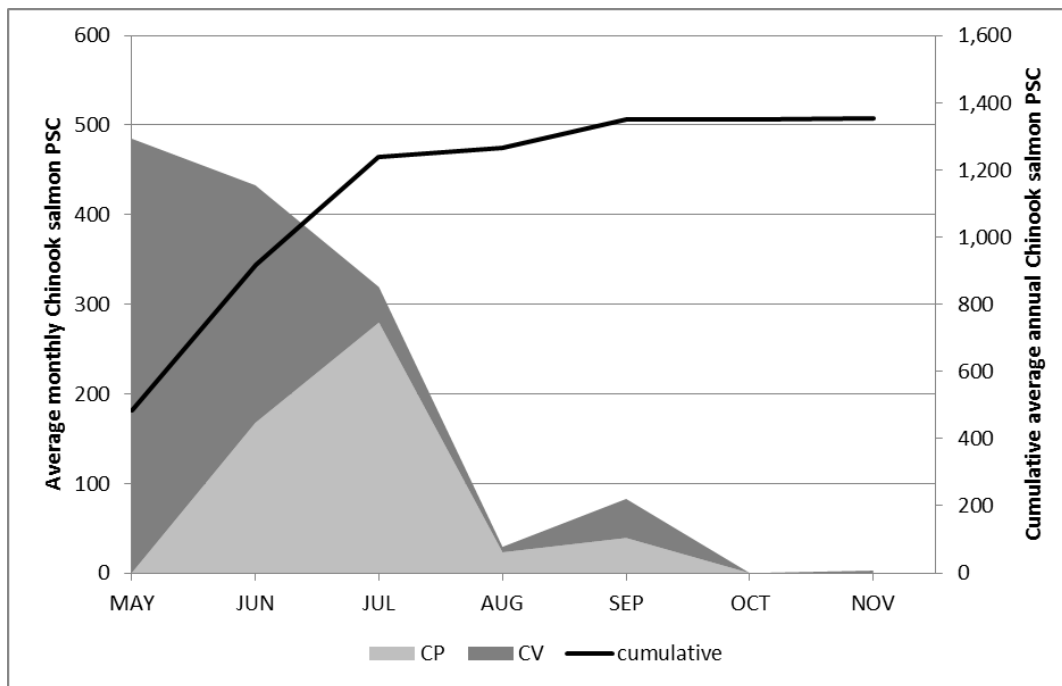
For the purposes of Section 4.7.1, the considered rollover is restricted to the above format for three reasons. First, the other rollover alternatives – listed above as (c) – were crafted after the Council had chosen an initial preferred alternative, which did not include some of the options under Alternative 2. For example, combinations including Option 1, where Chinook PSC is apportioned by regulatory area, were off the table at the time when the expanded range of rollover formats was introduced. Second, the other rollover alternatives – again, listed above as (c) – were crafted with a view to combining them with the uncertainty pool mechanism, which was not defined until the Council selected its initial preferred alternative in June 2013. Third, these other rollover alternatives were similarly crafted with the format of the selected RP carve-out, as defined in the Council's June 2013 initial preferred alternative, in mind. At that time, the Council had restricted the direct apportionment of Chinook PSC to only the CV sector of the Rockfish Program.

Analysis of the other rollover alternatives is incorporated into the description of the Council's final preferred alternative and its rationale for the selection (Section 4.9), and in Appendix 2. Section 4.9 focuses on the rollover that was selected for the PA, while Appendix 2 provides the analysis of other rollover alternatives that was presented to the Council, but cannot be found elsewhere in this document. The details of those rollover formats are listed in Section 4.3, as well as in the list of alternatives that were considered throughout the process, but not advanced (Section 2.6).

The following impact summary is in reference to the rollover format listed above as (b).

PSC recorded on RP trips from May to September averaged 1,354 Chinook salmon per year – 510 in the CP sector and 839 in the CV sector. PSC in the Rockfish Program after October 1, has been very low, averaging 3 Chinook salmon per year, on an average post-October harvest of 311 mt of groundfish per year (Figure 4-24, see also Table 4-39); nearly all post-September activity occurred in the CV sector. If this trend is indicative of the future, the unused Chinook PSC allowance (up to 400) that is not rolled over into the non-Rockfish Program fisheries would effectively function as a PSC retirement.

**Figure 4-24 Average monthly Rockfish Program Chinook salmon PSC, 2007 to 2012**



The amount of Chinook PSC that would be rolled over into the non-RP fisheries can be estimated by taking the total RP PSC limit (1,500 to 3,500) and subtracting the amount of Chinook PSC allowance that is unused (in the characteristic year) on October 1. This results in a remaining balance of RP PSC allowance of 151 fish under a 1,500 Chinook hard cap, 1,151 fish under a 2,500 Chinook hard cap, and 2,151 Chinook under a 3,500 fish hard cap. The actual remaining balance of RP PSC allowance is variable from year to year. There obviously would have been fewer units of Chinook PSC allowance to rollover in the high PSC years of 2007 and 2008, and more from 2009 through 2012. Keeping with the characteristic year, as a measure of central tendency, the analysts propose Table 4-74 as a straw-man estimate of how much additional Chinook PSC allowance could be used to support the GOA non-RP non-pollock trawl fisheries.

**Table 4-74 Estimated PSC allowance to be rolled back into the non-Rockfish Program fisheries after October 1, under Option 4, Suboption 2 (number of Chinook salmon)**

Total PSC Limit	All but...	Rollover
1,500	200	-
	300	-
	400	-
2,500	200	951
	300	851
	400	751
3,500	200	1951
	300	1851
	400	1751

The estimated 151 fish allowance remaining under a 1,500 RP cap would not provide any rollover PSC, after netting out the 200 to 400 fish, as stipulated in the Council's motion. The estimated 751 to 951 fish

limit rolled over under a 2,500 RP cap would be enough to cover the total non-RP Chinook PSC that occurred in October to December of the characteristic year. This amount of fall fishery-supporting PSC allowance would have covered the actual October to December PSC in all years, except for 2009, 2010, and 2011. The non-RP fishery encountered a large amount of October PSC while targeting shallow water flatfish in 2009, arrowtooth flounder in 2010, and Pacific cod in 2011. The estimated 1,751 to 1,951 Chinook salmon rolled over under a 3,500 RP cap would also have covered the late year non-RP PSC in the characteristic year. Actual PSC records indicate that the late-year fishery would still have closed with a rollover in 2009 and 2010, due to Chinook PSC in the target fisheries mentioned above.

If the non-RP fishery reaches its annual Chinook PSC limit prior to October 1, it will have imposed uncompensated losses, any addition to which society is unwilling to incur (i.e., the participants have reached the maximum threshold number of Chinook salmon that will be permitted). In this case, one might ask whether individual fishermen, will incur substantial losses while waiting for a rollover from the Rockfish Program or create any general inefficiency by targeting non-pollock groundfish (especially the Pacific cod B season, for the Central GOA CV fleet) on October 1. In theory, it is possible that waiting to prosecute the Pacific cod B season until October 1 would cause an efficiency loss, because the pollock D season also opens on that date and is generally more valuable; participants would likely opt to target pollock when the season opens. However, history shows that in some years Pacific cod participants are already standing down in September, due to halibut PSC constraints, so the action under consideration would not be causing a new trade-off in the fishery by forcing vessels to choose to fish for pollock or cod on October 1. One should consider that any efficiency loss in the non-RP fishery, due to the timing of the Chinook PSC rollover, is ultimately the result of the non-RP operators' failure to remain below their sector's maximum Chinook PSC allowance. In any case where the fishery was closed due to Chinook PSC, the non-RP sector is made better off by a rollover.

#### **4.7.1.3.4 Options 3 & 4 – Rockfish Program Carve-out with a Seasonal PSC limit for Non-Rockfish Program Trips**

As noted above, any recommendation by the Council that involves Option 4 reduces the size of the Chinook salmon PSC limit for the non-Rockfish Program fishery. Selecting Options 3 and 4 together would result in a reduced amount of Chinook salmon PSC available to support non-RP fishing prior to June 1.

The seasonal split created by Option 3 would not apply to the Rockfish Program. From 2007 through 2011, May RP activity (all in the CV sector) accounted for 9.5% of total GOA pre-June 1 non-pollock groundfish harvest (2,800 mt per year) and 14% of GOA pre-June 1 Chinook salmon PSC (525 fish per year). May RP harvest consisted primarily of trips targeting rockfish, according to NMFS CAS, but trips targeting Pacific cod and sablefish also occurred; all of the RP's Chinook salmon PSC recorded during this part of the year occurred on trips targeting rockfish.



**Table 4-75 Seasonal Chinook PSC sub-limits and simulated closure results for the GOA non-Rockfish Program fishery (2007 through 2011), under Options 3 & 4**

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 seasonal PSC limits in Table 4-75 are simply downward adjustments of the seasonal limits for the entire GOA fishery under Option 3 (Table 4-70). The non-RP fishery recorded 3,266 Chinook salmon PSC prior to June 1, in the characteristic year constructed to typify 2007 through 2011. This figure is similar to the most recent five years of data, during which the non-RP fishery took 3,205 Chinook over those months (Table 4-65). Comparing those totals to the seasonal PSC limits in Table 4-75, the analysts suggest that an April fishery closure is a probable outcome under total GOA PSC limits of 7,500 or less and with some sort of PSC carve-out for the Rockfish Program.

The results listed in Table 4-70, for Option 3, include some earlier closure dates, such as mid-February or early March. Those simulated closures typically occurred in the years from 2003 through 2006, when early year PSC was particularly high (especially in 2003). Because selecting Options 3 and 4 together deals specifically with the Rockfish Program, these results deal only with the years since 2007. It would be invalid to compare the apportioned PSC limits for Options 3 & 4 to the pre-RP years, where PSC from RP trips is not removed.

Similar to the analysis of Option 4 (above), an outcome noting five closure years should be interpreted as the non-RP fishery closing in every analyzed year. The earliest simulated closures for these particular outcomes occurred in mid-March or early April; the latest observed closures occurred in early May. So, for these outcomes, the analysis suggests a high likelihood of losing some of the May non-RP fishery, at a minimum, all else equal.

The non-RP fishery harvested an average of 26,500 mt of groundfish between January and May of 2007 through 2011. Based on 2007 through 2011 non-RP fishery data, a seasonal mid-March closure would preclude around 14,000 mt of groundfish harvest and avoid loss of 2,900 Chinook salmon as PSC. An early April closure would preclude around 13,000 mt of groundfish harvest and avoid loss of 2,700 Chinook as PSC. A mid-April closure would preclude around 7,500 mt of groundfish harvest and avoid loss of 1,650 Chinook. A late April closure would preclude around 4,500 mt of groundfish harvest and avoid loss of 1,000 Chinook. An early May closure would preclude around 1,800 mt of groundfish harvest and avoid loss of 200 Chinook salmon.

Prior to June, the GOA non-RP fleet primarily targets Pacific cod, arrowtooth flounder, and rex sole. During the years considered, and in the months prior to June, the observed combined non-RP harvest of Pacific cod and flatfish generated an average wholesale value of \$1,136 per metric ton. Based on the forgone harvest estimates listed above, the estimated maximum impacts on gross groundfish revenue would range between \$2 million and \$16 million per year. The value of Chinook salmon not lost to PSC in these fisheries cannot be numerically estimated, due to data constraints, but are known to exist.

#### **4.7.1.4 Options that apportion the Gulf-wide Chinook salmon PSC limit by area or by harvest sector**

Eight of the 12 analyzed end-points for Alternative 2 (selected options, or combination of options) would result in a Chinook salmon PSC limit that is apportioned to the different regulatory areas or operational type sectors that are affected by this action. In making its recommendation, the Council would need to specify the time period and metric upon which to base PSC limit apportionment. This analysis considers four potential bases for apportionment, combining either historical Chinook salmon PSC usage or historical non-pollock groundfish harvest with either a 5-year or a 10-year time period. The 5-year time period analyzed in this report includes the years 2007 through 2011, and the 10-year time period includes the years 2002 through 2011.

The Council considered options that apportion the total GOA hard cap in conjunction with one another, or in conjunction with options that would superimpose a seasonal PSC limit or make a direct PSC apportionment to the Central GOA Rockfish Program fishery. These end-points are listed in Table 4-67.

The following subsections adhere to the letter of the Council's December 2012 motion, wherein apportionment of the total annual GOA PSC limit is, in all cases, done according to the metrics listed above. The Council considered whether or not it is appropriate to use a 10-year historical period to apportion Chinook PSC in cases where there is a carve-out for the Rockfish Program. End-points that include Option 4 require that a new set of apportionment percentages is calculated for the non-Rockfish Program fisheries (Table 4-68). The non-RP fishery in the Western GOA may not have changed substantially during the 2002 through 2011 basis period, but in the Central GOA all trips that were taken under the Program are removed from the historical baseline for apportionment. As a result, under a 10-year basis the Central GOA non-RP fisheries are receiving the history from vessels prosecuting the Central GOA directed rockfish fishery from 2002 through 2006, but not from 2007 through 2011. Also, in the case of rolling over unused Chinook PSC from the Rockfish Program to the fall non-Rockfish Program fisheries (on October 1), the Council considered whether it is appropriate to apportion the rollover amount according to the same metrics used to apportion the annual limit. Doing so may apportion some rollover PSC allowance amount to fisheries that have little or no activity after September. This case arises in suites of options (end-points) that include both Options 2 and 4.

##### **4.7.1.4.1 Option 1 – PSC limit apportioned between the Central GOA and Western GOA**

Option 1 would establish an apportioned Chinook salmon PSC limit that applies separately to the fishing activity in either affected regulatory area. In evaluating the impact of such a cap structure on participants, one should consider that more than half of the LLPs in the fishery are endorsed for both areas (see Section 4.7.1.1). If, for whatever reason, an area-specific hard cap closes the non-pollock fishery in one area, individuals with dual-endorsements would have a greater opportunity to continue trawling in the GOA. This and other aspects of behavioral responses to an apportioned PSC hard cap are further discussed in Section 4.7.3. This portion of the analysis focuses on the probable timing and direct harvest and PSC impact of an area-based apportionment scheme, as well as how the proposed basis metrics would differently divide the allowable Chinook PSC between the areas.

The most recent five years of data available (2008 through 2012) indicate that the Central GOA fishery encounters 5,570 Chinook salmon per year, on average, and the Western GOA fishery encounters 539 (Table 4-64). Comparing those annualized PSC levels to the apportioned limits listed in Table 4-76 suggests that only a total GOA PSC limit of 5,000 would be expected to close down the fisheries with a high probability. However, Chinook salmon PSC is highly variable across years, and the table also indicates that the fisheries would have closed in a number of years since 2003, based on their actual yearly Chinook salmon encounter.

The relative percentage of allowable PSC apportioned to each area turns out to be similar if historical PSC usage and groundfish harvest are evaluated over a 10-year period. On a 5-year basis period, however, the Central GOA benefits substantially when using PSC history for apportionment (an 11% difference).

**Table 4-76 Simulated closures for the GOA non-pollock fishery (2003 through 2011), under Option 1**

	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	6,236	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	797	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 Central GOA non-pollock fishery harvested around 51,000 mt of groundfish per year, from 2003 through 2011, and took around 5,000 Chinook salmon. Rockfish trips accounted for around 30% of harvest, arrowtooth flounder and rex sole combined to account for roughly 35% of total area harvest, while Pacific cod accounted for around 20% (60% of which occurred during the A season). PSC closures that occur before May could preclude the entire area rockfish fishery. The impact of a closure that occurs later in May could fall more heavily on the CP sector, as CPs do not typically begin targeting rockfish until July. In regard to fall closures, there is a large difference in the impact of a closure that occurs in mid-to-late September and one that precludes the entire Pacific cod B season. The B season has historically accounted for 40% of Central GOA Pacific cod harvest, and 8% of total area non-pollock harvest; it has generated on the order of \$6 million per year in wholesale gross revenue. Late season harvest occurs primarily on trips targeting arrowtooth flounder and shallow water flatfish; shallow water flatfish trips, primarily taken by CVs, are responsible for the greatest amount of Chinook salmon PSC of any fall fishery.

A mid-to-late April closure in the Central GOA could preclude around 35,000 mt to 37,000 mt of harvest, and prevent the loss through PSC of between 3,000 and 3,500 Chinook salmon, based on fishing outcomes in the characteristic year. A closure in early-to-mid May could cause the fishery to forgo roughly 30,000 mt to 32,000 mt of harvest, depending on how much of the CV rockfish fishery had occurred; a closure in this time range could prevent the loss through PSC of around 2,200 to 2,400 Chinook salmon. An early September closure could cause a harvest loss of around 12,000 mt, but a mid-September closure could have an impact closer to 7,000 mt; the large difference in potential harvest impacts is mainly attributable to the productive early weeks of the Pacific cod B season. The Pacific cod B season has averaged around 350 Chinook salmon per year, over the analyzed time period. A closure at the start of the fall cod season would prevent the loss of around 1,100 Chinook salmon to PSC, while a closure that is triggered part-way through the fishery would prevent loss of around 900 Chinook. The average annual wholesale revenue generated in the Central GOA non-pollock fishery is roughly \$58 million. In 2011, the average value generated per metric ton of harvest was roughly \$1,350, across all key targets. Based on the forgone harvest estimated above, the range of revenue impacts on the Central GOA non-pollock groundfish fishery is between \$10 million and \$50 million. The economic value that could accrue from the associated Chinook salmon savings (e.g., enhancing escapement, subsistence-use, commercial, recreational, and charter catches) cannot be quantified at this time. Nonetheless, they should be acknowledged as partially off-setting.

Almost 80% of the average annual Western GOA harvest consists of A season Pacific cod (primarily a CV fishery) and rockfish trips from June to August (primarily a CP fishery). The dates of the earliest simulated closures, above, fall after the early Pacific cod season is typically completed. In effect, the PSC taken by the CV fleet could trigger closures that would more heavily impact the Western GOA CP fleet. Estimated impacts based on the 2003 through 2011 characteristic year, below, may actually understate the effect of future closures, as the gross amount of Western GOA rockfish harvest has increased since 2007.

Average annual Western GOA non-pollock harvest was approximately 11,000 mt over the analyzed period, while average annual Chinook PSC was around 950 salmon. A closure occurring in late March or early April could result in forgoing roughly 7,500 mt of harvest, and would preclude the loss of 500 to 600 Chinook. A closure in mid-to-late April could result in a harvest loss of around 7,000 mt and avoid the PSC of around 425 Chinook. The harvest impact of a mid-May closure is around 6,500 mt and the PSC impact is around 180 avoided Chinook. A fall closure in mid-September could preclude only about 250 mt of harvest – mainly of rockfish, arrowtooth flounder and flathead sole – and could prevent the loss of around 25 Chinook salmon. Because the most likely Western GOA closures would primarily impact trips targeting rockfish and flatfish, general revenue impacts are estimated using an aggregate wholesale value per metric ton that is specific to Western GOA records and excludes Pacific cod trips (\$1,170/mt). Based on this, early spring closures have an estimated maximum revenue impact on groundfish producers of between \$8 million and \$9 million, while a late spring closure could have an impact on this sector of around \$7.5 million.

#### **4.7.1.4.2 Options 1 & 4 – PSC limit apportioned by regulatory area, with a carve-out for the Central GOA Rockfish Program**

This section addresses the potential impacts of the area-based Chinook salmon PSC limits as they would be implemented alongside a PSC carve-out for the Central GOA Rockfish Program. The impacts analyzed here relate to the non-Rockfish Program non-pollock fishery; impacts within the Rockfish Program are discussed in Section 4.7.1.3.3.

The relative apportionment percentages to the non-RP fisheries are listed in Table 4-68. Removing the historical PSC usage or groundfish harvest that occurred in the Central GOA RP fishery from the historical apportionment baseline could increase the Western GOA's share of the non-RP PSC cap by 2% to 4%, depending on the selected baseline metrics and time frame. Under a 10-year historical basis period, the choice between PSC history and groundfish harvest history does not affect the relative apportionment of the non-RP PSC cap between the two areas. Under a 5-year basis period, the Central GOA non-RP fishery would be allotted 11% more Chinook salmon PSC, if apportionment is based on historical PSC usage, as opposed to historical groundfish harvest. The converse is true for the Western GOA non-RP fishery. Ultimately, the Council selected a 5-year historical period of Chinook salmon PSC as the recommended apportionment basis.

Table 4-77 summarizes 96 different area-specific outcomes, covering a range of permutations on the sizes of the RP carve-out and the considered historical baselines for apportionment of the non-RP PSC limit. For the Central GOA, the non-RP PSC limits at the top end of the ranges arise from apportioning based on a 5-year PSC history. The top end of the Western GOA non-RP PSC limits are the result of apportioning based on a 5-year groundfish harvest history.

Table 4-64 reported the most up-to-date five year average non-RP PSC usage (2008 through 2012); the Central GOA non-RP fishery recorded an average PSC of 4,335 Chinook salmon per year, and the Western GOA non-RP fishery took an average PSC of 539 Chinook per year. If this best-available average were any indication of future PSC levels, a non-RP fishery closure would be unlikely for the total PSC cap levels greater than 7,500.

**Table 4-77 Simulated closures for the GOA non-Rockfish Program fishery (2007 through 2011), under Options 1 & 4**

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 analysts applied the seasonal harvest and PSC distribution from the non-RP fisheries' characteristic year – based on 2007 through 2011 records – to the earliest simulated closures that could have occurred if such limits had been in place. In a year that typifies the period since the Rockfish Program was implemented, non-RP trips in the Central GOA harvest around 44,000 mt of groundfish and incur a PSC of 4,550 Chinook salmon; trips in the Western GOA amount to around 11,500 mt, with a PSC of 500 Chinook salmon (note that these Western GOA characteristic year numbers differ from those used to analyze Option 1 without a RP carve-out, because the analysts are considering only 2007 through 2011, when Western GOA PSC tended to be lower than in earlier years).

With a total GOA PSC limit of 5,000 Chinook salmon, the Central GOA non-RP fishery would have experienced a closure in every analyzed year, under all but one permutation of the RP carve-out and apportionment scheme scenarios. These high probability closures could occur between early April and mid-May, if a PSC limit of 3,500 Chinook salmon is allotted to the RP, and between mid-April and early October if the RP Chinook salmon PSC carve-out is 1,500 or 2,500 Chinook. Forgone harvest in the Central GOA non-RP fishery could be on the order of 34,000 mt for an early-April closure, and 23,000 mt for a mid-May closure. Using the 2011 average wholesale value per metric ton, these closures could have a wholesale revenue impact of between \$31 million and \$64 million. Avoided Chinook PSC would be around 4,100 and 1,700 salmon for the same closures, respectively. The large difference between the estimated salmon savings for these closures lies mainly in the April Central GOA fishery for arrowtooth flounder and rex sole.

When a total GOA Chinook salmon PSC limit of 10,000 triggered a closure in the Central GOA non-RP fishery, it tended to occur in late September, or after. A late September closure could preclude the harvest of around 8,000 mt of groundfish, and prevent the loss of around 1,200 Chinook salmon through PSC.

Option 4 includes a suboption that would roll over unused RP PSC to support the non-RP fisheries that occur in the fall, and predominantly take place in the Central GOA. From 2007 through 2011, the Central GOA non-RP fishery harvested an average of 7,400 mt and recorded an average PSC of 1,160 Chinook salmon after October 1.<sup>62</sup> The estimated Chinook salmon PSC allowance rollover amount resulting from the Rockfish Program characteristic year (listed in Table 4-74) would likely be enough to support the late-year arrowtooth, rex sole, and shallow water flatfish fishery through October, if the size of the RP carve-out is large (2,500 or 3,500 Chinook salmon)<sup>63</sup>; however, these larger RP carve-out options are more likely to have closed the Central GOA non-RP fishery before September, meaning that the fall season for Pacific cod may be pushed back to October 1, and the demand for Chinook salmon PSC allowance in the

<sup>62</sup> By comparison, the fall fishery in the Western GOA is very small. From 2007 through 2011, the Western GOA averaged 270 mt of groundfish harvest and PSC of 25 Chinook salmon from October to December.

<sup>63</sup> The analysts interpret the Council's December 2012 motion to infer that any PSC allowance rolled over from the Rockfish Program after October 1 would have to be apportioned between the Central and Western GOA fisheries by the same percentages listed in Table 4-68, meaning that the Western GOA would still receive between 10% and 21% of the rollover amount, even though Chinook salmon PSC in the area is very low after September.

post-rollover time period would be higher upon re-opening than was the case during that period in the analyzed years. In broad terms, a smaller RP Chinook PSC allowance carve-out would decrease the probability of having the Central GOA fishery closed when the Pacific cod B season normally occurs, but a larger RP PSC allowance carve-out (with the rollover option) would likely ensure at least some fall re-opener. The Council considered whether there is any ancillary benefit to “over-funding” the Rockfish Program with Chinook PSC, if the likely result is a fall non-RP fishery that is delayed until October 1. The preceding scenario is, of course, dependent on the RP fishery reaching October with remaining Chinook PSC allowance amounts available, as opposed to fishing in a manner that fully exhausts its carve-out apportionment.

The Western GOA was observed to close as early as late February when the RP carve-out was set high (3,500 Chinook). A closure this early could preclude around 9,000 mt or 10,000 mt of groundfish harvest (a portion of the Pacific cod A season and the entirety of the Western GOA limited access rockfish fishery); recall that average annual Western GOA harvest totaled around 11,500 mt per year, which would have generated \$20.3 million, based on 2011 average wholesale value per metric ton. Late April closures would likely be triggered by trips targeting arrowtooth flounder, and would primarily impact trips targeting rockfish. A closure around this time period could prevent the loss of around 450 Chinook salmon to PSC. The earliest closures for the lower carve-out levels tended to occur in mid-to-late April, at which time the projected harvest loss would be around 7,500 mt or 8,000 mt. Such a closure would cost the fishery around \$16 million in gross wholesale revenues. Western GOA non-RP closures could still occur alongside smaller Chinook PSC carve-outs for the RP. These closures fell in early July, and were observed when apportionment of the total GOA PSC cap was based on a 5-year PSC history – the least favorable for the Western GOA. An early July closure impacts the limited access rockfish fishery, and would carry a harvest impact of between 4,500 mt and 7,500 mt, depending on how many weeks of this high-intensity, short-duration fishery were completed. Western GOA rockfish trips generated an average gross wholesale value of \$2,060/mt in 2011, which would compute to a gross wholesale revenue loss in the range of \$9 million to \$15 million.

#### **4.7.1.4.3 Option 2 – PSC limit apportioned between the CP and CV sectors**

Option 2 would apportion the total GOA Chinook salmon PSC limit between the catcher/processor and the catcher vessel harvest sectors. Chinook salmon PSC taken in either the Western or the Central GOA would accrue against the sector’s hard cap in the same manner. The apportionment percentages listed in Table 4-68 indicate that choosing to divide the total GOA limit according to historical PSC usage has a very different impact than apportioning based on historical groundfish harvest. By PSC usage, the CP and CV sectors would receive comparable amounts of the total Chinook salmon PSC limit, but the CV sector would receive around 65% of the hard cap, if the basis is historical target catch. Regardless of the metric used for apportionment, the CP sector would receive a larger share of the total Chinook PSC limit, if 10 years of history are considered, while the CV sector would receive a larger share under a time period restricted to five years.

This report has highlighted some of the fundamental differences between the sectors, including which target fisheries they prosecute, when and where they fish, as well as their rates of observer coverage and sampling protocols (Sections 5.1.1 and 5.1.2). Apportioning separate Chinook salmon PSC limits to the two trawl harvest sectors may reduce some perverse incentives to intensively fish for groundfish, with less regard to avoiding PSC. Such a race could arise if one sector feels exposed to large, fast-occurring spikes in credited PSC that may occur in a fleet that is engaged in a totally unrelated fishery. It is possible that either harvest sector could perceive the other as a Chinook PSC-closure risk, as GOA non-pollock CPs have historically recorded higher Chinook PSC rates, while GOA non-pollock CVs operate with a substantially lower rate of observer coverage (casting doubt on accuracy of reported Chinook PSC in this segment). Any shared cap creates a dynamic where rewards accrue to the individual, but penalties accrue

to the collective. The risk-averse reaction to the threat of being closed down by another sector would be to prioritize target harvest while the fishery is still open. Moreover, existing sector-based harvest cooperatives – such as the Amendment 80 co-op structure that covers most of the CP fleet, or the CP and CV co-ops in the Rockfish Program – may be an effective management level at which to promote individual vessel accountability.

One issue that a sector-based Chinook salmon PSC would not address is the competitive dynamic created by seasonal halibut PSC limits, which are shared between the CP and CV sectors. It would be difficult for a particular harvest sector to follow a Chinook PSC management plan that called on vessels to wait until the latter end of a halibut PSC season to target, for example, arrowtooth flounder and rex sole. If the other sector is using up the allowable seasonal halibut PSC mortality, the deep-water complex may already be nearing a closure by the time the Chinook PSC-avoiding sector opens participation.

The most recent five years of data available (2008 through 2012) indicate that the PSC of the CP fleet numbers 2,888 Chinook salmon per year, on average, and the CV fleet averages Chinook PSC totaling 3,221 fish (Table 4-64). As with the other options, Chinook PSC limits at the level of the period average would only cause a fishery closure under the smaller of the of the considered total GOA PSC allowances (7,500 and 5,000 Chinook salmon). The analysis assesses impacts under volatile annual PSC scenarios by applying the simulated closures from 2003 through 2011 to the harvest and PSC patterns of a characteristic year. Over this set of years, the CP sector averaged roughly 22,000 mt of groundfish harvest and Chinook salmon PSC totaling 3,164 fish; the CV sector averaged roughly 40,000 mt of harvest and PSC totaling 2,845 Chinook salmon.

**Table 4-78 Simulated closures for the GOA non-pollock fishery (2003 through 2011), under Option 2**

	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	3,623	2	Mid May	3,838	2	Mid May	2,544	6	Late April	2,683	5	Late April
	5,000	2,416	6	Late April	2,559	6	Late April	1,696	8	Late March	1,789	8	Late March
CV	12,500	6,460	-	-	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	3,662	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 lowest total GOA PSC limit was projected to close the CP sector between late March and late April, with a fairly high probability. CP closures in this time range would be driven by Chinook salmon PSC in the arrowtooth flounder and rex sole fishery, and would result in between 18,000 mt and 21,000 mt of foregone harvest (out of 22,000 mt total). Avoided Chinook PSC would likely save between 1,500 and 2,500 Chinook salmon. Higher total GOA PSC limits would have closed the CP sector with less frequency (though earlier and more often when apportioned based on historical groundfish harvest). The general maximum potential impact would be a closure in early or mid-May, which would preclude the entire CP rockfish fishery that accounts for over 50% of average annual CP harvest. The estimated maximum forgone harvest from a May closure is around 17,000 mt or 18,000 mt, assuming no improvement in Chinook salmon avoidance. This harvest would have generated around \$28 million in wholesale revenue based on 2011 values for CP-caught rockfish and flatfish (\$1,592/mt). A closure in early or mid-May would have prevented between 900 and 1,100 Chinook salmon PSC.

In the most recent years analyzed, the PSC rates of CPs operating in the Western GOA were lower than those of CPs in the Central GOA. For CP vessels with trawl endorsements in both areas, a limit that jointly apports PSC across both areas could induce a race to harvest Central GOA groundfish ahead of

a more probable closure. Another potential response could be the redirection of flatfish harvest into the Western GOA, thus, preserving the later months of key Central GOA rockfish harvest. The real likelihood of an early season flatfish race in the Western GOA is likely constrained by harvester's ability to realign their delivery relationships with processors.

The CV sector would have experienced fewer years with Chinook PSC closures if a cap like Option 2 had been in place during the analyzed period. Closures were rarely observed when comparing past CV PSC records to the sector's apportioned cap under a 10,000 or 12,500 GOA Chinook PSC limit. However, due to the size and intensity of the early-year Pacific cod fishery, the earliest observed CV closures would have shut down the sector sooner and with a greater impact. A late February closure would have precluded around 34,000 mt of harvest (out of 40,000 mt), causing a revenue loss of around \$44 million, all else equal.

Other maximum potential impacts, based on the closure dates contained in Table 4-78, could cause the CV sector to forgo between 24,000 mt (late April) and 15,000 mt (mid-July) of groundfish harvest, assuming no improvement in Chinook salmon avoidance. The bulk of the groundfish value that is harvested during this interval comes from rockfish and, to a lesser extent, shallow water flatfish trips in the Central GOA. The roughly 15,000 mt of groundfish that occurs after the rockfish season tapers off consists mainly of Pacific cod, arrowtooth flounder, and shallow water flatfish; in 2011, this forgone harvest would have generated around \$16 million in wholesale value, all else equal, and adopting a \$1,200/mt assumed value.

#### 4.7.1.4.4 Options 2 & 3 – PSC limit apportioned between the CP and CV sectors, with a seasonal limit prior to June 1

Selecting Option 2 and Option 3 together would put a seasonal limit on the Chinook salmon PSC hard cap apportioned to each harvest sector. As described in Section 4.7.1.3.2 (Option 3), a sector that reaches its seasonal PSC sub-limit before June would be closed from fishing non-pollock groundfish until June 1. If there is a remainder in the pre-June Chinook PSC limit, the residual amount would roll into whatever portion of the sector's annual limit is reserved for the latter half of the year.

The CP sector is relatively less active in the early months of the year. CPs focus on arrowtooth flounder and rex sole during April, which tends to be a high Chinook PSC rate fishery. The CV sector, by contrast, is busy prosecuting the Pacific cod A season, April flatfish, and the beginning of the CV rockfish season in May. The Pacific cod A season generated just under 8,000 mt of groundfish per year, accounting for roughly 20% of the sector's annual average groundfish harvest.

From 2003 through 2011, the CP sector averaged 5,050 mt of groundfish harvest and 2,425 Chinook salmon PSC, prior to June. During the same months, the CV sector averaged 21,000 mt of harvest and 1,600 Chinook salmon PSC. Table 4-65 presents average annual January-to-May PSC, by sector, for a more recent sample of years; from 2008 through 2012, the CP sector averaged 2,057 Chinook and the CV sector averaged 1,702. During the most recent five years, April through May accounted for over 70% of the CP sector's average annual Chinook salmon PSC.

**Table 4-79 Seasonal PSC sub-limits and simulated closure results for the GOA non-pollock fishery (2003 through 2011), under Options 2 & 3**

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	4,361 - 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	1,689 - 1,119	3 - 4	Early April	1,652 - 1,221	3	Mid April	2,181 - 1,612	2 - 3	Mid April



Based on the average pre-June Chinook PSC recorded from 2008 through 2012, the CP sector would appear to be susceptible to spring closures under even the higher of the total annual GOA Chinook salmon hard caps, all else equal; whereas the CV sector could expect a closure under only the lowest cap. Section 4.7.1.3.2 outlined the variability in early-year Chinook PSC, and the lack of correlation between high annual Chinook PSC and high Chinook PSC prior to June. In regard to assessing Options 2 and 3 together, the analysts note that pre-June Chinook PSC was more variable from year to year in the CP sector, displaying a greater variance around the period mean.

Maximum potential impacts on the CP sector were derived from applying early-to-late April closures to the sector's weekly harvest and Chinook salmon PSC records in the characteristic year. A closure from early April to June 1 could have precluded the harvest of roughly 3,700 mt of groundfish (primarily arrowtooth flounder and rex sole), and prevented the loss of around 1,700 Chinook salmon to PSC. A closure from late April to June 1 could have precluded the harvest of roughly 1,800 mt of groundfish (primarily arrowtooth and rex sole), and prevented the loss of around 800 Chinook salmon. In 2011, flatfish taken by the CP sector prior to June generated an average wholesale revenue value of \$1,132 per metric ton. By this measure, the maximum potential revenue impacts would be on the order of \$1.9 million to \$4.1 million. As previously noted, estimates of the total value of the Chinook salmon not lost to PSC in these fisheries, in this period, cannot be provided at this time. Nonetheless, avoiding loss of these highly valued Chinook salmon is important to acknowledge when weighing these tradeoffs.

In scenarios where the CV sector experienced a spring closure, the highest PSC years triggered closures around mid-to-late April. A closure from mid-April to June 1 could have precluded the harvest of roughly 7,000 mt of groundfish (primarily flatfish and rockfish), and prevented the loss of around 900 Chinook salmon to PSC. A closure from late April to June 1 could have precluded the harvest of roughly 4,500 mt of groundfish, and prevented the loss of around 600 Chinook salmon. In 2011, flatfish and rockfish taken by the CV sector generated an average wholesale gross revenue value of \$1,146 per metric ton. By this measure, the maximum potential gross revenue impacts would be on the order of \$5 million to \$8 million. The value of the Chinook PSC savings cannot currently be estimated.

#### **4.7.1.4.5 Options 2 & 4 – PSC limit apportioned by harvest sector, with a carve-out for the Central GOA Rockfish Program**

This section addresses the potential impacts of the harvest sector-based Chinook salmon PSC limits as they would be implemented alongside a PSC carve-out for the Central GOA Rockfish Program. The impacts analyzed here relate to the non-Rockfish Program non-pollock fishery; impacts within the Rockfish Program are discussed in Section 4.7.1.3.3.

The relative apportionment percentages to the non-RP fisheries are listed in Table 4-68. Removing the historical PSC usage or groundfish harvest that occurred in the Central GOA RP fishery from the historical apportionment baseline would increase the CP sector's share of the non-RP PSC cap by up to 3%, depending on the baseline metrics and time frame. As with Option 2 in the absence of a RP carve-out, apportioning the total GOA hard cap according to historical PSC patterns results in a somewhat even division of allowable Chinook salmon PSC, while apportioning on the basis of historical groundfish catch would lead to a tighter limit on the CP sector.

Table 4-64 reported the most up-to-date five year average non-RP PSC (2008 through 2012); the non-RP CP sector recorded an average of 2,568 Chinook salmon PSC per year, and the CV sector averaged 2,307. By this measure, the non-RP CV sector would not expect to be closed down due to Chinook salmon PSC encounter if the total GOA hard cap is set at 7,500 or above, but Table 4-80 indicates that PSC years large enough to close down the fishery under higher caps did occur during the analyzed years since 2007. Recent average annual PSC in the non-RP CP sector, on the other hand, could have triggered closures

under total GOA PSC limits of up to 10,000 Chinook salmon. Simulated closures of the non-RP CP sector could have occurred under any size RP carve-out (1,500 to 3,500 Chinook), though impactful closures under the smallest of the three carve-out options only occurred when apportioning Chinook PSC based on historical groundfish harvest.

Table 4-80 summarizes 96 different area-specific outcomes, covering a range of permutations on the considered sizes of the RP carve-out and the considered historical baselines for apportionment of the non-RP Chinook PSC limit. Apportionments to the CP sector tend to be the highest when a 10-year PSC history is considered, and the lowest under a 5-year history of groundfish harvest. The opposite is true for CVs.

**Table 4-80 Simulated closures for the GOA non-Rockfish Program fishery (2007 through 2011), under Options 2 & 4**

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	2281 - 709	2 - 5	Mid April

In the characteristic year that typifies the 2007 through 2011 time period, the non-RP CP sector averaged around 19,500 mt of groundfish harvest and 2,580 Chinook salmon PSC per year. The non-RP CV sector averaged around 36,000 mt of groundfish harvest and 2,490 Chinook PSC per year. The analysts applied the seasonal harvest and PSC distribution from the non-RP fisheries' characteristic year – based on 2007 through 2011 records – to the earliest simulated closures that would have occurred if such limits had been in place.

When Options 2 & 4 are selected, and the total GOA PSC limit is set at 5,000 Chinook salmon, the earliest non-RP CP sector closure was observed between mid-March and early April of every analyzed year. Such a closure would result in the loss of around 18,000 mt of harvest, and avoided Chinook salmon totaling 1,800 to 2,300 fish. Most of the forgone harvest would be in flatfish, but the non-RP CP sector still averages around 9,000 mt of groundfish taken on July trips designated as targeting rockfish. Under the same scenarios, but in low PSC years, closures occurred between mid-May and September. A mid-May closure would preclude around 14,500 mt of harvest, and a September closure would preclude around 2,500 mt.

With a total GOA Chinook PSC cap of 7,500 salmon, the non-RP CP sector was projected to close in anywhere between one and five of the five analyzed years. The apportionment scenarios that suggest a high probability of closing the sector tend to be those where the RP carve-out is the largest, though a carve-out of only 1,500 Chinook for the RP could still close the non-RP CP sector as early as mid-April, causing a direct harvest impact of 17,500 mt. In a year that is characteristic of the 2007 through 2011 period, the non-RP CP sector recorded around 1,400 Chinook salmon PSC after mid-April.

Maximum potential harvest impacts on the non-RP CV sector fall in mid-to-late April, under the small considered total GOA Chinook PSC cap levels. A closure at that point in the season could preclude between 18,000 mt and 22,000 mt of groundfish harvest, and could completely preclude the B season for Pacific cod. A 10,000 total Chinook PSC limit could, in high PSC years, close the sector in October – even with the smallest RP carve-out selected. An October closure could cause a harvest loss of around

4,000 mt, and could catch the tail end of the Pacific cod B season, as well as the fall arrowtooth and shallow water flatfish fisheries. The non-RP CV sector's October-to-December Chinook salmon PSC record has been around 950 fish per year, on average.

Option 4 includes a suboption that would roll over unused RP PSC to support the non-RP fisheries that occur in the fall, and predominantly take place in the Central GOA. From 2007 through 2011, the non-RP CP sector harvested an average of 2,150 mt of groundfish and recorded an average of 220 Chinook salmon PSC after October 1. The non-RP CV sector harvested an average of 5,500 mt groundfish and, as mentioned above, recorded around 950 Chinook salmon PSC in the post-September months. Table 4-81 lists the estimated amount of remaining Chinook salmon PSC allowance that would be rolled back into the fall non-RP fisheries, based on a characteristic year that typifies Rockfish Program fishing activity based on week-by-week records. Any rollover allowance would have to be re-apportioned between the CP and CV sectors. The ranges presented in Table 4-81 represent the variance in each sector's potential rollover allowance, covering the different options for apportionment basis metrics that the Council considered. As before, the CP sector receives the largest apportionment based on a 10-year history of Chinook PSC, while the CV sector receives the largest Chinook PSC apportionment based on a 5-year history of groundfish harvest. The apportionment scheme that benefits either sector the most is also the one that generates the worst outcome for the other sector. For its final preferred alternative, the Council selected to apportion Chinook PSC based on a 5-year PSC history.

In the 2007 through 2011 characteristic year for the non-RP fisheries, the non-RP CV sector is targeting arrowtooth flounder and shallow water flatfish through the end of the calendar year, and is finishing the Pacific cod B season around the end of October. The non-RP CP sector targets primarily arrowtooth flounder and rex sole, with some flathead sole, in the post-September months.

**Table 4-81 Estimated PSC allowance available to be rolled back into the non-Rockfish Program fisheries after October 1, under Option 2 & Option 4, Suboption 2**

<b>Total PSC Limit</b>	<b>All but...</b>	<b>Total Rollover</b>	<b>CP</b>	<b>CV</b>
1,500	200	-	-	-
	300	-	-	-
	400	-	-	-
2,500	200	951	331 - 504	447 - 620
	300	851	296 - 451	400 - 555
	400	751	261 - 398	353 - 489
3,500	200	1,951	679 - 1,034	917 - 1,272
	300	1,851	644 - 981	870 - 1,206
	400	1,751	610 - 928	823 - 1,141

#### **4.7.1.4.6 Options 2, 3, & 4 – PSC limit apportioned by harvest sector, with a seasonal limit prior to June 1 and a carve-out for the Central GOA Rockfish Program**

Selecting Options 2, 3, and 4 would combine the apportioned seasonal limit and the Rockfish Program carve-out described in the previous sections. As before, a sector that reaches its seasonal Chinook PSC sub-limit before June would be precluded from fishing non-pollock groundfish until June 1. If there is a remainder in the pre-June Chinook PSC limit, the residual amount would roll into whatever portion of the sector's annual limit is reserved for the latter half of the year.

From 2007 through 2011, the non-RP CP sector averaged 5,150 mt of groundfish harvest prior to June 1 (primarily flatfish) and recorded roughly 2,025 Chinook salmon PSC; the average spring PSC total was

slightly lower than the updated 2008 through 2012 average of 2,057 Chinook salmon PSC listed in Table 4-65. During the same period, the non-RP CV sector harvested an average of 21,300 mt of groundfish (40% of which was Pacific cod, with the balance primarily in flatfish) and recorded roughly a 1,250 Chinook PSC. The Pacific cod A season accounted for only about 13% of the non-RP CV sector's pre-June Chinook PSC. This CV PSC figure is slightly higher than the updated 2008 through 2012 average of 1,148 Chinook salmon, also listed in Table 4-65.

Table 4-82 summarizes 192 different seasonal apportionments that could be applied to the non-RP CP and CV sectors, depending on the size of the total GOA PSC limit, the size of the RP carve-out, the amount of the sector's annual apportioned hard cap that is available prior to June 1 (50% or 66%), and the selected apportionment basis metrics.

**Table 4-82 Seasonal PSC sub-limits and simulated closure results for the non-Rockfish Program fishery (2007 through 2011), under Options 2, 3, & 4**

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	2,636 - 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 - 2,298	1 - 2	Mid April	3,132 - 2,068	1 - 3	Early April
	CV	50/50	3,585 - 2,600	-	-	3,259 - 2,364	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	2,610 - 1,724	1 - 3	Early April	2,262 - 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	-	-	3,226 - 2,340	0 - 1	Late April	2,796 - 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 - 696	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 - 946	2	Mid April
		66/34	2,581 - 1,872	0 - 2	Late April	2,151 - 1,560	1 - 2	Mid April	1,721 - 1,248	2	Mid April
5,000	CP	50/50	923 - 609	4 - 5	Mid March	659 - 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	1,506 - 1,092	2	Mid April	1,075 - 780	2 - 3	Mid April	645 - 468	4	Early April

Based on the average pre-June PSC recorded by the non-RP sectors from 2008 through 2012, the CP sector would appear to be at risk of spring closures under even the highest total annual GOA Chinook salmon PSC hard caps, regardless of the size of the RP carve-out (1,500 to 3,500 Chinook), all else equal. By contrast, the CV sector's average spring Chinook PSC falls below the apportioned seasonal cap for all but a total annual GOA PSC limit of 5,000 Chinook salmon. In short, a sector-based seasonal limit, combined with a RP carve-out, poses a more likely constraint to the CP sector, which typically records the majority of its annual Chinook PSC in the spring flatfish fisheries. As noted in Section 4.7.1.4.4 (Options 2 & 3), spring Chinook PSC is also more variable from year to year in the CP sector.

The maximum potential impacts on the non-RP CP sector could be generated by closures ranging from early March to mid-April, depending on the size of the RP carve-out and the total GOA annual Chinook PSC limit, all else equal. The cells in Table 4-82 indicating that the sector would have been closed in five years means that the likelihood of *some* impact is fairly high, based on retrospective analysis. In these cases, the latest simulated closure observed from 2007 through 2011 fell around mid-April to mid-May, again depending on the size of the total annual GOA Chinook PSC cap and the size of the RP carve-out. A seasonal closure beginning in early March could generate a harvest loss of around 4,700 mt, and avoid PSC losses of about 1,930 Chinook salmon. A closure from mid-April to June 1 would preclude around 2,300 mt of harvest and avoid loss of 850 Chinook to PSC. With a 2011 average wholesale value per metric ton of \$1,150 (based on pre-June records of flatfish and some Pacific cod trips), these closures could cause a maximum wholesale revenue loss on the order of \$2.6 million to \$5.4 million, all else equal. The economic value deriving from the projected Chinook PSC savings cannot currently be estimated, due to data limitations. They nonetheless should be consciously taken account of in balancing the tradeoff between groundfish catch and Chinook salmon PSC limits.

The maximum potential impacts on the non-RP CV sector would be generated from closures ranging from late February to late April. While the CV sector displayed a lower likelihood of being constrained by an apportioned seasonal Chinook PSC cap, smaller hard caps could trigger more impactful closures when the Pacific cod A season encounters an above-average amount of Chinook salmon PSC. A seasonal closure beginning in late February would generate a harvest loss of around 12,700 mt of groundfish and avoid loss of about 1,100 Chinook salmon to PSC. A closure from late April to June 1 would preclude around 5,300 mt of harvest and avoid the loss of 800 Chinook to PSC. The lower PSC-per-forgone-ton is reflecting the higher PSC rates in the spring CP flatfish fishery. With a 2011 average wholesale value per metric ton of \$1,110, these closures could have caused a maximum wholesale revenue loss of between \$5.9 million and \$14 million, all else equal. The economic value of the avoided Chinook salmon PSC loss cannot be quantified at this time, but represents at least a partial offset to these foregone groundfish catches when assessing the net effect of the action.

In regard to the option to roll over remaining Chinook PSC allowance from the Rockfish Program to the non-RP fisheries on October 1, the non-RP CV sector would have a higher demand for fall Chinook salmon allowances than the CP sector. From 2007 through 2011, the non-RP CV sector averaged a PSC of 965 Chinook salmon after September; the non-RP CP sector Chinook PSC was only 220 fish. On average, the CV sector is the more active sector in the late-year months, recording around 5,500 mt of Pacific cod and flatfish per year, while the CP sector recorded around 2,150 mt per year (mainly arrowtooth flounder and flathead sole). In the previous section, Table 4-81 lists the range of estimated apportioned rollover amounts, as determined by the metrics chosen to determine sector apportionment. Little or no rollover is expected under a 1,500 Chinook salmon PSC RP carve-out. The rollover from a 2,500 or 3,500 Chinook PSC carve-out would likely fund the fall CP fisheries. If no non-RP PSC allowance is left over as of October 1, the fall CV sector would likely struggle to fish through the end of the calendar year, relying only on Chinook PSC rolled over from a 2,500 salmon PSC RP carve-out. Relying on rollover from a 3,500 Chinook PSC RP carve-out would leave the fall CV sector with a Chinook PSC allowance that is just above or below its average fall Chinook PSC, depending on the apportionment basis metrics.

#### **4.7.1.4.7 Options 1 & 2 – Chinook PSC limit apportioned between the CP and CV sectors within each area**

Table 4-83 summarizes the apportioned Chinook PSC limits and simulated closure results for a GOA Chinook salmon PSC hard cap that is subdivided to apply to each harvest sector's activity in each regulatory area. For discussion on how apportioning a hard cap by area or by sector might affect behavior, refer back to Sections 4.7.1.4.1 (Option 1) and 4.7.1.4.3 (Option 2).

Because the Central GOA CP sector was the most PSC-intensive sector during the analyzed years, it is the only one of the four sectors considered under this scenario that would not benefit from apportioning Chinook PSC based on past groundfish harvest. The Chinook PSC allowable limit in the Central GOA CP sector would drop by either 16% or 22%, when apportioning on the basis of harvest, depending on the length of the basis time period. Both Western GOA harvest sectors would benefit from the use of the longer 10-year basis period, as their relative share of harvest and Chinook PSC has declined since 2007.

At the broadest level, the Western GOA CV sector is the only sector that would be affected by fewer simulated closures (based on yearly Chinook PSC from 2003 through 2011) if its PSC limit was separated from both the CP sector and from the CV sector in the Central GOA. Even so, PSC apportionment to the Western GOA CV sector could be so low (less than 100 Chinook salmon per year, employing a 5-year PSC historical apportionment basis) that it could still be exposed to very early closures. An early February closure could result in the loss of around 1,600 mt of the sector's 3,000 mt average annual

harvest. At an average wholesale value of \$1,539/mt, the maximum potential impact on the sector could be around \$2.5 million.

Table 4-83 shows that the other three sectors experienced earlier closures, closures in more of the analyzed years, or closures under higher total GOA hard cap levels than they did under a limit that was apportioned only by harvest sector or by area (compare to Table 4-76 and Table 4-78). Under this range of Chinook PSC caps, all else equal, the Western GOA CP fishery displays a significant likelihood of being closed prior to its limited access rockfish fishery, which begins in July and accounts for 70% of the sector's annual harvest (5,500 mt); this fishery could be worth over \$11 million in wholesale revenue, based on average wholesale value per metric ton for Western GOA CP rockfish trips in 2011 (\$2,060).

The Central GOA CV averaged roughly 37,000 mt of groundfish harvest in the characteristic year. The sector appears to have a low probability of closing under an apportioned 10,000 or 12,500 total GOA Chinook PSC limit, though late September closures did occur in the highest PSC years. A late September closure could impact around 4,500 mt of groundfish harvest, including part of the important Pacific cod B season, shallow water flatfish, arrowtooth flounder, and the tail end of the rockfish fishery – a gross revenue loss of around \$9 million, based on an average wholesale value per metric ton of \$2,034 for these species during this time period in 2011. Other apportionment scenarios resulted in sector closures ranging from mid-February to mid-July. A mid-February closure would preclude around 31,000 mt of harvest, including the entire rockfish fishery; a mid-July closure would preclude around 14,000 mt of groundfish harvest.

The Central GOA CP fishery is smaller, by comparison, averaging roughly 14,000 mt of groundfish harvest during the analyzed period. The sector targets primarily arrowtooth flounder and rex sole in April, and again in the fall; it heavily focuses on the rockfish fishery in July. This sector would likely experience the largest marginal increase in the probability of being closed down under Options 1 & 2, compared to either option applied separately. Apportioning a Chinook PSC limit based on historical groundfish harvest would significantly increase the probability of a Central GOA CP closure, as simulated closures to the sector occurred in more than half of the nine retrospectively analyzed years for any total GOA Chinook PSC limit set at 10,000 salmon or below. An early April closure could cause the sector to forgo around 13,000 mt of harvest. A closure around mid-May would preclude around 11,000 mt of harvest. All but one of the maximum impact scenarios (the earliest simulated closure under each apportionment level) resulted in a sector closure that occurred prior to the Central GOA CP rockfish fishery, which generates around \$13 million in wholesale revenue, based on a 2011 target-specific average value per metric ton of \$2,150.

**Table 4-83 Simulated closures to the GOA non-pollock fishery (2003 through 2011), under Options 1 & 2**

	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	-	-	4,792	-	-	2,674	3	Early May	2,851	2	Early May
	10,000	4,103	1	Early Oct	3,834	1	Mid May	2,139	6	Mid April	2,281	5	Mid April
	7,500	3,077	2	Mid May	2,875	2	Mid May	1,605	6	Mid April	1,711	6	Early April
	5,000	2,052	6	Late April	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	-	-	4,399	2	Late Sept	6,175	-	-	5,909	-	-
	7,500	3,824	2	Mid July	3,299	3	Early July	4,631	1	Late Oct	4,431	2	Mid Sept
	5,000	2,549	4	Mid March	2,199	7	Mid Feb	3,088	3	Mid May	2,954	3	Late March
WG CP	12,500	910	4	Early April	1,604	3	Early May	1,566	2	Late April	1,620	2	Late April
	10,000	728	4	Late March	1,284	3	Early April	1,253	4	Late March	1,296	3	Late March
	7,500	546	4	Late March	963	4	Early April	939	4	Late March	972	4	Late March
	5,000	364	5	Late March	642	4	Late March	626	4	Late March	648	4	Mid March
WG CV	12,500	86	4	Early Feb	606	-	-	541	-	-	643	-	-
	10,000	69	4	Early Feb	485	-	-	433	-	-	514	-	-
	7,500	52	5	Early Feb	363	-	-	325	-	-	386	-	-
	5,000	35	5	Early Feb	242	-	-	216	-	-	257	-	-

Based on the most recent five years of available data (2008 through 2012), the four sectors specified in Options 1 and 2 have recorded the following average annual Chinook salmon PSC: the Central GOA CP sector averaged 2,391 Chinook salmon, the Central GOA CV sector averaged 3,179 Chinook salmon, the Western GOA CP sector averaged 497 Chinook salmon, and the Western GOA CV sector averaged 43 Chinook salmon. The economic value to users of Chinook salmon lost to PSC in these fisheries cannot currently be estimate, due to data limitations. If future Chinook PSC allowances conform to these levels, direct salmon savings could be interpreted as the difference between the average annual amounts (listed) and the apportioned PSC hard caps noted in the table.

#### **4.7.1.4.8 Options 1, 2 & 4 – Chinook PSC limit apportioned between the harvest sectors within each area, with a carve-out for the Central GOA Rockfish Program**

This section addresses the potential impacts of Chinook salmon PSC limits that are apportioned to each operational type sector in each affected regulatory area, as they would be implemented alongside a Chinook PSC carve-out for the Central GOA Rockfish Program. The impacts analyzed here relate to the non-Rockfish Program non-pollock trawl fishery; impacts within the Rockfish Program are discussed in Section 4.7.1.3.3.

The relative apportionment percentages to the non-RP fisheries are listed in Table 4-68. Removing the historical Chinook PSC amount or groundfish harvest that occurred in the Central GOA RP fishery from the historical apportionment baseline would decrease the Central GOA CV sector's portion of the total Chinook PSC cap by between 1% and 3%, depending on the basis for apportionment. Apportionment to the Central GOA CP sector would remain more or less the same under Option 4, with 1% increases or reductions depending on the baseline metric. Western GOA Chinook PSC and groundfish harvest history would not be "carved-out" of the apportionment history if RP records are removed, so both sectors in that regulatory area stand to receive a greater percentage of the total apportioned Chinook PSC cap with the inclusion of Option 4.

The non-RP Central GOA CP sector is the only one of the four sectors that receives its largest possible apportionment, if Chinook PSC history is used as the basis for apportionment. If Chinook PSC is used, a 5-year history results in the largest apportionment percentage, but if groundfish harvest history is used then a 10-year history brings a better result. The non-RP Western GOA CP sector fairs best under a 5-year groundfish history, but would achieve its second-best result under a 10-year Chinook PSC history,

and its smallest possible apportionment under a 5-year PSC history. The non-RP Central GOA CV sector always receives a higher Chinook PSC limit apportionment percentage under a groundfish harvest basis and under a 5-year history. The non-RP Western GOA CV sector would fair best under a 10-year basis history, and when groundfish harvest history is the metric for apportionment.

Table 4-64 reported the most up-to-date five year average non-RP PSC (2008 through 2012). The non-RP Central GOA CP sector recorded an average of 2,071 Chinook salmon per year, and the non-RP Central GOA CV sector averaged 2,264 Chinook; the non-RP Western GOA CP sector recorded an average of 497 Chinook PSC per year, and the non-RP Western GOA CV sector's PSC averaged 43 Chinook. Comparing these best-available average PSC figures to the ranges of apportioned PSC limits in Table 4-84 suggests that the non-RP Central GOA CP sector is susceptible to Chinook PSC closures at any total GOA cap level, while the other three sectors are susceptible to closures at either of the two lower total GOA Chinook PSC cap levels. Nevertheless, simulations, reported in Table 4-84, indicate that all sectors would have experienced at least one closure under any Chinook PSC cap level, owing to annual variability. Furthermore, some of the apportioned Chinook PSC limits that could be applied to the Western GOA sectors are quite small, and may prove to be too small to be managed inseason by the Agency, as defined in Section 5.2.1.1.

Table 4-84 summarizes 192 different sector-specific outcomes, covering a range of permutations on the considered sizes of the RP carve-out and the considered historical baselines for apportionment of the total GOA non-RP Chinook PSC limit.

**Table 4-84 Simulated closures for the GOA non-Rockfish Program fishery (2007 through 2011), under Options 1, 2 & 4**

Total GOA PSC Limit	CG CP			CG CV			WG CP			WG CV		
	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 - 3,765	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	535 - 138	1 - 4	Late Feb	200 - 13	0 - 2	Late Jan

In the characteristic year that typifies the 2007 through 2011 time period, the non-RP Central GOA CP sector averaged around 11,000 mt of groundfish harvest and 2,100 Chinook salmon PSC per year. The non-RP Central GOA CV sector averaged around 33,000 mt of groundfish and 2,450 Chinook PSC per year. The non-RP Western GOA CP sector averaged around 8,500 mt of groundfish and 470 Chinook PSC per year. The non-RP Western GOA CV sector averaged around 3,000 mt of groundfish and 45 Chinook PSC per year. The analysts applied the seasonal harvest and Chinook PSC distribution from the non-RP fisheries' characteristic year – based on 2007 through 2011 records – to the earliest simulated closures that would have occurred if such limits had been in place.

When Options 1, 2, & 4 are selected and the total GOA PSC limit is set at 5,000 Chinook salmon, the non-RP Central GOA CP sector experienced a simulated closure under almost all apportionment basis scenarios. The earliest would have fallen in early March, generating a harvest loss on the order of 10,500 mt in groundfish, or basically all harvest less some early year rex sole, all else equal. The gross wholesale revenue loss, based on 2011 records for rockfish and flatfish processed in that non-RP sector (\$1,250/mt) would have been around \$13 million. A closure that early would have prevented the loss of around 2,000 Chinook salmon, the economic value of which cannot currently be quantified. Under the 5,000 Chinook PSC total GOA limit, even the latest closures fell around mid-May. Such a closure could prevent around 7,000 mt of harvest, and would avoid PSC losses of around 460 Chinook. The large difference in avoided Chinook salmon indicates that the vast majority of the sector's Chinook PSC is incurred in the spring rex sole and arrowtooth flounder fishery. The higher considered total GOA PSC limits would generate



maximum impact closures in early April, preventing around 10,200 mt of harvest and reducing loss of 1,900 Chinook salmon to PSC.

The earliest simulated closures observed in the non-RP Central GOA CV sector tended to occur later in the year, giving a rough indication that this sector would be the least constrained. That said, there is still a potential for closures to occur as early as April, and the lowest considered total GOA Chinook PSC limit would have closed the sector in four or five of the five analyzed years under most apportionment scenarios. The latest observed closure for the scenarios that closed the fishery in all analyzed years occurred in mid-October; this can be taken as an estimate of the “minimum likely impact” on groundfish catch amounts. Closures in early or mid-April would impact limited access trips targeting rockfish, shallow water flatfish, fall arrowtooth trips, and the Pacific cod B season. Forgone harvest would be on the order of 18,000 mt to 22,000 mt, and avoided Chinook PSC losses would be in the 1,750 to 2,250 fish range. Based on an aggregate 2011 average wholesale value per metric ton for non-RP catch of all species groups (rockfish, Pacific cod and flatfish), forgone harvest could cost around \$1,071/mt. The estimated maximum revenue impact would be around \$19 million to \$23.5 million. The higher total GOA PSC limits carry a maximum potential impact from fishery closure in October. October closures would generate a loss of around 1,500 mt to 5,500 mt. The value of the forgone harvest largely depends on whether or not the Pacific cod B season is complete at the time of closure. For this subset of the fishery, a 2011 estimated wholesale value per mt for flatfish-only would be around \$848/mt. October closures were projected to avoid between 350 and 950 Chinook salmon PSC. The economic value of these Chinook cannot be quantified, at present, due to data limitations.

The non-RP Western GOA CP sector still derives the majority of its groundfish catch from trips designated in Catch Accounting data as targeting rockfish – over 6,000 mt per year. A late February closure, observed when the sectors apportioned limit was minimal and Pacific cod or arrowtooth trips encountered Chinook, would preclude around 8,300 mt of groundfish harvest and PSC of around 460 Chinook. A late April closure could preclude around 7,750 mt of harvest and avoid the loss of 330 Chinook to PSC. In either case, the key impact is the loss of the summer rockfish harvest. In 2011, the sector’s post-April harvest of rockfish and some fall flatfish generated around \$2,025/mt, resulting in an estimated maximum revenue impact for these closures of around either \$17 million (late February closure) or \$15.5 million (late April closure).

Potential impacts to the non-RP Western GOA CV sector depend almost entirely on the early-year PSC recorded in the Pacific cod A season, which typically concludes by early March. A late January closure would preclude around 2,800 mt of harvest, and avoid the loss of around 40 Chinook salmon. A late February closure would preclude around 1,600 mt of harvest and avoid loss of around 20 Chinook. The estimated wholesale revenue impact of these closures could be between \$2.4 million and \$4.3 million, based on the sector’s 2011 per unit average wholesale revenue of \$1,530/mt.

Option 4 includes a suboption that would roll over remaining RP Chinook PSC allowance amounts to support the non-RP fisheries that occur in the fall. The fall fisheries primarily occur in the Central GOA (from 2007 through 2011, the non-RP Western GOA CP sector averaged around 270 mt of groundfish catch, and a PSC of 25 Chinook salmon from October through the end of the year). By contrast, after September the non-RP Central GOA CV sector has averaged around 5,500 mt of groundfish harvest (primarily arrowtooth, shallow water flatfish, and the end of the Pacific cod B season) and a PSC of 950 Chinook salmon; the non-RP Central GOA CP sector has averaged around 1,900 mt of groundfish (arrowtooth, rex sole and flathead sole) and 200 Chinook PSC.

The amount of RP Chinook PSC to be rolled over is contingent upon the size of the RP carve-out, and the amount of PSC in the Program prior to October 1. Table 4-81 (in Section 4.7.1.4.5, Options 2 & 4) provides estimated ranges of how much PSC the Gulf-wide CP and CV sectors might expect to receive as

an October 1 rollover in a typical fishing year, depending on the size of the carve-out and the basis for sector apportionment. The rolled-over, apportioned PSC limits would have to be further subdivided by area (in addition to by sector) under Options 1, 2, & 4. The apportionment percentages for this subdivision are summarized in Table 4-68. Having noted the small amounts of post-September Chinook PSC (or virtual absence, in the case of the non-RP Western GOA CV sector), the Council considered whether the method of apportioning the rollover in the same percentages used to apportion the annual Chinook PSC limit “over-funds” the Western GOA non-RP sectors. Depending on the apportionment basis metric, the CVs in those sectors could receive as much as 6% of the rollover, and the CPs could receive as much as 15%.

The non-RP Central GOA CV sectors average post-September Chinook PSC (950) would only be covered by its projected apportioned rollover allowance under a 3,500 Chinook RP carve-out, and only if the selected apportionment scheme is one of the ones that are more favorable to that sector (groundfish harvest basis). That said, even a smaller amount of rollover to that portion of the CV fleet could help complete the valuable Pacific cod B season harvest in a high-PSC year. The non-RP Central GOA CP sector tends to record fewer late-year Chinook PSC encounters, and could likely support – or come close to – its fall flatfish season with the projected rollover from a 2,500 or 3,500 Chinook PSC allowance RP carve-out, regardless of the selected apportionment basis.

#### **4.7.2 Impacts on Chinook Salmon Users**

As a “prohibited species,” retention of a Chinook salmon for commercial use 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 4.7.3 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. Under the proposed action, reaching a Chinook 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 was able to 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) attributable to a reduction in Chinook PSC 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 potentially forgone 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, including ESA-listed species, 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 Chinook PSC when 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 losses 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<sup>64</sup> pose a high cost to the nation. ESA-listed evolutionary significant unit (ESU) Chinook salmon runs have been harmed by decades of 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 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 accounting 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, all else equal. 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. Aside from 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 obvious economic rationale for incurring additional costs to decrease PSC or PSC rates. Moreover, if inseason PSC levels are well below the annual allowance, a harvester operating near the end of the 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. On the other hand, compared to a fishery with no PSC cap, simply setting a limit could lead to *some* strategic behavior if the cap is thought to be even potentially constraining in an exceptional year. In the most general sense, any

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<sup>64</sup> 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.

shared constraint creates a situation where costs are borne by individuals, while benefits are dispersed to the collective. If a PSC cap appears to be constraining, or that it could become constraining in the future, 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 participants 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. Participants who rely upon late-year harvest (principally in flatfish, though B-season Pacific cod is an important source of revenue for the Central GOA CV sector<sup>65</sup>) are more likely to lose revenue to Chinook 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 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. While this analysis does not include vessel-level data to analyze the point, it may be the case that the participants who are most likely to fish late into the year are from the local fleet. Late-year flatfish fisheries are generally less valuable, and vessels returning to distant homeports may be closer to indifference when it comes to preserving a marginal week of harvest at the end of the fishing year. The analysis notes that the late-year fisheries are more heavily prosecuted by the CV sector. The Council has included several options to Alternative 2 that address the issue of late-year fisheries closing at the expense of spring and summer fisheries that may incur high rates of Chinook PSC while bearing little individual cost; refer to the sections on Options 3 and Option 4 (Suboption 2) for additional detail (4.7.1.3.2 and 4.7.1.3.3).

Participants may reallocate fishing effort across space, in addition to time. If a Chinook PSC limit is not apportioned by regulatory area, harvesters with multiple area endorsements may choose to redirect fishing effort; they 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 affect fishing opportunities or profitability for those who have historically prosecuted the fisheries that experience an influx of effort, although the fact that area/gear/operating mode endorsements are required to do this clearly limits this risk.

A Chinook 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. To the extent that harvesters redirect effort to other areas, area-based PSC limits could relatively advantage entities with endorsements in both of the regulated GOA areas. Derby-style fishing, in general, increases uncertainty in the fishery and may impair business planning; it may also affect the Agency's willingness to keep

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<sup>65</sup> 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).

fisheries open when TAC or PSC limits are nearing their cap, as deviations from historical relationships and voluntary harvest plans become more likely to break down.<sup>66</sup>

Many participants, however, are limited in their 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 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 queuing dockside to make deliveries, 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. Moreover, 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. Shifting harvest to times of lower expected Chinook encounter, such as July (Table 4-51), may generate the best outcome in terms of salmon avoidance, but could impose opportunity costs on harvesters. For example, delaying rockfish harvest until July might mean that AFA participants have to transit to the Bering Sea for the June pollock season and then return to the GOA; or, vessels that operate as tenders in July would have to forgo that revenue stream in order to prosecute a fishery that might otherwise have already been completed.

The interaction of the proposed Chinook PSC limit with the existing halibut PSC limit could also be an important limitation on fishermen's motivation and ability to avoid Chinook salmon. Halibut PSC has been a major concern for groundfish fishermen, and halibut PSC limits were recently reduced. If halibut PSC closures are perceived as more imminent, vessels may focus primarily on avoiding halibut, and fish in a manner that increases the likelihood of high Chinook PSC events. More broadly, the manner in which halibut PSC is managed is not a perfect match with current and considered management measures for Chinook PSC in the GOA fisheries. Halibut PSC mortality limits are divided between the deep-water and shallow-water groundfish complexes, but shared by both the CP and CV sectors; also, halibut mortality is limited on a seasonal basis as opposed to an annual limit (Table 4-31). One can imagine a scenario where a Chinook PSC limit is apportioned separately to the CP and CV sectors (as in Option 2), and one sector wishes to delay fishing in order to avoid a time of high-probability Chinook encounter. However, if the other sector is fishing and using up the seasonal limit of halibut PSC, the target fishery may soon be closed and the decision to avoid Chinook PSC by waiting would not pay off in opportunities to catch groundfish.

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. All CP vessels are in the full observer coverage category under the restructured Observer Program (see Section 5.1.1), so PSC accountability should 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 with BSAI harvest co-ops (Amendment 80). In general, cooperative associations provide a foundation for the development of additional agreements to limit use of Chinook PSC. Conversely, if the GOA Chinook PSC limit is shared between the two sectors, the sector with the higher level of observer coverage may be wary of potential spikes in credited Chinook PSC that can result from the extrapolation of a few observed hauls to many unobserved vessels operating at the same time. Such uncertainty could undermine the optimal use of the cooperative management tools available within a particular sector.

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<sup>66</sup> Refer to 4.4.5 for a discussion of early experience with managing a hard cap under changing area-participation in the 2012 GOA pollock C and D season.

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 ahead of an imminent closure. Harvesters may react to the possibility of PSC closures by taking individual inseason measures to control their PSC rate, in lieu of – or in addition to – timing and area shifts. Such measure could include additional investment in gear or technology that aids in Chinook avoidance. Again, the incentive for such action would be moderated by the fact that a PSC hard cap typically distributes the benefit of individual Chinook avoidance across the entire fleet, potentially at the cost of the individual who takes action.

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 inseason 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, leaving less time available to work elsewhere.

Given the current context of speculation on future quota-based PSC and bycatch management measures in the GOA, a Chinook salmon PSC limit may only have the effect of intensifying whatever race for target catch history may be occurring. To the extent that harvest cooperative members and limited access participants 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 participants who are not a party to such agreements and choose not to abide by the stand-down. A hard cap measure that exacerbates competition would likely reduce the instances of voluntary PSC and bycatch coordination. Given the stage of the current discussion on quota-based management measures in the GOA, the analysts think it unlikely that a large number of latent (inactive) LLPs that have not already entered the fishery will do so in the near-future. The likelihood that a Chinook PSC hard cap will act as a binding constraint can be assessed effectively in relation to the current level of fishery participation.

Central GOA Rockfish Program cooperatives are an example of a stakeholder group whose PSC management efforts could be undermined, or whose members could be placed at a competitive disadvantage. This action considers a direct allocation of Chinook salmon PSC to the Rockfish Program fishery (Option 4). 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. In the absence of a Rockfish Program PSC allowance, 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 and market arrangements, so a seasonal shift caused by Chinook salmon PSC limitation is likely to make these rockfish CPs less well-off. The action could result in additional Chinook PSC, if the historical trend of higher Chinook PSC rates in May continues in the future.

As described in Section 5, Rockfish Program catcher/processors will have additional monitoring requirements under Alternative 2, 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 PSC, of any species, must be retained until it is counted by an observer;

- Vessel crew must transport all salmon PSC 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 PSC 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.

CP vessels may incur costs related to providing additional space in the observer sample station for a salmon storage location. These costs depend on the current layout of the observer sample station and the extent to which modifications to the area will be required to comply with the new requirements. Therefore, these costs are difficult to estimate.

The requirement to allow 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, as well as the availability of an observer (i.e., on a 100% observed vessel, a single observer is aboard; that individual is not always on-duty). Ensuring no salmon PSC passes the last point where sorting occurs in the factory would likely impose processing costs associated with lower throughputs of retained catch and potential decreases in product quality if fish remain unprocessed for longer periods of time. 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. However, the variability in the flow of fish through a given factory and the changes to sorting conditions make it difficult to predict costs to industry. Further, the magnitude of these costs would likely be vessel-specific as needed to facilitate a salmon census of observed deliveries. The potential to incur these costs may also act as another incentive to minimize Chinook PSC.

The video requirements would be modeled similarly to those designed for the Chinook salmon monitoring requirements under Amendment 91 for AFA catcher/processors. A vessel must provide and maintain cameras, a monitor, and a digital video recording system for all areas where sorting, storage, and discard of salmon prior to being counted by an observer could occur. The video data must be maintained and made available to NMFS upon request for no less than a 120 day period. The video systems would also be subject to approval by NMFS at the time of the observer sample station inspection.

Costs for the video include cameras, waterproof monitors, a digital video recorder (DVR), associated software, storage of the data, installation of the equipment, and maintenance of the system. Because vessel configurations are variable, the costs for a vessel to implement video to ensure an observer can monitor all locations where sorting, storage, and discard of salmon prior to being counted could occur could be quite variable, depending on the nature of the system chosen. In most cases, the system would be expected to consist of one DVR/computer system, a monitor and between two and five cameras.

Waterproof or water-resistant monitors may range in price between \$2,000 and \$12,000 dollars, depending on the size of the monitor and the degree of protection against intrusion of foreign objects, such as water. DVR systems range in price from \$1,500 to \$10,000, and cameras cost between \$75 and \$450 each. Storage costs will vary depending on the frame rate, color density, amount of compression,



and image size. The system would be expected to record data at a rate of between 5 and 20 GB (gigabits)/day. Assuming that vessels choose to purchase redundant video storage capacity, and that USB compatible hard drives cost approximately \$1.00 per GB, NMFS estimates that storage will cost between \$400 and \$3,000. Installation costs will be a function of where the DVR/computer can be located in relation to an available power source, cameras, and the observer sampling station. The installation costs for a fairly simple installation are estimated at approximately \$4,000, while a complex installation is estimated to cost approximately \$22,000. However, these costs can be considerably lower, if the vessel owner chooses to install the equipment while upgrading other wiring. Thus, total installed system costs would be expected to range between \$6,050 and \$46,650 per vessel.

Maintenance costs are difficult to estimate because it can vary between vessels. However, we estimate a hard disk failure rate of 20 percent per year, and a DVR/computer lifespan of three years, or between \$680 and \$4,100 per year. We estimate one camera replacement at between \$75 and \$450 every three years depending on how much vibration and shocks the camera might endure. During the first years of implementation, the video systems aboard the Amendment 80 vessels have been reported to cost between \$10,000 and \$40,000 depending on the systems. However, the systems in place for the Amendment 80 vessels occur in harsher environments, such as inside the fish bins, and must sometimes cover large areas that may need up to 8 cameras to allow viewing of all areas. The systems required for catcher/processors participating in the Rockfish fishery may not operate in as harsh environments or may require fewer cameras to achieve the needed coverage.

Operators of CPs participating in the Rockfish fishery would be required to submit to NMFS using an electronic logbook so that the data is readily available to NMFS in an electronic format. The electronic logbooks are already a requirement under the Rockfish Program, so there would be no additional costs associated with entering the Chinook salmon data in the elogbook.

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.

A requirement described in Section 5, Alternative 3 would require the addition of an observer work station for CPs currently described in regulations at 679.28(d). Almost all CP vessels operating in the GOA already have requirements for an observer workstation as part of the Rockfish and Amendment 80 programs. However, this alternative could impose additional costs related to providing additional space for an observer sample station and a salmon storage location for any vessels that do not already have these areas designated. These costs depend on the current layout of the vessels and the extent to which modifications to the area will be required to comply with the new requirements. Therefore, these costs are difficult to estimate.

#### **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 vessels 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 Chinook 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 Chinook PSC limits, NMFS may be compelled to use short openings or re-open groundfish fisheries after a closure to allow vessels to harvest groundfish while Chinook PSC limits remain, 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 significantly influenced, if not 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 historical 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 a PSC cap is apportioned separately to Western and Central GOA harvesters (for example, 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, as well as impacts on the processing communities themselves.

Any alteration of delivery patterns throughout the fishing year can impact processor revenues, even if total deliveries are not reduced. An approaching Chinook PSC cap may create incentive for fishermen 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 Sections 4.4.2.3 and 4.4.4 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 those directly related to fishing.

Finally, in reference to Table 5-2 in the management section on Alternative 2, the analysts note that shoreside processors may incur additional costs under Alternative 2, Option 4. Section 5 notes that 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.

Last, NMFS notes that managing a hard cap may include additional requirements to be met in the Catch Monitoring and Control Plan (CMCP). Under current regulations, each inshore processor that receives Rockfish Program catch is required to develop and operate under a NMFS-approved CMCP. Each processor must annually submit a CMCP to NMFS. The monitoring standards for CMCP are described in regulation at 50 CFR 679.28(g). Plant layouts and operations vary widely among processors; therefore, the CMCP regulations were developed as a series of performance-based standards that each processor must meet. Each CMCP describes how a particular processor will meet each standard. NMFS would need to implement additional measures to existing CMCP performance standards in order to ensure that fisheries observers have the means to count all Chinook salmon in each delivery.

The procedures established under the Rockfish Program for the CMCPs were designed to monitor the weighing of rockfish species at the onshore processing plants. Proper weighing of large volumes of a target species require different conditions than does the proper sorting, identification, and counting of a more infrequently occurring species, such as salmon. Salmon can be difficult to see, identify, and count amidst the large volume of target groundfish catch. The factory areas of processing plants can be large and complex. Preventing observers from seeing Chinook salmon that enter the factory area of the processing plant would not be difficult. In addition, observers must examine each salmon to verify the species identification.

Proposed changes to inshore monitoring requirements would likely impose processing costs associated with lower throughputs of fish in the plant to properly sort out all of the salmon PSC. In addition, product quality could decline if fish remain unprocessed for longer periods of time. Costs would increase in concert with an increase in the time required to convey fish through a processing facility, increased vessel offload times, and the need to reconfigure conveyor belt and sorting layouts. However, the variability in the flow of fish through a given plant and the changes to sorting conditions make it difficult to predict

costs to industry. Further, the magnitude of these costs would likely be plant-specific as needed to facilitate a salmon census of observed deliveries.

#### 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 7 percent 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 4-85 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 4-86 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 for those vessel operators 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); these communities are briefly described in Section 4.4.4. The magnitude of any effects will depend on the timing of any fishery closures and the foregone harvests caused by 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 non-GOA-groundfish 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 trawl 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 fisheries late in the year, in particular, could create a range of challenges with respect to continuity of operations and utilization of 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, except for the most constraining limits, on Chinook PSC 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 4-87 Shore-based processors annual average first wholesale gross revenues from deliveries of GOA groundfish by gear type and by Alaska community of operation, 2003 through 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	\$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 reduced to both the State of Alaska and the communities. The State could 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 forgone because the PSC limit constrains harvests. In addition, the State of Alaska could 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 attributable to 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 could 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 through 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 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 1.25% on harvested natural resources, including fish. 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. It is also true that Chinook salmon are of commercial importance to most of this region. Chinook are processed in shoreside plants, and increases in deliveries of Chinook (a very high valued fish) would generate additional fish tax revenues. Chinook salmon are also prized as a sport fish, generating local economic activity and, thus, tax revenues to the region's communities (e.g., through both guided and unguided recreational tourism, Charter fishing business taxes, sporting goods suppliers, hotels, restaurants, transportation, sport fish

processing, etc.). The State of Alaska collects fees and taxes from all segments of the sport fishing sector, as well.

#### **4.8 Analysis of Impacts: Alternative 3, Full Retention of Chinook Salmon PSC**

Alternative 3 would require full retention of salmon PSC, 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. The Council selected Alternative 3 as part of its final Preferred Alternative.

Analysis of Alternative 3 is qualitative, and directly relates to the management and enforcement analysis in Section 5. As of 2013, under the restructured observer program, most CP vessels are in the full coverage category, and will always carry 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, those from foreign sources (e.g., Asia), those from PNW sources, especially 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.

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 to under report salmon PSC may exist, depending on how constraining the limit is perceived to be. Consequently, NMFS would not have in place the requisite capability to conduct 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, the agency notes that a different sampling methodology could perhaps be considered for these fisheries, but such an approach has yet to be investigated. In terms of direct costs to harvesters, Alternative 3 would require an observer sampling station onboard CP vessels; this would only be an additional cost to one vessel, as most have already added this facility as part of participation in the Amendment 80 fishery.

#### **4.9 Council's Final Preferred Alternative**

The Council finalized its preferred alternative (PA) for Chinook salmon PSC limits in the GOA non-pollock groundfish trawl fishery at the December 2013 meeting. At that time, the Council selected a preferred alternative for the trailing action on reincorporating a Chinook PSC rollover from the Rockfish Program CV sector to other fall non-pollock CV fisheries. This preferred alternative for the trailing rollover action was then added to the existing PA for Chinook salmon PSC, which had been selected in June 2013. The specific elements of the final PA are listed in Section 4.3; they are described below, along with the Council's rationale for its decision.

The Council's final PA includes six elements:

- (1) A long-term average PSC limit of 7,500 Chinook salmon PSC per year for the combined Western and Central GOA non-pollock trawl fisheries;
- (2) Apportionment of the annual PSC limit between three sectors:
  - Catcher/Processors (CP),
  - Rockfish Program Catcher Vessels (RP CV) – i.e. CVs operating under the authority of a rockfish cooperative fishing quota permit,
  - Non-Rockfish Program Catcher Vessels (non-RP CV) – i.e. all other the non-pollock trawl CV activity within the action area;
- (3) A seasonal Chinook PSC limit for the CP sector;
- (4) An incentive buffer (the “uncertainty pool mechanism”) for the CP and the non-RP CV sectors that provides a sector with additional PSC if that sector met a certain Chinook avoidance threshold in the preceding year;
- (5) Two in-season rollovers of unused Chinook salmon PSC from the RP CV sector to the non-RP CV sector, occurring on October 1 and at the end of the Rockfish Program season on November 15;
- (6) Full retention of all salmon.

#### GOA non-pollock trawl Chinook salmon PSC limit

The Council gave careful consideration to the selection of the total Chinook PSC cap level for non-pollock trawl fisheries, ultimately arriving at 7,500 fish. The considered range included cap levels from 5,000 to 12,500 Chinook salmon per year. The low end of the range falls below the GOA non-pollock trawl fishery's historical average Chinook PSC, which is around 6,000 fish per year (see Section 4.4.9). The upper end of the range was selected in view of 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), which 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. The Council apportioned 25,000 Chinook PSC to the pollock trawl fishery under Amendment 93 to the GOA Groundfish FMP (June 2011), as around 75% of GOA Chinook PSC is taken on pollock trips. In February 2012, the Council set the upper non-pollock Chinook PSC limit to be analyzed at 12,500, which encompassed the highest year of historical non-pollock Chinook PSC (10,877 fish in 2003). The Council also cited the need to maintain flexibility, noting the imprecision of data on actual PSC levels that result from relatively low levels of observer coverage in the regulated fisheries, especially when considering options that would apportion the PSC limit among multiple user groups with different historical PSC levels.

The Council reviewed the potential impacts of setting the Chinook PSC limit at different levels, and apportioning those limits among different areas or sectors of the non-pollock trawl fishery (Section 4.7.1). The options under Alternative 2 were examined according to the number of fishery closures and the timing of those closures as they would have occurred during the 2003 through 2011 historical period. The emerging trade-offs to consider centered around the amount of Chinook salmon that would not have been taken if the fishery had closed, and the amount or value of the groundfish that would not have been landed. Lower PSC limits and PSC limits that are sub-apportioned to a greater number of harvester groups generally result in more closures, and closures that occur earlier in the fishing season. This analysis notes that a retrospective impact analysis may overestimate the impact of a hard cap, as harvester behavior can be expected to change when the possibility of a PSC closure is imminent. Broader impacts of using hard cap measures to minimize Chinook PSC are discussed qualitatively in reference to other



Chinook salmon users (Section 4.7.2), trawl harvesters (Section 4.7.3), shore-based processors (Section 4.7.4), and GOA coastal communities (Section 4.7.5).

The selected limit of 7,500 Chinook salmon PSC reflects the Council's intent to balance two objectives: minimizing Chinook PSC to the extent practicable, and preserving the potential for the full harvest of non-pollock trawl groundfish fishery TACs. The Council explicitly recognized that the Chinook salmon resource is currently fully utilized, and it is valuable to many stakeholder groups. These stakeholder groups are diverse, including but not limited to subsistence, commercial, recreational, and cultural users. The Council recognized that Chinook salmon conservation is necessary, and that selecting a high hard cap level could place the majority of the conservation burden on non-trawl user groups. At the same time, the Council also recognized that the GOA non-pollock trawl fisheries provide important cultural and economic benefits to GOA coastal ports and processing communities, as well as fish tax revenues for the State of Alaska. As such, selecting a hard cap level that is expected to dramatically curtail the groundfish season could have a foreseeable direct adverse impact on an array of stakeholders, including harvesters, plant workers, and fishery supporting businesses. Given the limitations in current knowledge about the linkage between trawl interception of Chinook salmon in the GOA and Chinook returns to Alaska and other U.S. rivers<sup>67</sup>, the Council selected the hard cap level that it deemed to strike the most equitable balance of required conservation action. Ultimately, the Council determined that setting a PSC limit at or above 10,000 Chinook per year would only have generated PSC reductions in one of the 9 analyzed years, while setting the limit at 5,000 Chinook per year could impose a significant burden on each of the three GOA non-pollock trawl sectors and the processing sector, and that the likely closures under the lowest considered cap level would be difficult to mitigate under the present management regime.

#### Apportionment of the 7,500 Chinook salmon PSC limit

The Council selected the option to apportion Chinook salmon PSC between the CV and CP sectors, in accordance with historical PSC levels over the analyzed 5-year period (2007 through 2011). The choice of sector-level apportionment was largely based on two factors: first, the sectors have significantly different fishing plans in terms of timing and key target species; second, the sectors currently experience very different levels of observer coverage. Among other items, the Council noted that CPs rely more heavily on targeting flatfish, which has tended to be more Chinook-intensive than, for example, Pacific cod. Also, the Council recognized that combining CPs and CVs under the same hard cap would mean that the CP fleet is affected by PSC estimates that are extrapolated to unobserved CVs; to the extent that the CP fleet feels that it has less control over whether or not the hard cap will be reached, CPs may have a reduced incentive to actively mitigate Chinook PSC in their own operations.

The resulting split apportions 52% of the total GOA non-pollock PSC limit to the CV sector, and 48% to the CP sector. **The final recommended annual PSC limits are 3,900 and 3,600 Chinook salmon per year, for the CV and CP sectors respectively.** The Council considered, but did not select, the option to make sector apportionments on the basis of 10-year average PSC performance, which would have apportioned 49% of the total annual PSC limit to the CV sector and 51% to the CP sector. The Council determined that the 5-year average captures the time period that is most reflective of the current management regime in the affected fisheries. Specifically, the period beginning in 2007 captures the fisheries as they have operated under the Central GOA Rockfish (Pilot) Program and Amendment 80, which were implemented in 2007 and 2008, respectively. Moreover, the Council recognized that nearly all CP vessels are members of harvest cooperatives in either the Rockfish Program, Amendment 80, or both. As such, the CP sector has additional tools for reducing Chinook PSC rates through cooperative action and information sharing.

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<sup>67</sup> Refer to discussion in Section 3.3.8 of the EA.

The Council also took apportionment measures to preserve fishing opportunities in the Rockfish Program fishery, which has become a relatively high-value fishery since implementation. Both the CP and the CV sectors of the RP fishery are managed through harvester cooperatives, and, thus, have additional tools available to aid in mitigating Chinook salmon PSC encounters. The final PA reflects the Council's concern that unpredictable high PSC events during the spring, prior to the May opening of the RP fishery, could preclude or severely curtail the Program's season, thereby eliminating an opportunity to prosecute a valuable fishery in which the prospects for effective PSC avoidance are promising.

The Council recommended a seasonal PSC limit as a measure to ensure that sufficient Chinook PSC is available to open the CP sector of the Central GOA Rockfish Program fishery and to prosecute rockfish in the Western GOA limited access fishery. CPs historically begin fishing RP quota at the beginning of June. Under the preferred alternative, directed fishing for CPs operating in the GOA non-pollock trawl fishery would be closed until June 1<sup>st</sup>, if the sector, in aggregate, takes 66% of its annual PSC apportionment of 3,600 Chinook prior to that date. This computes to a pre-June PSC limit of 2,376 Chinook salmon, leaving an allowance of *at least* 1,224 Chinook PSC available to prosecute groundfish in the summer and fall<sup>68</sup>. The limit does not operate as a seasonal apportionment, so any amount of PSC in the pre-June limit that is not taken would still be available to support CP activity throughout the rest of the year. The same percentage would be applied to the CP sector's annual Chinook PSC limit if it is carrying forward an "uncertainty buffer" that was earned in the previous year. If the CP sector recorded fewer than 3,120 Chinook PSC in the preceding year, then it would have access to an additional 480 Chinook PSC, resulting in an annual PSC limit of 4,080. In that case, the CP sector would be limited to 2,693 Chinook PSC prior to June 1<sup>st</sup> – or 66% of 4,080. (The "uncertainty pool" mechanism is described in greater detail in Section 2.2.4, and below). Any Chinook PSC triggered pre-June closure of the CP sector would likely occur in mid-April or May, when the primary target fishery is flatfish – specifically arrowtooth flounder and rex sole. Since 2007, the CP sector would have only experience a seasonal closure in one year (2010), and that would have been triggered in mid-April. Assuming no change in harvester behavior, the mid-April to June closure would have precluded the harvest of around 2,700 mt of groundfish, which was roughly 51% of the pre-June harvest in that year, and 12% of the year's total CP harvest. The closure would have avoided the loss of 1,143 Chinook salmon. While a temporary closure would have a negative revenue impact for non-pollock groundfish harvesters, the cost of precluding the CP sector's participation in the RP fishery would be much greater. In recent years, all but one active GOA CP have participated in the Rockfish Program.

The Council chose to make a separate Chinook PSC apportionment for the Rockfish Program CV sector, to the same end of ensuring the ability to open the RP fishery. This apportionment of 1,200 Chinook PSC would be "carved out" of the total CV sector apportionment of 3,900 Chinook PSC, leaving 2,700 Chinook to support non-Rockfish Program activity throughout the year. The RP CV apportionment is not further sub-apportioned to individual cooperatives within that sector, so the cooperatives are collectively responsible for fishing within the 1,200 Chinook limit. The RP CV limit would have constrained the sector only once during the analyzed period; that would have occurred in 2008 when, as discussed in Section 4.4.10, the Program was new and the cooperatives' management priorities emphasized halibut avoidance.

Median Chinook PSC in the RP CV sector was just below 800 fish per year. The Council chose to apportion a larger amount to the sector (1,200), while also including a rollover provision whereby Chinook PSC allowances that are not utilized during RP CV activity are available to support other CV activity after a certain date. Selecting these limits and options should provide the greatest assurance that Rockfish Program quota can be fully harvested, while also maintaining a high likelihood that Chinook

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<sup>68</sup> Note that CP participation in fall groundfish fisheries is typically low, and that spring flatfish and summer rockfish trips make up the bulk of the sector's participation in the GOA non-pollock trawl fishery.

PSC allowance will be available to prosecute the fall Pacific cod and flatfish fisheries. On average, 87% of the CVs that are active in the RP also participate in fall non-pollock trawl fisheries, so ample incentive to avoid Chinook salmon PSC during the Program fishery should exist. Further information is provided below, in the subsection titled *Rockfish Program Chinook PSC rollover for the CV sector*.

#### Uncertainty Pool incentive mechanism

The Council’s preferred alternative includes a provision to incentivize taking fewer Chinook PSC than the amount set by the limit, while also providing sectors that perform well with a moderate amount of flexibility around their PSC apportionment in the case of a subsequent year with high PSC totals. The Council’s final recommendation includes the following incentive structure, termed the “uncertainty pool,” which would apply only to the CP sector and the non-Rockfish Program CV sector.

In providing rationale for the PA, the Council acknowledged that hard cap measures could potentially result in a sector being indifferent to the amount of PSC encountered, so long as it does not trigger a fishery closure. To promote further Chinook avoidance, a sector that records less than its proportional share of a 6,500 Chinook salmon total PSC hard cap in one year would be allowed to access up to its proportional share of 1,000 *additional* Chinook PSC allowance in the following year. This provision could be thought of as an insurance policy that must be earned in every year. The “insurance” aspect of this mechanism reflects the Council’s awareness that Chinook PSC levels are unpredictable from year to year, and that lightning-strike PSC events may occur, despite a sector’s good faith efforts to avoid salmon. A sector that utilizes its apportioned share of the uncertainty pool, earned in the previous year, would, in the following year, return to fishing under a simple hard cap equal to its apportioned share of the 7,500 Chinook PSC limit. The Council chose not to include the RP CV sector in this mechanism, noting that its apportionment of 1,200 Chinook PSC is likely adequate to absorb intermittent high-PSC events. The Council further noted that including the RP CV sector would require a reduction in the amount of Chinook PSC that is eligible to be “rolled over” to the non-RP CV sector on October 1 (described below); both analysis and stakeholder input indicated that the sector would derive a greater benefit from a larger rollover than from access to an uncertainty buffer.

Table 4-88 provides the apportionment of the overall GOA non-pollock trawl Chinook PSC limit to each of the three sectors defined in the PA. The uncertainty pool threshold figures are a sector’s proportional share of a supposed 6,500 Chinook hard cap. If an eligible sector fishes below this threshold in one year, it would then have access to additional Chinook PSC allowance for the following year, in the amount labeled as the uncertainty pool buffer. A sector’s performance in relation to the uncertainty pool threshold does not affect, nor is it affected by, the performance of other sectors.

**Table 4-88 Chinook salmon PSC limit apportionment, uncertainty pool performance thresholds, and buffer sizes in the Preferred Alternative**

		Rockfish Program Catcher Vessels	Non-Rockfish Program Catcher Vessels	Catcher/Processors
<i>Apportionment Share</i>		<i>16%</i>	<i>36%</i>	<i>48%</i>
Base PSC Limit	<b>7,500</b>	1,200	2,700	3,600
Uncertainty Pool Threshold	<b>6,500</b>	N/A	2,340	3,120
Uncertainty Pool Buffer	<b>1,000</b>	N/A	360	480

Table 4-89 illustrates how a sector's annual PSC limit might vary from one year to the next, given the performance incentives and the limitations designed into the mechanism. Note that if a sector performs within its uncertainty pool threshold in a year (Year 1), and continues to do so in subsequent years (Year 2), the sector's effective maximum allowable amount of Chinook PSC will never exceed its base PSC limit, plus its uncertainty pool buffer. A sector that earns an uncertainty buffer for Year 2 is held to the same performance standard (threshold) that it faced in Year 1 in order to maintain the benefit of the uncertainty buffer in the following year (Year 3). These limits guarantee that the incentive to avoid Chinook salmon does not decrease over time, even if performance has been good. Moreover, there is no scenario in which a sector's Chinook PSC exceeds its apportioned amount of the base Chinook PSC limit when averaged over a set of consecutive years.<sup>69</sup> This is ensured by the fact that, in order to earn the uncertainty pool buffer in Year 2, the sector would have had to come in under its base PSC limit by *at least* the buffer amount in Year 1.

Based on the analyzed historical years during which the Rockfish (Pilot) Program was in place – 2007 through 2012 – the CP and non-RP CV sectors would have fished within the uncertainty pool threshold more often than not. The CP sector fished below its uncertainty pool threshold (3,120 Chinook salmon) in all years except for 2010. In 2010, the CP sector recorded a 4,631 Chinook salmon PSC. While it would have been provided access to an additional 480 Chinook PSC allowance due to its successful PSC avoidance in the preceding year, the sector would still have exceeded its effective hard cap level of 4,080. In that year, the CP sector would have been closed in mid-September. However, without the additional 480 Chinook salmon PSC allowance it was afforded by the uncertainty buffer, it would have closed in early July. During that interval, the CP sector harvested over 14,000 mt of non-pollock groundfish, with a gross first wholesale value of around \$19 million. The non-RP CV sector fished below its uncertainty pool threshold (2,340 Chinook) in all years, except for 2010 and 2011. In 2010, the additional 360 Chinook PSC buffer would not have extended the sector's activity through the end of the year, but it would have allowed for an additional week of harvesting. The additional fishing opportunity would have fallen in early October, when the wholesale revenues generated by the Pacific cod fishery are up to \$1 million per week. In addition to the uncertainty pool buffer, the non-RP CV sector would also have had access to a Chinook PSC allowance rollover from the RP CV sector. In 2010, the RP CV sector would have rolled over an allowance of 85 additional Chinook PSC on October 1 (Table 4-90), extending Pacific cod and flatfish harvest by an additional one to two weeks. In 2011, the uncertainty buffer alone would have extended the non-RP CV fishery through the end of the year, while the RP CV sector would have rolled over an allowance totaling an additional 682 Chinook PSC on October 1 (Table 4-90).

**Table 4-89 Path of Chinook salmon PSC limits from year to year, under the uncertainty pool mechanism in the Preferred Alternative**

	If Year 1 PSC...	Then in Year 2...	If Year 2 PSC...	Then in Year 3...
<b>Non-Rockfish Program Catcher Vessels</b>	Path A: $2,340 \leq \text{Yr.1} \leq 2,700$	Limit = 2,700	$2,340 \leq \text{Yr.2} \leq 2,700$	Limit = 2,700
			or $\text{Yr.2} < 2,340$	Limit = 2,700 + 360
	Path B: $\text{Yr.1} < 2,340$	Limit = 2,700 + 360	$2,340 \leq \text{Yr.2} \leq 3,060$	Limit = 2,700
			or $\text{Yr.2} < 2,340$	Limit = 2,700 + 360
<b>Catcher/Processors</b>	Path A: $3,120 \leq \text{Yr.1} \leq 3,600$	Limit = 3,600	$3,120 \leq \text{Yr.2} \leq 3,600$	Limit = 3,600
			or $\text{Yr.2} < 3,120$	Limit = 3,600 + 480
	Path B: $\text{Yr.1} < 3,120$	Limit = 3,600 + 480	$3,120 \leq \text{Yr.2} \leq 4,080$	Limit = 3,600
			or $\text{Yr.2} < 3,120$	Limit = 3,600 + 480

<sup>69</sup> If, for example, the CP sector recorded 3,119 Chinook PSC in Year 1, 4,080 in Year 2, and 3,600 in every year after that, then the average annual PSC for Years 2 through 'X' would be greater than 3,600, but the average including Year 1 would be less than 3,600.

### Rockfish Program Chinook PSC rollover for the CV sector

Having recommended a separate apportionment to only the CV sector of the Rockfish Program, and having also included the uncertainty pool mechanism in its initial June 2013 preferred alternative, the Council initiated a trailing action to analyze how to reincorporate a PSC rollover into the final preferred alternative. The Council emphasized that any rollover provision selected for the final PA should not allow for any take of Chinook salmon in excess of the sector PSC limits as defined in the PA, nor should it jeopardize the clean functionality of the uncertainty pool. Five rollover alternatives were analyzed, including a ‘no action’ alternative that would leave the June 2013 PA intact, with no PSC rollover. The selected rollover alternative is analyzed in this section. The other three rollover action alternatives are described in Section 2.6 and Section 4.3; the analysis of those alternatives that was presented to the Council has been adapted for inclusion in Appendix 2.

On October 1, all but 150 of the Chinook PSC allowance that remains from the RP CV sector’s annual apportionment (1,200 fish) will be rolled over into the non-RP CV sector limit. Table 4-90 shows the amount of Chinook PSC that would have been rolled over. The Council selected October 1 because, historically, most RP CV activity is completed by this date. October 1 is also a key time in the non-RP CV fishery, as it falls during the Pacific cod B season. Should the non-RP CV sector be closed due to Chinook PSC in the spring and early summer, the rollover would allow the valuable Pacific cod fishery to open. During the analyzed period, Chinook PSC in the Pacific cod B season occurred at a rate of around 50 Chinook per week. As a result, all but the most exceptional years of PSC in the RP CV sector should allow a sufficient rollover to prosecute the Pacific cod fishery.

The date of this initial rollover is the same in every year. The Council did not select a rollover alternative that would have given the RP CV cooperatives the ability to coordinate a sector-wide “check out” from the RP fishery and roll over unused Chinook PSC allowance amounts at that time. While that alternative would have granted the RP co-op members the ability to respond to an urgent “need” to open the fall Pacific cod fishery, it could also have placed significant pressure on the inter-cooperative manager or individual members of the RP CV fleet who had not yet completed their rockfish quota harvest. Establishing a consistent rollover date also reduces business planning uncertainty as the need for additional Chinook PSC allowances in the non-RP sector becomes apparent.

**Table 4-90 Historical October 1 Chinook salmon PSC allowance rollover amount, had the preferred alternative been in place from 2007 through 2012**

<b>Year</b>	<b>Oct. 1 PSC Rollover</b>
2007	585
2008	n/a
2009	277
2010	85
2011	682
2012	233
<b>Average*</b>	<b>372</b>

\* Includes only years in which a rollover would have occurred

The Council elected to remove the RP CV sector from the uncertainty pool mechanism. Stakeholders who participate in both the RP and non-RP CV sectors indicated to the Council that the ability to utilize additional Chinook PSC allowances in the fall is more beneficial to their operations than is the opportunity to increase their maximum potential RP Chinook PSC allowance from 1,200 to 1,360, which would have been the potential benefit of earning an uncertainty buffer (see Table 2-5 in Section 2.2.4). Chinook PSC in the RP sector has rarely approached either of those levels, and has not done so recently.

In contrast, Chinook PSC in the non-RP CV sector has reached potentially constraining levels in the past, is highly variable, and could increase due to forthcoming changes to halibut PSC regulations that might facilitate increased spring flatfish effort.<sup>70</sup> Moreover, the proportion of vessels that fish in the spring or summer but *not* in the fall is greater in the non-RP CV sector than in the RP sector. That divergence in seasonal participation patterns could pose a challenge for the non-RP sector in coordinating fleet-level action to slow PSC rates when spring Chinook encounter is high. As such, this analysis supports the notion brought forward during public testimony that alternatives removing the RP CV sector from the uncertainty pool and maximizing the potential Chinook PSC rollover provide a likely benefit to the fleet at a low expected cost.

With no uncertainty buffer to ensure for the following year, the amount of PSC held back from the October 1 rollover can be selected on the basis of how much Chinook salmon PSC the RP CV sector might expect between October 1 and November 15. Holding back 150 Chinook salmon would result in an expected allowance rollover of around 300 Chinook PSC to the non-RP CV fishery. Table 4-90 gives an average observer rollover during the analyzed years of 372 fish, and the median observed rollover would have been 277 fish.

Based on the Chinook PSC performance in the first six years of the RP CV fishery, a small amount of Chinook salmon PSC would have been sufficient to support the sector's activity from October 1 through the end of the season, all else equal. During that calendar period, the sector recorded a PSC of 18 Chinook salmon in one year, and zero in the five other years. Also, the number of active CVs in the RP after October 1 has been low, averaging two vessels per week. However, the Council selected a higher hold-back amount (150 fish),<sup>71</sup> because these participation and PSC trends could change in the future, resulting in either higher or lower post-rollover Chinook PSC in the RP CV sector. As co-ops prioritize active PSC rate management, more voluntary stand-downs in May could shift effort to later in the year; seasonal Chinook PSC rates could vary due to environmental or other exogenous factors; or TAC levels for allocated RP species could increase or decrease relative to present levels. NMFS constantly monitors effort levels and PSC rates in the RP fishery, and would close the sector if the Chinook PSC limit is exceeded, or is projected to be exceeded before the Agency's next chance to close the fishery.<sup>72</sup> Even considering the low historical PSC rates during this calendar period, a small post-rollover Chinook PSC limit provides a narrow range for precise inseason management of the RP fishery, especially given the unpredictable magnitude and time-distribution of Chinook salmon encounter. Two factors enhance the Agency's ability to keep the fishery open as long as possible. RP CVs have a high level of observer coverage, so Chinook PSC rates are rarely extrapolated from one vessel to another and are stable over time. Also, RP cooperative managers closely monitor observer PSC data, and could take voluntary steps to address problematic PSC rates. Nevertheless, knowing that NMFS might have to close the fishery to prevent a PSC overage could cause RP CV participants to take a risk-averse strategy, and fish as much as possible prior to October 1. That response would, in turn, further decrease the expected level of Chinook

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<sup>70</sup> Spring trawl harvest has typically been constrained by the second season limit on trawl halibut PSC, during which the CV and CP sectors share 395 mt of halibut mortality over the April 1 to July 1 period. In the past, 296 mt of this seasonal limit has been apportioned to the deep-water complex, which includes rockfish, arrowtooth flounder and rex sole. Halibut PSC closed the deep-water complex to trawl fishing in June of every analyzed year (2007 through 2012). The complex was closed for the latter half of May 2007, and for all of May from 2008 through 2012. In addition, the complex was closed for the final weeks of April in every year except for 2007. These closures effectively reduced Chinook salmon PSC levels by stopping the arrowtooth flounder and rex sole target fishery for a significant portion of each spring. Upon the implementation of the proposed rule for GOA Amendment 95 (revised halibut PSC limits), the halibut PSC available for the second season deep-water and shallow-water complex may be combined and used in either complex from May 15 to June 30. This change is likely to increase the amount of halibut mortality available to flatfish trawlers in May and June, and, by extension, could result in additional Chinook salmon PSC being caught and debited against the non-RP CV hard cap. Any such increase has the potential to exacerbate the effects of a potentially constraining sector hard cap that would be experienced in the fall. As a result, the likelihood of fall closures may increase.

<sup>71</sup> The Council had previously considered holding back only 50 or 100 Chinook PSC at the time of the October 1 rollover. Analysis of those options is included in Appendix 2.

<sup>72</sup> On the day following the receipt of the information that the limit has been, or is expected to be, exceeded.

PSC available after the rollover. However, a rush to fully harvest one's Rockfish quota could have other undesirable effects, such as high PSC or bycatch rates and poorly timed delivery to shoreside processors.

Historically, the non-RP CV sector recorded 891 Chinook salmon PSC from October 1 through the end of the year (Table 4-44), though the amount varied over a range from 208 to 1,776 fish. A rollover is most critical in years when the non-RP sector's October 1 remaining Chinook PSC allowance is low. On October 1, the amount remaining in the sector's annual base PSC apportionment (2,700 Chinook) has been observed at over 2,000, and less than 200.<sup>73</sup> In 2010 and 2011, the non-RP CV sector would have begun the fall fisheries with around a 150 or 500 Chinook PSC allowance, depending on whether or not it carried an uncertainty buffer. In these cases, even the low end of the range of historically observed rollovers (around 100 Chinook) would be a substantial benefit.

Though it is greater than the RP CV sector's historical PSC after October 1, holding back a 150 Chinook PSC allowance comports with the Agency's preference for a marginally more manageable RP CV sector between October 1 and November 15. While it is small in terms of active vessels, managing that fishery with a 50 Chinook PSC limit could have the real effect of closing the sector after only one small Chinook PSC event. Even if some of the 50 Chinook allowance remains, NMFS might have to close the fishery based on projected PSC rates and the number of vessels active. Holding back an amount that is too small could cause more vessels to shift the timing of the RP quota harvest to earlier in the summer, thereby compressing the fishery and removing some of the Program's desired flexibility.

Any of the 150 Chinook PSC allowance held back in the RP CV sector that remains on November 15 would roll over to the non-RP CV sector at that time. The Council articulated that the 7,500 Chinook PSC limit, and sector apportionments thereof, is intended to support non-pollock trawl harvest. While incentive measures are in place to encourage further Chinook avoidance, fishing within the established hard cap satisfies the Council's best effort to balance the National Standards that call for both minimization of bycatch and achieving optimal yield in target fisheries. As a result, it is not the Council's intent to have any Chinook PSC that remains with the RP CV sector at the end of the Program season be necessarily retired and unavailable to support prosecution of other CV fisheries.

The non-RP CV sector has recorded only around 5% of its annual post-rollover Chinook PSC occurring after November 15. Trawl activity is focused on flatfish species during that period, as the Pacific cod season closes by regulation on November 1. Chinook PSC levels of around 40 fish, with one high-PSC year of 100 fish, and two years where zero salmon, were taken after mid-November. Up until November 15, the non-RP CV sector averaged 2,194 Chinook PSC, with a median of 1,868 (the average is influenced by high PSC years in 2010 and 2011). Judging from the historical period, the sector might expect to have an allowance of around 500 to 800 PSC remaining in its apportionment at the middle of November. This estimated range, based on measures of central tendency, considers a possible increase in late-spring PSC, due to increased flatfish effort (see footnote 70), but does not consider the potential for carrying an uncertainty buffer in some years. This portion of the non-pollock CV fishery, which has accounted for between 0.4% and 2.3% of annual first wholesale value from the fishery, would likely be sustained by the sector's remaining Chinook PSC limit apportionment and the expected November rollover in all but the most unusual years.

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<sup>73</sup> The median October 1 PSC remainder was 1,570, or 1,930 if the sector had begun the year with a 360 Chinook uncertainty buffer.

## 5 Management and Enforcement Considerations

### 5.1 Status Quo

NMFS estimates Chinook salmon prohibited species catch for the Gulf of Alaska trawl fisheries based on data from the North Pacific Groundfish 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 in order to compare the methods that are currently being used for PSC limits in the GOA pollock fishery and the status quo in other GOA trawl fisheries.

#### 5.1.1 Observer Coverage and Monitoring

##### 5.1.1.1 Observer Coverage under restructure

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 became effective in 2013.

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. These changes reduce sources of bias that jeopardized 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, are included in the new Observer Program. Coverage levels are no longer based on vessel length and processing volume; rather, NMFS has 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, nearly all GOA CPs are included in the full coverage category and carry an observer on every trip.<sup>74</sup> 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 CVs participating in the Rockfish Program are in the full coverage category and carry an observer on every trip.

The 2013 Annual Deployment Plan (ADP) (NMFS 2013a) describes the methodology to deploy observers on vessels in the partial coverage category. In preparing the ADP, NMFS also found the Environmental Analysis for the restructured observer program was adequate and did not need to be supplemented (NMFS 2013b). In brief, NMFS implemented the partial coverage category in 2013 by placing vessels in one of three observer selection pools with differing requirements:

- *No selection:* Vessels less than 40 ft LOA or fishing with jig gear are in the “no selection” pool which means that they will not be selected for observer coverage. NMFS will not to deploy observers on these vessels in 2013 due to logistical issues. NMFS will consider expanding

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<sup>74</sup> 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.



coverage to vessels less than 40 ft and/or vessels fishing with jig gear if data collection needs warrant coverage and logistical issues are resolved.

- *Vessel Selection*: This category applies to CVs fishing with hook-and-line and pot gear that are less than 57.5 ft 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.
- *Trip Selection*: This category applies to all CVs of any length fishing with trawl gear, and to hook-and-line and pot gear CVs that are greater than or equal to 57.5 ft LOA. Vessel owners or operators whose vessel is in the trip selection pool are 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.

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 in the GOA will occur during deliveries of pollock to Kodiak to prioritize the collection of genetic samples for Chinook salmon. Some processors that take pollock from both the GOA and the BS are in full coverage when they are receiving or processing BS pollock.

The restructured Observer Program is anticipated to reduce the number of vessels without any chance of coverage, increase the number of vessels in the partial coverage category, and result in an overall increase in observer coverage due to full coverage requirements on CPs. The sampling methods achieve representative sampling of fishing events for trawl vessels in the partial coverage category and will reduce sampling bias that results from non-representative deployment of observers (deployment bias). The random deployment result in observer coverage that is proportional to fishing effort; vessels that make more trips will receive more observer coverage. Thus, combinations of gear, time, target, and FMP area combinations with high amounts of effort are expected to receive more observer coverage than those with low effort.

Since 2013 is the first year of the new Observer Program it will take time before NMFS can evaluate how observer deployment in the GOA non-pollock trawl fisheries compares to what was seen in the past. However, through the analysis presented in the 2013 ADP, the median coverage rate for vessels in the partial coverage category is anticipated to be higher than was seen under the previous deployment system (using 2011 as a comparison year) in nine of the ten trawl fisheries in the GOA. Specifically, observer coverage is expected to increase for the non-pollock trawl CV fisheries for deep-water and shallow-water flatfish, compared with the coverage prior to 2013.

#### **5.1.1.2 Monitoring in the Rockfish Program**

The Council adopted the Central Gulf of Alaska Rockfish Program on June 14, 2010, to replace the expiring Pilot Program. The Rockfish Program became effective in 2011, and fishing under it began in 2012. 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).

## 5.1.2 Observer Sampling

### 5.1.2.1 Sampling on Catcher Vessels Delivering to Shoreside Processors

When an observer is deployed on a 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 expected to sample every haul for composition and biological data. In some cases, an observer is unable to sample all the hauls during a trip and is instructed to use a random break table. This could be a result of observer illness or 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 on 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 are generated from offload sampling that occurs during the delivery to the shoreside processor.

#### Sampling on GOA trawl non-pollock CVs

Unlike CVs in pollock fisheries, vessels in other GOA trawl fisheries, which include deep and shallow-water flatfish and Pacific cod, sort their catch extensively at sea. Sorting at sea is a critical attribute associated with the fisheries because of a larger amount of unmarketable bycatch. For example, vessels frequently have conveyor systems on deck to facilitate sorting of uneconomical species and PSC, which must be discarded at sea. If vessels do not have a sorting conveyor then they often sort directly from the trawl alley. Observers collect species composition samples prior to any sorting of catch by the fishing crew. 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. Because of the extensive sorting for unmarketable bycatch at sea, 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 at sea in these fisheries. Therefore, PSC estimates from CVs in other GOA trawl fisheries are all derived from at-sea samples. Biological data are collected from salmon inside of the observers' composition samples. No genetic samples are collected from salmon found inside observer's composition samples since the current genetic sampling protocol developed for the Bering Sea by Pella and Geiger (2009) requires complete enumeration of all salmon and systematic sampling.

### Sampling on Rockfish Program CVs

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 halibut PSC allocations. Observers collect species composition samples at sea prior to any sorting occurring. Since the majority of species caught in these fisheries are allocated to the cooperative and full retention of these species is required, sorting at sea is limited to the species that are required to be discarded such as PSC and other prohibited species like lingcod during certain times of the year. As in the pollock fishery, codends in the rockfish fishery tend to be larger and sorting at sea is limited to PSC, including salmon and halibut, which is required to be discarded but are difficult to sort from large codends as they are being dumped directly into RSW tanks. PSC estimates from CVs in Rockfish Program are derived from at-sea samples. Biological data are collected from salmon inside of the observers' composition samples. No genetic samples are collected from salmon found inside the observers' composition samples since the current genetic sampling protocol developed for the Bering Sea by Pella and Geiger (2009) requires complete enumeration and systematic sampling of all salmon.

#### **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 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 PSC salmon from a delivery.

For some shoreside 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 (CMCP) that details how the processor will ensure that all species are sorted and weighed within view of the observer. CMCPs 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 CMCP, no other species besides pollock are allowed to enter the processing area without first being sorted and weighed. CMCPs also require a designated storage location for salmon PSC within view of the observer at all times during the offload and specific handling requirements for salmon found during the offload.

At a GOA shoreside processor, salmon that are missed during sorting of the delivery end up inside the processing facility, 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 processing area. 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 a plant observer has been assigned to the processor and the processor provides the salmon to the plant observer. Further complications in shoreside processor salmon accounting occur when multiple CVs are delivering in quick succession, making it difficult or impossible to determine which CV these salmon should be assigned. Also, shoreside processor personnel may not be saving after-scale salmon for observers; therefore, after-scale salmon numbers are difficult to quantify and verify for each delivery.

In the GOA pollock fishery, shoreside processors have been requested to sort the salmon from the offload, place them in a tote, and notify the plant observer that the offload is complete so the plant observer can collect biological data. The biological data include: sex/length, scales to enable identification of species, sex/length/weight, genetic samples, and coded-wire tags (CWT). Sex/length, scales, and CWT data, are collected from all salmon species but currently genetic samples and sex/length/weight data are only collected from chum and Chinook salmon PSC. Using a similar method in the BSAI pollock CV fishery, observers are instructed to follow a random systematic sample design to collect biological data for chum and Chinook salmon PSC.

#### Shoreside sampling of non-pollock deliveries

In all CV trawl fisheries other than pollock, biological data are only collected from those salmon PSC 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 sampling of Rockfish Program deliveries

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. The CMCP specialist is a NMFS employee who monitors portions of the offloads to ensure that the processor is following their CMCP and provides feedback to the processors to improve sorting and weighing of all species delivered. Biological data are not collected from salmon PSC encountered during the delivery. No observers are currently assigned to shoreside processors receiving deliveries from CV trawl vessels in the Rockfish Program.

#### **5.1.2.3 Sampling on Trawl Catcher/Processors**

Sampling methods used on CPs allow observers to collect larger species composition 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 all CPs have at least one observer aboard. Additionally, on many CPs that are in the 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 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 Rockfish or Amendment 80 Programs, most CPs continue to use the flow scale and allow the observer access to the sampling station in other fisheries in the GOA. Biological data are collected from those PSC salmon encountered within the species composition samples, but currently no genetic samples are collected from these salmon. The number of salmon PSC in each haul is derived from observer samples. Because observers are frequently completing other duties during the sorting of each haul and may not be available during the end of a haul, the total salmon PSC count per haul, or census, is not available.

### 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). The catch, bycatch, and PSC estimation methods are described in detail in 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 Fisheries 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 production reports were submitted weekly). Shore based 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 a landing report is required. On making a landing, a representative of the shoreside processor 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 where a trip is defined as the time period between when fishing gear is first deployed and the day the vessel offloads groundfish. Landing reports are mandatory for all processors required to have a Federal Processor Permit, including motherships who receive groundfish from Federally permitted CVs.

As was described in the previous section, there are differences in observer sampling between vessel types and fisheries in the GOA and the diversity of sampling methods results in differences in how PSC is estimated among fisheries. The estimation methods are described in the following sections. A description of PSC estimation in the GOA pollock fisheries is also included to contrast the data and methods that are being used to manage the PSC limit in that fishery and what is available in other GOA trawl fisheries.

#### 5.1.3.1 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 PSC salmon is completed by the vessel observer. The on board vessel observers assess any PSC that is discarded at sea and the total amount of salmon PSC discarded at sea is added to the salmon PSC counted at offload to obtain the total amount of species-specific PSC for the trip. NMFS uses the total discard information (estimated salmon discard at sea, plus salmon counted at offload) to create salmon 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 PSC 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 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).

#### **5.1.3.2 PSC Estimation in GOA Non-Pollock Trawl Fisheries**

Chinook salmon PSC estimates from non-pollock trawl CP and non-pollock trawl CV fisheries in the GOA are based on at-sea sampling. 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 Chinook 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, such as Chinook.

##### PSC estimation on CPs and Rockfish Program CVs

As described in the previous section, under the restructured observer program all CPs and any vessels participating in the Rockfish Program are in the full observer coverage category and all of their trips are observed with at least one observer (or in the case of CPs participating in the Rockfish Program fisheries, with two observers). On observed vessels, the estimates of the Chinook PSC are specific to the observed vessels' data. The observer samples are extrapolated to the haul and the amount of Chinook PSC in the sampled hauls is used to calculate a vessel specific PSC rate for the week (CPs) or trip (CVs).

All CPs are required to have the Atlas software for observers to enter and transmit their data while at sea. CVs in the Rockfish Program are also required to use Atlas software; however, the observers transmit at the end of the trip at the shoreside processor. After deployment in the field, which may be as long as three months, observers review their data with NMFS staff and ensure that data were collected following NMFS protocols. The use of Atlas software increases the timeliness and quality of the observer data, since the software contains data quality checks. However, there it is still normal for there to be data modifications during this "debriefing" and quality control process.

##### PSC estimation on non-Rockfish Program CVs

Non-pollock catcher vessels that are not participating in the Rockfish Program, which includes vessels participating in shallow-water flatfish, deep-water flatfish, and Pacific cod fisheries, are in the partial coverage category and their trips are randomly selected for observer coverage. In estimating PSC, the Chinook estimates on observed trips are specific to the observed vessels' data, while unobserved vessels receive Chinook PSC rates that may be averaged across multiple vessels and trips. As a consequence, salmon PSC information from multiple observed vessels is averaged into PSC rates that are used for multiple unobserved vessels. From an inseason management perspective, the Chinook PSC rates on unobserved vessels change as additional observer information is obtained. This creates temporal variation

in Chinook salmon PSC estimates, resulting in uncertainty associated with inseason management of Chinook salmon PSC limits. This uncertainty complicates management of salmon PSC limits because PSC rates can change from day-to-day, resulting in Chinook PSC estimates that oscillate around limits in concert with changing observer information.

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 may be 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, Chinook 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 Non-Pollock Trawl Fisheries**

The GOA non-pollock trawl fisheries include shallow-water and deep-water flatfish and Pacific cod. These fisheries can be high-pulsed fisheries due to the amount of seasonal or annual allocations and the fleets 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 rates 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.

In projecting a closure date there is a risk that the fleet will not harvest the entire directed fishing allowance 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 directed fishing allowance 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 four days after the day it is announced. There is usually about a week between the closure and the subsequent reopening.

Table 5-1 shows that, from 2007 through 2012, an average of three shoreside processors, 21 CVs, and 13 CPs participated in the Western GOA non-pollock trawl 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 trawl fisheries over the same time period. The largest increase over these years was the 2012 increase of 48 catcher vessels in the Central GOA.

**Table 5-1 Number of shoreside processors (SP), catcher vessels (CV), and catcher/processors (CP) in the Western and Central non-pollock trawl 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
<b>WGOA</b>	4	28	13	2	24	11	2	25	14	4	15	13	3	12	14	4	24	15	3	21	13
<b>CGOA</b>	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.

### Rockfish Program

The Rockfish Program allocates PSC limits for halibut but does not include limits on salmon PSC. The rockfish cooperatives have developed awareness of the importance of avoiding Chinook salmon. For the CV sector participants, the Rockfish Program cooperatives require hotspot reporting on Chinook salmon PSC rates from the fishing grounds. This information can be helpful for vessels to avoid salmon; 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. Further tools will need to be developed as the fleet continues to research avoidance tools.

### Amendment 80

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, salmon 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 the Amendment 80 GOA sideboard limits.



## **5.2 Alternative 2: Chinook salmon PSC Limit**

Alternative 2 would create a Chinook salmon PSC limit or hard cap in the non-pollock trawl fisheries with various options for how the limit could be subdivided by management area (Option 1), operation type (Option 2), time of year (Option 3). Option 4 would allow a separate Chinook PSC limits for the Rockfish Program entities.

The implementation of Alternative 2 and the associated Chinook 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. These would include changes to inseason management, monitoring requirements, catch accounting, and enforcement responsibilities. These options are summarized in Table 5-2 and described in the following sections.

**Table 5-2 Summary of the management, Chinook PSC estimation, and monitoring for sectors of the GOA non-pollock trawl fishery under the status quo, other considered alternatives, and the Preferred Alternative**

		<b>Rockfish Program CPs</b>	<b>Non-Rockfish CPs *</b>	<b>Rockfish Program CVs</b>	<b>Non-Rockfish Program CVs **</b>
<b>Alternative 1: Status Quo</b>		<ul style="list-style-type: none"> <li>• 200% observer coverage (“pay as you go” by industry).</li> <li>• NMFS-approved flow scale.</li> <li>• Observer sampling station.</li> <li>• Atlas software</li> <li>• eLogbook</li> <li>• Must follow specified catch handling procedures.</li> <li>• VMS</li> </ul>	<ul style="list-style-type: none"> <li>• Full observer coverage (“pay as you go” by industry).</li> <li>• Atlas software</li> <li>• Must follow specified catch handling procedures.</li> <li>• VMS</li> </ul>	<p>Catcher vessels:</p> <ul style="list-style-type: none"> <li>• Full observer coverage (“pay as you go” by industry) when checked to Rockfish Program</li> <li>• VMS</li> <li>• Atlas software</li> </ul> <p>Shoreside processors:</p> <ul style="list-style-type: none"> <li>• Operate under NMFS-approved CMCP</li> <li>• NMFS CMCP Specialist monitors rockfish deliveries</li> </ul>	<p>Catcher vessels:</p> <ul style="list-style-type: none"> <li>• Partial observer coverage (paid for from observer fee).</li> </ul> <p>Shoreside processors:</p> <ul style="list-style-type: none"> <li>• Partial coverage – however in 2013 no shoreside observers other than GOA pollock deliveries.</li> </ul>
<b>Alternative 2 &amp; Preferred Alternative: Chinook Salmon PSC limit</b>	Options 1 through 3: Fishery, area, or sector Chinook PSC limits (based on extrapolated observer data)	<ul style="list-style-type: none"> <li>• Maintain 200% observer coverage &amp; monitoring as under status quo.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain current full observer coverage &amp; monitoring levels as under status quo.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain current full observer coverage &amp; monitoring levels as under status quo.</li> <li>• No changes to shoreside observer coverage.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain current partial observer coverage as under status quo.</li> <li>• No changes to shoreside observer coverage.</li> <li>• Note that timeliness of data and high variance in the estimates likely make it extremely difficult to accurately manage a small Chinook PSC limit.</li> </ul>

Table 5-2 continued

		Rockfish Program CPs	Non-Rockfish CPs *	Rockfish Program CVs	Non-Rockfish Program CVs **
<b>Alternative 2: Chinook Salmon PSC limit (continued)</b>	Option 4: Chinook PSC limit for entities (census-level accounting)	<ul style="list-style-type: none"> <li>• Maintain 200% observer coverage &amp; monitoring as under status quo.</li> <li>• Salmon PSC storage container.</li> <li>• Video monitoring of all locations where salmon could be sorted and the salmon storage container.</li> <li>• Retain all salmon for observer and remove salmon from area once observer has completed sampling.</li> </ul>	Not applicable	<p>Catcher vessels:</p> <ul style="list-style-type: none"> <li>• Maintain current full observer coverage &amp; monitoring as under status quo.</li> <li>• Retain all salmon until delivery to processor.</li> </ul> <p>Shoreside processors:</p> <ul style="list-style-type: none"> <li>• 200% observer coverage at plant; full coverage, “pay as you go” by industry.</li> <li>• Additional CMCP requirements.</li> <li>• Designate a salmon storage area at processor.</li> <li>• Retain all salmon for observer and remove salmon from area once observer has completed sampling.</li> </ul>	Not applicable

Table 5-2 continued

	Rockfish Program CPs	Non-Rockfish CPs <sup>*</sup>	Rockfish Program CVs	Non-Rockfish Program CVs <sup>**</sup>
<b>Alternative 3 &amp; Preferred Alternative:</b> <b>Full retention of Chinook PSC to enable biological sampling</b>	<ul style="list-style-type: none"> <li>• Maintain 200% observer coverage &amp; monitoring as under status quo.</li> <li>• All salmon must be retained from each haul until the observer has had the opportunity to collect biological samples.</li> <li>• Designated area to store the salmon PSC.</li> </ul>	<ul style="list-style-type: none"> <li>• All salmon PSC must be retained from each haul until the observer has had the opportunity to collect biological samples.</li> <li>• Designated area to store salmon PSC.</li> <li>• Observer Sampling Station.</li> </ul>	<p>Catcher vessels:</p> <ul style="list-style-type: none"> <li>• Retain all salmon PSC until delivery to a processor.</li> </ul> <p>Shoreside processors:</p> <ul style="list-style-type: none"> <li>• Processor must retain all salmon PSC from each trip until a sampler has had the opportunity to collect biological samples.<sup>***</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Full retention not feasible under current fishing and sorting practices from both CVs and shoreside processors.</li> <li>• Observers could collect genetic samples from salmon PSC in species composition samples, however a new genetic sampling protocol would need to be developed. Number of samples that could be collected likely low due to rare occurrence of Chinook.</li> </ul>
	<p>Note: samples would be combined and analyzed as a single strata. NMFS would conduct genetic stock composition analysis; however, it may not be possible to determine the stock composition of the catch and results could be limited to presence of stocks.</p>			

<sup>\*</sup> Includes CPs fishing under Rockfish Program sideboards or Amendment 80 sideboards, but does not include the F/V GOLDEN FLEECE.

<sup>\*\*</sup> Includes CVs participating in the GOA Pacific cod and shallow & deep water flatfish fisheries.

<sup>\*\*\*</sup> Could be a sampler provided by industry, or NMFS staff, or an observer.

### 5.2.1 Management of PSC Limits (Hard Caps)

The management methods used for a Chinook PSC limit depends on whether NMFS manages PSC limits for a group of vessels or whether these Chinook PSC limits are allocated among specific entities within a fishery. There are two general types of PSC limits: 1) fishery, area, or sector-level PSC limits; and 2) PSC limits to specific entities. The Council's final preferred alternative apportions Chinook PSC at the sector level. The apportionment that is made to the Rockfish Program CV sector is not sub-allocated to specific cooperatives (entities), so the selected version of Option 4 still fits into the first category of a sector level Chinook PSC limit.

#### 5.2.1.1 Management of fishery, area, or sector-level Chinook PSC limits (Options 1-3)

PSC limits by fishery (e.g. non-pollock trawl) or area (e.g. Central and Western GOA) or sector (CV and CP) would be non-transferable Chinook salmon PSC limits managed by NMFS with a directed fishing closure once this limit was reached. This would be similar to current Chinook PSC limits in the GOA pollock fishery are managed. For example, a notice is issued in the *Federal Register* to close directed fishing for GOA pollock as a result of reaching the Chinook salmon PSC limit. These closures apply to all vessels participating in the relevant directed fisheries. Any vessel fishing after the closure is in violation of regulations governing the closure.

As was described under the status quo, the decision to manage a fishery inseason is made if the catch limit is large enough and the data are available to allow NMFS the time to assess the catch rate and close the fishery before the catch limit is exceeded. NMFS' ability to manage Chinook salmon PSC limits in the GOA non-pollock fisheries is likely to be difficult for several reasons:

- the Chinook PSC limits could be very small and the smaller the catch limit, the more conservative the management that is required to ensure that the catch limit is not exceeded;
- non-pollock trawl fisheries can be high-pulsed fisheries; however, there is a time-delay in getting the data needed to derive Chinook PSC estimates, the observer data can change substantially throughout the fishery and debriefing process;
- 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.

For these reasons, 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 Chinook PSC.

For the GOA non-pollock trawl fisheries NMFS would consider ChinookPSC limits that are less than the historically 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 PSC a week each for the Central GOA, and 1,000 Chinook salmon PSC for the CPs and 100 Chinook salmon PSC 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. An annual record of the highest weekly Chinook PSC event, by area or by operational type sector, is provided in Table 4-52.

Following is a description of the challenges inherent in managing small PSC limits in an open access fishery using the pollock fishery as an example. In the 2012 Western GOA C and D season pollock fisheries, the 5,598 Chinook salmon PSC limit was exceeded by 1,258 Chinook salmon for a total PSC of 6,856 Chinook salmon. The challenge in managing the PSC limits in these fisheries is related to the

timing of the fisheries and reporting of the data. In 2012, Chinook salmon PSC limits were effective for the C and D season pollock fisheries. The 2012 Chinook PSC limits were 5,598 salmon in the Western GOA and 8,929 salmon in the Central GOA, to account for only the C and D seasons' Chinook PSC compared to the full limits for all seasons in future years of 6,684 Chinook in the Western GOA and 18,316 salmon in the Central GOA. The C and D season are concurrent, August 25 through October 1 and October 1 through November 1, respectively. However, in 2012, the Western GOA C season reached the total allowable catch and the season closed September 10. At that time, the Western GOA pollock fishery Chinook salmon PSC was estimated as 458 salmon or 5,140 salmon below the Chinook PSC limit. The 2012 D season pollock fishery opened October 1. The Chinook salmon PSC rates are often, but not always, higher in October than September. This is one reason that the Chinook salmon PSC limit for the 2012 Western GOA C and D seasons was set at 84 percent of the annual PSC limit in future years.

In 2012, observer coverage was under the old program and was based on vessel length. For the 2012 Western GOA pollock C and D seasons, 26 vessels participated of which 6 were over 60 feet length overall (LOA) with 30% observer coverage and no vessels were 125 feet LOA or greater with 100% coverage. Twenty of the participating vessels were less than 60 feet LOA and exempt from observer coverage requirements in 2012. Five vessels had observers on board, two vessels in the C season and all five vessels in the D season. All five of the observed vessels fished both the C and D seasons. Participation by one of the six vessels over 60 feet LOA was low enough to not require observer coverage (less than 3 days).

Western GOA D season pollock fishery opened October 1 and closed October 23, 2012. When the fishery closed, the estimate for salmon PSC was 4,702 salmon or 896 salmon below the PSC limit. However, because of the timing of when observer data is available for these fisheries, not all the observer data was in the system when the fishery was closed; observer data with high PSC rates from the GOA D pollock season, appeared in the catch accounting system (CAS) 9 to 10 days after the Western GOA pollock fishery closed for 2012. It was this observer data that extrapolated to unobserved vessels and produced the PSC rates that resulted in the 2012 PSC limit being exceeded in the Western GOA. At this time in the Western GOA, the 5,598 Chinook salmon PSC limit was exceeded by 2,209 Chinook salmon for a total PSC of 7,807 Chinook salmon. These data were rechecked for possible reporting errors. However, not all of the observers had been debriefed. At this time there was a back log in debriefing since many of the observers had finished for the year. In mid-December 2012, revised observer data entered the CAS as a result of observer debriefing. As the result of debriefing changes made to the observer data the Chinook salmon PSC decreased to 6,856 salmon. The revised amount of the PSC overage is 1,258 Chinook salmon. The high rates from the observed vessels match fairly closely with the industry's fish ticket counts. It is mainly 3 high rates that are extrapolated to most of the unobserved vessels.

Compared to the Western GOA, the 2012 Central GOA C and D pollock fisheries had more vessel participation and observer coverage, 55 catcher vessels participated of which 40 were over 60 feet LOA with 30% observer coverage and none were 125 feet LOA or greater with 100%. Fifteen of the participating vessels were less than 60 feet LOA and exempt from observer coverage requirements in 2012. Thirty-six vessels had observers on board, 19 vessels in the C season and all 36 vessels in the D season. Most vessels fished both the C and D seasons. The final 2012 Chinook salmon PSC for the Central GOA C and D pollock fisheries is 8,217 Chinook salmon out of the 8,929 Chinook salmon limit with an estimated allowance of 712 Chinook salmon remaining.

**Table 5-3 Estimated 2012 final Chinook salmon PSC (number of salmon) and pollock catch (mt) by season**

Chinook Salmon PSC					Pollock				Chinook salmon/pollock rate		
Season	610	620	630	CGOA	610	620	630	CGOA	610	620	630
<b>A/B total</b>	806	2,399	215	2,614	8,177	30,886	6,891	37,777	0.10	0.08	0.03
<b>C total</b>	1,649	2,982	1,380	4,362	9,339	9,107	9,039	18,146	0.18	0.33	0.15
<b>D total</b>	5,207	1,907	1,948	3,854	9,353	4,253	7,684	11,937	0.56	0.45	0.25
<b>C/D total</b>	6,857	4,889	3,328	8,217	18,692	13,359	16,723	30,082	0.37	0.37	0.20
<b>2012 total</b>	7,663	7,288	3,543	10,831	26,869	44,245	23,614	67,859	0.29	0.16	0.15

Source: NMFS Catch Accounting System

Small Chinook PSC limits may be difficult for the fleet to respond to in the open access non-pollock fisheries. The Chinook salmon PSC limits proposed under this alternative could be very small. Without the management structure of a catch share program, vessels may not have the tools or the incentives to move from an area of higher salmon PSC if the race for fish still exists, particularly in fast-paced fisheries. In catch share programs with Chinook PSC limits, the programs can provide the participating 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 Chinook salmon PSC. In addition, in years where PSC is near the PSC limit, estimate imprecision may impose costs, on one hand, by permitting excessive losses of Chinook salmon through unaccounted for PSC, or on the other hand, by prematurely constraining target species catch and the ability of fishermen to realize efficiency gains created through catch share programs, particularly in a race for fish situation.

#### **5.2.1.2 Management of PSC limits made to Rockfish Program entities (Option 4)**

Catch share programs that apportion Chinook 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 allowances generally are prohibited from exceeding their allocations. If they exceed an allowance, NOAA may initiate an enforcement action against the entity. Currently, halibut PSC limits are allotted the Rockfish Program cooperatives. Cooperatives monitor their halibut PSC relative to their PSC limit and are prohibited from exceeding their halibut PSC limits. Similar prohibitions against exceeding Chinook salmon PSC limits to specific entities were created under Amendment 91 in the Bering Sea pollock fishery. PSC limits allocated to the Rockfish Program cooperatives could include provision for transfers of Chinook salmon PSC between entities.

Option 4, suboption 2 allows for a reallocation of all but 200, 300, or 400 of the remaining Chinook salmon limit from CGOA Rockfish Program to the other non-pollock trawl fisheries on October 1<sup>st</sup>. Since the Rockfish Program ends by regulation on November 15, most of the groundfish and PSC data should be in the CAS by October 1. However, the data may still change, and the amount of Chinook salmon PSC allowance remaining may increase or decrease until the data are finalized in February to April of the next year. NMFS would need to issue an inseason action to reallocate the PSC limit to another fishery. The completion of this action may require a week. **NMFS suggest that the option be worded *after October 1*, instead of *on October 1*.**

## **5.2.2 Monitoring, Observer Sampling, and PSC Accounting for a PSC Limit**

The observer sampling, monitoring requirements, and accounting for a Chinook PSC limit depends on the option or suboptions that the Council selected under Alternative 2, and whether NMFS manages PSC limits for a group of vessels or whether these PSC limits are allocated among specific entities within a fishery. The Council's preferred alternative apportions Chinook PSC to groups of vessels: CPs, Rockfish Program CVs, and non-Rockfish Program CVs.

### **5.2.2.1 Monitoring, observer sampling, and Chinook PSC estimation for fishery, area, or sector-level PSC limits (Options 1-3)**

As described in the previous section, the management structure under an area, time, or sector PSC limit is fundamentally different from one in which a PSC limit is allocated to an entity. In programs where PSC limits are allocated to entities, such as the Amendment 80 Program, Amendment 91, and the Rockfish Program, NMFS has concluded that use of Chinook PSC rates from observed vessels to estimate the PSC by unobserved vessels is not appropriate, due to the incentive for unobserved vessels to fish differently than observed vessels. Also, it is difficult to enforce penalties for overages based in part on PSC rates from other vessels. Furthermore, the ability for vessels within a cooperative to collude could allow them to manipulate their PSC rates to the degree that NMFS would be prevented from collecting and estimating accurate PSC data. For a PSC limit to be the most effective, estimation of PSC needs to be credible to create incentives at the vessel level for Chinook salmon and other PSC avoidance. The monitoring requirements to enable PSC accounting under a catch share program, where a PSC limit is allocated to an entity, impose large costs on the industry. However, these costs may be offset by, or be small in comparison to, the benefit and management infrastructure of a catch share program.

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 PSC 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. Even under Amendment 91, NMFS has concerns with the adequacy of the monitoring and the enforceability of the program, especially in years of high Chinook PSC. In an open access fishery there would be little incentive to reduce PSC, and high incentive to bias PSC accounting, so the level of monitoring needed would be even greater.

For all of these reasons, the observer sampling protocols and the PSC estimation methods in the CAS would not change under Alternative 2, Options 1 through 3, which includes the Council's preferred alternative. NMFS would continue to use the species composition samples for obtaining Chinook salmon PSC estimates<sup>75</sup>. Full retention of salmon and subsequent offload sampling and counts derived at shoreside processors would not occur under this option for trawl CVs. As described under the status quo, on unobserved non-Rockfish Program CVs trips NMFS estimates of PSC are derived from PSC rates on observed trips that are applied to the unobserved trips landings data. The CAS makes use of all observer

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<sup>75</sup> Note that the Alaska Groundfish Data Bank, Pacific States Marine Fisheries Commission, and the observer program are working on a North Pacific Research Board 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.



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 old observer program, where observer data were only available for the PSC estimates when vessels chose to take an observer. However, gaps may still occur and the review of the first year of the new observer program won't be available until June, 2014. NMFS expects that even under the new observer program 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 limit is allocated between areas then 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, data quality controls are performed, and the observer data are finalized. Decisions on quota management must be made long before the 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. The impact of changes is exacerbated when they are applied to PSC limits that are very small.

Options 1-3 will require programming modifications to the CAS to accommodate PSC limit allocations by Federal reporting area and/or operation type (CP or CV), or season. However, PSC limits by area and operation type are not hugely complicated and will not require a large programming effort.

#### **5.2.2.2 Monitoring, observer sampling, and PSC estimation for PSC limits made to Rockfish Program entities (Option 4)**

Monitoring and managing Chinook salmon PSC limits allocated to the Rockfish Program cooperatives under option 4 would increase the complexity of changes that would be required to be made to NMFS's Catch Accounting System (CAS) and the online Electronic Fisheries Information System (eFISH) that Rockfish cooperatives use to monitor their catch and complete transfers. Modifications to both CAS and eFISH would be required to enable NMFS and cooperatives to track PSC limits and accommodate Chinook PSC transfers.

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 Chinook PSC data collected by observers must be used as a basis for enforcement action should an entity exceed a catch limit. The catch of most target species is readily determined using observer and landings data because the target species must be retained, landed, and sold for the vessel owner to receive earnings from that catch. However, 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.

Current observer sampling and methods for estimating Chinook salmon PSC in the non-pollock trawl fisheries is described in Section 5.1. Estimates of PSC by CVs delivering to shoreside processors are based on data collected by observers. Data collected by an observer on a vessel is used to estimate the PSC by that vessel and PSC rates from observed vessels are used to estimate the PSC by unobserved vessels. There are two primary problems associated with using estimated PSC rates when enforcing a prohibition against exceeding a PSC limit:

- The CAS method of applying information from observed vessels to non-observed vessels to estimate PSC by CVs delivering to shoreside processors assumes that the observed CVs fish in a

manner similar to the unobserved CVs. From a legal perspective, calculated PSC rates (based on other CVs fishing activities) do not reliably represent a vessels fishing behavior for prosecution purposes. Thus, calculated PSC rates cannot be used as a basis for imposing liability for exceeding a PSC limit.

- As new observer information becomes available, the CAS continuously updates PSC rates, which are applied to non-observed vessels or hauls. The CAS rate calculation would continuously change account balances (positive or negative) for PSC limit holders. Thus, an entity may exceed a particular allocation due to the CAS analytical process. This can present several problems for enforcement, including whether the entity was even aware of the overage.

PSC limits that are allocated to entities are used in the Bering Sea pollock fisheries as implemented by Amendment 91 to the BSAI FMP and the allocations to the non-AFA trawl CPs under Amendment 80 to the BSAI FMP. These fisheries provide the model for NMFS's recommendations about the management and monitoring requirements that would be needed to implement a PSC limit under option 4.

Amendment 80 cooperatives receive allocations of six BSAI groundfish and four PSC species. Similar to the constraint that exists as a result of a Chinook salmon PSC limit, halibut PSC by the Amendment 80 cooperatives could limit their catch of target species. The analysis prepared to evaluate the monitoring requirements for the Amendment 80 Program concluded that the use of PSC rates from observed vessels to estimate the PSC by unobserved vessels was not appropriate due to the incentive for unobserved vessels to fish differently than observed vessels and the difficulty of enforcing penalties for overages based in part on PSC rates from other vessels. Furthermore, while the Amendment 80 limited access sector was not issued cooperative quota, it could be composed of participants that acted like a single entity. The ability for such vessels to collude could allow them to manipulate their PSC rates to the degree that NMFS would be prevented from collecting and estimating accurate PSC information.

Catch monitoring tools necessary to manage the halibut PSC limit allocated to CV entities were also a large component of the implementation of 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 cooperative 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.

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.

#### Rockfish Program CVs

Some of the tools that exist in the Rockfish Program for CVs that would assist with monitoring the Chinook 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 cooperative quota species; and near real time reporting of observer data. However, additional monitoring would be required to implement a census of salmon for CGOA Rockfish Program CVs. First, in addition to 100% observer coverage aboard the CVs, there would be a requirement that all salmon must be retained until delivery to a shoreside processor. Problems exist with this full retention requirement because these vessels are required to sort certain prohibited species, such as lingcod during specific times during the year and halibut PSC at all times. Also, because CGOA Rockfish Program CVs have allocations of Pacific cod and sablefish, there are times when sorting at sea could be extensive. As mentioned under the status quo description this creates challenges for an observer to monitor full retention of salmon while completing other duties.

Additionally, the shoreside processors would be required to have 200% observer coverage so that all deliveries could be monitored for sorting of salmon. Lower observer coverage (100%) might be possible if the shoreside processor only took deliveries over a 12 hour period. These plants would fall under the full coverage requirements and would be required to procure their own observers. Observer would not be deployed under the partial coverage program and fees would not be used to fund these observers.

Finally, CMCPs and potentially shoreside processor factory configurations would need to be modified to accommodate additional monitoring requirements to ensure that observers have access to all salmon PSC prior to the fish being conveyed into the factory area of the processing plant:

- Processors would be prohibited from allowing salmon to pass from the area where catch is sorted and into the factory area of the processing plant;
- No salmon of any species would be allowed to pass the observer's sampling area;
- The observer work station currently described in regulations at 679.28(g) would be required to be located within the observation area;
- A location must be designated within the observation area for the storage of salmon, and;
- All salmon of any species must be stored in the observation area and within view of the observer at all times during the offload.

#### Rockfish Program CPs

Tools exist in the Rockfish Program for CPs that could assist with monitoring salmon PSC limits to entities: every haul sampled by an observer (200% coverage); the use of flow scales; and the availability of an observer sampling station. The additional monitoring that would be required to implement a census on CPs would include:

- All salmon PSC of any species must be retained until it is counted by an observer;
- Vessel crew must transport all salmon PSC 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 PSC of any species may pass the last point where sorting occurs in the factory; and
- Operators of CPs would be required to submit the count of salmon by species in each haul to NMFS using an electronic logbook.

### **5.3 Alternative 3: Full Retention of Salmon**

Alternative 3 would require all GOA non-pollock trawl vessels to retain all salmon PSC to enable collection of scientific or biological samples. This requirement would be focused on collection of samples from Chinook salmon; however, because it is difficult to identify salmon species unless the fish is in hand, all species of salmon would be required to be retained.

Current regulations differentiate when retention of salmon is required based on whether an observer is aboard. 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 prohibited in the GOA groundfish fisheries, other than pollock, if an observer is not aboard.

Alternative 3 requiring full retention would not change the method by which NMFS calculates fleet-wide Chinook salmon PSC estimates. Full retention would enable the collection of biological samples, but NMFS will not have all the monitoring to verify that full retention of salmon PSC has occurred aboard these vessels. Therefore, under Alternative 3 NMFS would not modify the catch estimation protocols and NMFS would calculate Chinook salmon PSC using the existing system of extrapolating PSC rates from observed vessels to the unobserved vessels.

The Council selected Alternative 3 as part of its final preferred alternative.

### **5.3.1 Biological sampling under Full Retention**

The GOA pollock fishery provides a useful reference point for full retention to enable collecting biological samples from salmon in the GOA. NMFS has historically collected scales, sex-length frequencies, genetic samples and coded wire tags from salmon. The GOA pollock fishery currently has a shoreside sampling program for biological samples with a focus on genetic tissues, and a secondary objective of CWT sampling. The genetic tissues collections emulate, to the extent practical, sampling methods developed for the Bering Sea (Pella and Geiger 2009) of full retention and systematic sampling. Heads are removed from the same fish selected for genetic sampling if they have a clipped adipose fin, indicating a possible CWT. The operational characteristics of the pollock fishery facilitate full retention for genetic tissue collections without a large amount of on board monitoring. 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 PSC as the pollock are brought aboard and stowed is likely not practical, and is considered generally unsafe due to deck space limitations and stability concerns. There is still potential for bias in the shoreside samples if at-sea operations adopt at-sea sorting practices; however, given the nature of fishing activity this bias would require considerable adjustment in fishing operations. Thus, NMFS assumes that no sorting occurred at sea for the purposes of obtaining genetic samples. NMFS is then also dependent on the shore-side processing plants to sort and set aside salmon PSC for follow up sampling by observers. Unlike the model employed in the Bering Sea, limited coverage was assigned to the shore-side processing plants and observer sorting and verification of each delivery is not possible without significant increases in resources. Thus, observers take samples from the salmon PSC set aside by shoreside processing plants, from catch assumed not to have been sorted. NMFS cannot independently ensure that all salmon PSC were set aside, or that fish were not sorted at-sea. Comparable assumptions about at-sea sorting cannot be made for non-pollock fisheries, because of different at-sea catch handling practices.

Unlike the pollock fishery, in the non-pollock fisheries there are opportunities to sort salmon PSC at sea prior to being sampled for biological information. However, there are differences between the vessels types and fisheries that impact whether full retention for biological data collection is feasible. These differences are summarized in Table 5-2 (in the previous section) and are described here.

#### **Full Retention for Biological Sampling on GOA CPs**

Starting in 2013, all trawl CPs operating in the GOA have full observer coverage. Sampling on these vessels follows a randomized design. It does not follow the Pella-Geiger protocols for genetic tissue

sampling as that approach was only adopted on CPs fishing for pollock in the Bering Sea. Currently the number of salmon collected through random sampling on these vessels is very low and does not follow the recommended sampling design. Full observer coverage coupled with full retention could enable Pella-Geiger protocols for genetic sampling on GOA CPs. Regulations would require CPs to retain of the salmon PSC from each haul, notify the observer that the haul was complete, and allow the observer to collect biological samples from these salmon. The vessels would also have to have a designated area to store the salmon PSC and an observer sampling station where samples could be processed.

One caveat with a full retention requirement to enable genetic sampling is that there exists the potential for bias. As discussed under quota monitoring, without additional monitoring requirements there is a possible risk that not all PSC salmon are being sorted, resulting in a potentially biased population of caught salmon from which to take biological samples. For example, without the measures put in place under in Amendment 91, such as video systems and requirements for the crew to sort and record the salmon, there are opportunities to the vessel to discard the salmon prior to allowing the observer to collect the sample. It is also difficult without additional monitoring for the observer to verify which haul the salmon PSC came from.

#### Full Retention for Biological Sampling on Rockfish Program CVs

The operational characteristics for the Rockfish Program CVs, except for the hauls targeting Pacific cod and sablefish under the catch share program, are similar to the pollock fishery and, thus, full retention to enable collection of genetic samples following sampling methods developed for the Bering Sea (Pella and Geiger 2009) could be feasible. The regulations could be modified to require full retention. Shoreside processors and CVs operating in this fishery have CMCP requirements and at-sea observer coverage in place that would facilitate shoreside collection of salmon. In the first year of the full retention requirement for the GOA pollock fishery, NMFS has noted several issues with the ability of observers to get the needed samples and they are frequently unsure that these salmon all came from one delivery. Therefore, modifications to the CMCPs for the Rockfish Program fishery would be required to facilitate retention of salmon PSC delineated by delivery until an observer or sampler had the opportunity to collect the genetic samples and allow salmon to be linked to a particular offload and trip. These changes would allow better characterization of the area where the salmon PSC originated and other vessel trip characteristics.

Once the salmon PSC were sorted and available at the shoreside processors, then they would be retained from each trip until an observer or some other sampler was given the opportunity to collect genetic samples. Currently, under the restructured observer program, shoreside processors taking deliveries of Rockfish Program catch are under the partial coverage category. However, in 2013 plant observers are only deployed to shoreside processors for pollock deliveries in Kodiak to collect biological samples from salmon PSC.

If plant observers also were deployed to shoreside processors for Rockfish Program deliveries this observer coverage would come at the cost of at-sea observer coverage. Methods that do not require observer coverage to collect salmon PSC at shoreside processors may be more economical and some options that could be explored are using existing NMFS personnel currently collecting rockfish information or an industry led collection program.

A NMFS CMCP Specialist monitors the Rockfish Program deliveries to shoreside processors and there is a possibility that NMFS staff could collect some genetic samples at some offloads. However, NMFS staff are tasked with monitoring all Rockfish Program deliveries and ensuring that all cooperative quota species are sorted, weighed, and accounted for correctly and may not be able to collect genetic samples for salmon PSC collected at the end of a delivery. While assistance may be provided to collect samples, NMFS does not see this as a long term, on-going role for staff.

Currently the industry is exploring a cooperative study with NMFS to collect biological data from Chinook salmon PSC during Rockfish Program CV deliveries. The biological data would include scales for identification verification, sex/length/weight, genetic samples, and coded-wire tags (CWT). In this case, planned procedure is for the biological information to be collected by an industry port sampler and samples sent to NMFS for analysis.

If the Council is interested in detecting the presence of ESA listed Chinook salmon, or hatchery produced salmon in the GOA-non pollock fishery, it also might be possible to institute the coded wire tag (CWT) tunnel detector program. However, in order to do this, the processors would need to manage the program. This would require the purchase or lease and maintenance of the coded wire tunnel detector, the training of staff to operate the machine and collect the samples and record biological information, and the delivery of the CWT fish to NMFS. Requirements for the operation and maintenance of the CWT tunnel detector and the collection of samples would need to be developed by NMFS in regulations.

#### Full Retention for Biological Sampling on non-Rockfish Program CVs

In non-Rockfish Program CV trawl fisheries, such as flatfish or Pacific cod fisheries, sorting at sea is very common and frequently vessels have systems on deck to facilitate this sorting. For example, vessels frequently have conveyor systems on deck to facilitate sorting of uneconomical species and halibut PSC, which must be discarded at sea. Thus, salmon PSC is easily discarded under normal operational conditions. Additionally, even when an observer is aboard these vessels, they are frequently carrying out other sampling duties and not able to monitor all the sorting that is occurring at sea. Thus, assuring full retention on these vessels is not feasible, given the complexity of vessels with layouts designed to facilitate sorting and would likely generate biased samples. Without full observer coverage and additional monitoring tools, NMFS will have no way of verifying that full retention of salmon PSC has occurred aboard these vessels.

The current genetic sampling protocol used in the Bering Sea (Pella & Geiger 2009) requires a count of all the Chinook salmon PSC, followed by a systematic sample for tissues. This is a resource intensive protocol. However, the potential for an alternative sampling design was raised by the SSC in October 2009 and again during its February 2013 meeting regarding genetic sampling in the non-pollock GOA trawl fishery. For example, biological samples could be efficiently collected through random sampling schemes currently used by observers deployed randomly on trips of vessels. This type of protocol would be less resource intensive, but its applicability to genetic stock composition analyses would need evaluation. In summary, although full retention for genetic sampling is not feasible in the non-Rockfish Program CV fisheries, alternatives to a constant sample rate across all samples, and a non-census approach, using the current observer sampling methods could be investigated.

#### **5.3.2 Genetic analysis resulting from Full Retention requirement**

Under Alternative 3, samples from all non-pollock trawl (CPs, Rockfish Program CVs and any that could be collected in the non-Rockfish Program CVs) would be combined and analyzed as a single strata. NMFS would conduct genetic stock composition analysis; however, it may not be possible to determine the stock composition of the catch and results could be limited to presence of stocks. The results of genetic stock composition analysis will depend on the number of samples collected, the number that NMFS will be able to analyze, and the variability of the genetic composition of the samples.

In general, a minimum of 400 genetic samples for each particular strata is considered sufficient for performing genetic stock composition analysis of wide ranging stocks like salmon. Establishing a minimum sample size of 400 fish was roughly based on (1) sample sizes used in previous genetic analyses (Guthrie et al., 2013; Guthrie et al., 2012; Guyon et al., 2010a; Guyon et al., 2010b; NMFS,

2009; Wilmot et al., 1998), and (2) recommendations that the confidence value (CV) be no greater than 0.5 (defined as Standard Deviation/Estimated Value) for estimates with a 95% CV that the individual stock contributed to the fishery (Marlowe and Busack, 1995).

## **6 Final Regulatory Flexibility Analysis**

### **6.1 Introduction**

Section 604 of the Regulatory Flexibility Act requires that, when an agency promulgates a final rule under section 553 of Title 5 of the United States Code, after being required by that section, or any other law, to publish a general notice of proposed rulemaking, the agency shall prepare a final regulatory flexibility analysis.

Section 604 describes the required contents of a FRFA: (1) a statement of the need for, and objectives of, the rule; (2) a statement of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a statement of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments; (3) the response of the agency to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration in response to the proposed rule, and a detailed statement of any change made to the proposed rule in the final rule as a result of the comments; (4) a description of and an estimate of the number of small entities to which the rule will apply or an explanation of why no such estimate is available; (5) a description of the projected reporting, recordkeeping and other compliance requirements of the rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record; (6) a description of the steps the agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.

### **6.2 Need for and objectives of the rule**

A statement of the need for, and objectives of, the rule is contained in the preamble to this final rule and is not repeated here.

### **6.3 Public and Chief Council for Advocacy comments on the proposed rule**

NMFS published a proposed rule on June 25, 2014 (79 FR 35971). An initial regulatory flexibility analysis (IRFA) was prepared and summarized in the “Classification” section of the preamble to the proposed rule. The comment period closed on July 25, 2014. NMFS received three public comment letters, containing nine separate comments on the proposed rule. These comments did not address the IRFA or the economic impacts of the rule generally. The Chief Counsel for Advocacy of the SBA did not file any comments on the proposed rule. .

### **6.4 Number and Description of Small Entities Regulated by the Action**

This analysis considers the active fleet in 2012, which is the most recent year for which size, revenue and affiliation data were all available. In 2012, 19 CPs participated in the GOA non-pollock trawl fishery. Only one of those vessels is classified as a small entity. All others are members in Amendment 80 and/or Central GOA Rockfish Program cooperatives, the combined gross receipts of which total more than \$20.5

million. One of the non-small entities is also a member of an AFA cooperative. The 2012 CV sector was comprised of 70 active vessels. Fifty-four of these are classified as small entities. These include 31 vessels that were not affiliated with any cooperative (Rockfish Program, AFA), and 23 vessels that were affiliated with cooperatives that generated less than \$20.5 million in combined gross revenues. Small entity estimates reported in this FRFA have been updated from those in the IRFA to reflect recent revisions to Small Business Administration thresholds for identifying small entities (79 FR 33647, June 12, 2014). These changes increased the number of small catcher vessels by 4.

## **6.5 Recordkeeping and Reporting requirements**

No new record keeping and reporting requirements have been identified for the alternatives under consideration.

## **6.6 Federal rules that may duplicate, overlap, or conflict with proposed action**

No relevant federal rules have been identified that would duplicate or overlap with the considered action. Some current federal regulations would need modification to implement a Chinook PSC limit, or to require retention of Chinook salmon in the Central and Western GOA non-pollock fisheries. These regulatory changes are described in detail in Section 5.

## **6.7 Description of Significant Alternatives to the Final Action That Minimize Adverse Impacts on Small Entities**

A FRFA must the steps the agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected. The action is the Council's final preferred alternative, as defined in Section 2.4 of the EA/RIR/IRFA.

No alternatives or options that were omitted from the preferred alternative, nor alternatives that were considered but not advanced, would have accomplished the action's objectives while reducing the potential economic impact on small entities relative to the preferred alternative. The Council did not adopt a separate Chinook salmon PSC apportionment for small entities, because a shared hard cap across all entities within each operational type sector promotes information sharing and collective action in avoiding Chinook PSC, which is beneficial to all entities.

The economic impact on directly regulated small entities is the extent to which entities incur additional costs in the avoidance of Chinook salmon PSC, or are limited in their groundfish harvest by a closure due to the Chinook PSC limit being reached. Operational costs could arise from changing the location of fishing or from suspending fishing when relatively high Chinook PSC occurs. In addition, it is possible that some costs may be incurred in attempting to determine Chinook PSC rates in order to decide whether Chinook avoidance measures are needed. These potential impacts are not expected to more significantly and adversely impact small entities, relative to non-small entities. It may be the case that entities with cooperative affiliations have access to a broader array of information where spatial salmon avoidance is concerned, but many of the directly regulated small entities are also members of cooperatives. Moreover, under a shared hard cap, information sharing across the entire fleet is in the best interest of each entity, if the cap appears to be constraining. Finally, while non-small entities may have greater access to funds to invest in salmon excluding technologies – should they be developed and widely adopted – the small entities would benefit from the PSC reductions achieved by other vessels, as they would decrease the probability of fishery closure.



## 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 Chinook salmon PSC limit on the Western/ Central Gulf of Alaska (GOA) non-pollock trawl fisheries. Under some levels and apportionments, the Chinook PSC limits identified in the Preferred Alternative may prevent the non-pollock trawl fisheries from achieving total allowable catches (TACs) in some years, unless fishermen can find other methods to successfully 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 PSC 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 reduced by any relevant economic, social, or ecological factor; and
- (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

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 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,<sup>76</sup> 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.

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.

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<sup>76</sup> 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.

**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. The monitoring requirements for the Preferred Alternative (specifically Alternative 2, Option 4) may impose additional costs on the industry; Table 5-2 in Section 5.2 notes the additional monitoring that would be necessary to account for a PSC limit that is allocated to individual entities under a catch share program. However, these costs may be offset by, or may be small in comparison to, the benefits of a catch share management structure wherein the Agency does not have to inseason manage as conservatively.

**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 1.5. 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 the Preferred Alternative, 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. The Preferred Alternative 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 the Preferred Alternative 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 the Preferred Alternative 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 no significant impacts from the Preferred Alternative on ESA-listed species (marine mammals, seabirds, and salmon), designated critical habitat, or unlisted marine mammals. The only critical habitat designated for ESA-listed species in the GOA is for Steller sea lions and Cook Inlet beluga whale. The Preferred Alternative 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. The effects from the Alaska groundfish fisheries including Amendment 97 to the Fishery Management Plan for Groundfish of the Gulf of Alaska (GOA FMP) on Cook Inlet beluga whales or their critical habitat are within the scope of effects previously analyzed under the informal consultations completed March 26, 2010 (Brix 2010) and February 16, 2012 (Rivera 2012). 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. Therefore, this action does not affect ESA-listed Chinook salmon beyond those effects identified in previous biological opinions. 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. Therefore, this action does not affect Cook Inlet Beluga Whales or Southern Resident Killer whales, beyond the effects identified in previous section 7 consultations undertaken by NMFS.

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 the Preferred Alternative. 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). The Preferred Alternative 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. The Preferred Alternative 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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# Appendix 1: 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<sup>a</sup>.**

System	2011 Goal Range		Type	Year Implemented	Escapement								
	Lower	Upper			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 <sup>b</sup>	4,854 <sup>b</sup>	3,272 <sup>b</sup>
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 <sup>b</sup>	15,180 <sup>b</sup>	14,569 <sup>b</sup>
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 <sup>b</sup>	29,307 <sup>b</sup>	27,523 <sup>b</sup>
Chilkat River	1,850	3,600	Inriver <sup>c</sup>		5,657	3,422	3,366	3,039	1,445	2,905	4,429 <sup>b</sup>	1,815 <sup>b</sup>	2,803 <sup>b</sup>
	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 <sup>b</sup>
Situk River	450	1,050	BEG	2003	2,163	698	595	695	677	413	902	167 <sup>d</sup>	240

Note: NA = data not available.

<sup>a</sup> 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.

<sup>b</sup> Preliminary data.

<sup>c</sup> Inriver goal accounts for inriver subsistence harvest, which averages <100 fish.

<sup>d</sup> 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.**

System	2011 Goal Range		Type	Year Implemented	Escapement								
	Lower	Upper			2003	2004	2005	2006	2007	2008	2009	2010	2011
<b><u>Bristol Bay</u></b>													
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 <sup>a</sup>
Togiak River	9,300		lower-bound SEG	2007	NS	NS	NS	NS	NS	NS	NS	NS <sup>a</sup>	NS
Naknek River	5,000		lower-bound SEG	2007	6,081	12,878	NS	NS	5,498	6,559	3,305 <sup>b</sup>	NS <sup>a</sup>	NS
Alagnak River	2,700		lower-bound SEG	2007	8,209	6,755	5,084	4,278	3,455	1,825	1,957	NS <sup>a</sup>	NS
Egegik River	450		lower-bound SEG	2007	790	579	335	196	458	162	350 <sup>c</sup>	NS <sup>a</sup>	NS
<b><u>Upper Cook Inlet</u></b>													
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 <sup>a</sup>
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 <sup>d</sup>	NA <sup>e</sup>
	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 <sup>d</sup>	NA <sup>e</sup>
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 <sup>f</sup>	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
<b><u>Lower Cook Inlet</u></b>													
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 <sup>g</sup>
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 <sup>g</sup>
<b><u>Prince William Sound</u></b>													
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 <sup>h</sup>

<sup>a</sup> Aerial surveys for Chinook salmon were not flown in 2010 due to poor weather conditions and high water levels.

<sup>b</sup> 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.

<sup>c</sup> 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.

<sup>d</sup> TS-based escapement estimate deemed unreliable.

<sup>e</sup> TS-based escapement estimate not available.

<sup>f</sup> Lewis River diverged into swamp 1/2 mi. below bridge. No water in channel.

<sup>g</sup> Preliminary escapement estimates.

<sup>h</sup> 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.**

	2011 Goal Range			Year	Escapement								
System	Lower	Upper	Type	Imple- mented	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b><u>Kuskokwim Area</u></b>													
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
Kogruklu 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
Cheeneetuk 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
<b><u>Yukon River</u></b>													
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 <sup>a</sup>	Annual	80,594	48,469	67,985	62,630	34,904	33,883	65,278	32,010	46,844
<b><u>Norton Sound</u></b>													
Fish River/Boston Creek	100		lower-bound SEG	2005	240	112	46	NS	NS	NS	67 <sup>b</sup>	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 <sup>c</sup>	91 <sup>c</sup>	74 <sup>d</sup>	150 <sup>c</sup>	412	NS	129 <sup>b</sup>	29	106
Unalakleet/Old Woman River	550	1,100	SEG	2005	168 <sup>c</sup>	398 <sup>c</sup>	510 <sup>d</sup>	NS	821	NS	1,368	1,021 <sup>e</sup>	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.

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> 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.

<sup>d</sup> 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.

<sup>e</sup> 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
<b><u>AK Peninsula</u></b>													
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
<b><u>Chignik</u></b>													
Chignik River	1,300	2,700	BEG	2002	6,412	7,633	6,037	3,175	1,675	1,620	1,590	3,373 <sup>a</sup>	NA
<b><u>Kodiak</u></b>													
Karluk River <sup>a</sup>	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 <sup>b</sup>	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.

<sup>a</sup> 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
<b>CHINOOK SALMON</b>									
Blossom River	Under	Met	Met	Met	Under	Met	Under	Under	Under
Keta River	Met	Met	Met	Over	Met	Met	Under	Met <sup>a</sup>	Under
Unuk River	Met	Met	Met	Met	Met	Met	Met <sup>a</sup>	Over	Met <sup>a</sup>
Chickamin River	Over	Met	Over	Over	Met	Over	Met	Over	Met <sup>a</sup>
Andrew Creek	Met	Over	Over	Over	Over	Met	Under	Met <sup>a</sup>	Met <sup>a</sup>
Stikine River	Over	Over	Over	Met	Met	Met	Under	Met <sup>a</sup>	Met <sup>a</sup>
King Salmon River	Under	Met	Met	Met	Met	Met	Under	Met <sup>a</sup>	Met <sup>a</sup>
Taku River	Met	Over	Met	Met	Under	Under	Met <sup>b</sup>	Met <sup>a</sup>	Met <sup>a</sup>
Chilkat River	Over <sup>c</sup>	Met	Met	Met	Under	Met	Over	Met <sup>a</sup>	Met <sup>a</sup>
Klukshu (Alsek) River	Met	Over	Under	Under	Under	Under	Met	Met <sup>a</sup>	Met <sup>a</sup>
Situk River	Over <sup>b</sup>	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.

<sup>a</sup> Prior to 2009 goal was based on index count of escapements.

<sup>b</sup> 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
<b>Chinook salmon</b>									
<u><i>Bristol Bay</i></u>									
Nushagak River	Over	Over	Over	Over	Met <sup>a</sup>	Over	Met	Met	Met
Togiak River	NS	NS	NS	NS	NS <sup>b</sup>	NS	NS	NS	NS
Naknek River	Over	Over	NS	NS	Met <sup>b</sup>	Met	Under	NS	NS
Alagnak River					Met	Under	Under	NS	NS
Egegik River					Met	Under	Under	NS	NS
<u><i>Upper Cook Inlet</i></u>									
Alexander Creek	Under	Met	Met	Under	Under	Under	Under	Under	Under
Campbell Creek	Over	Over	eliminated			Met <sup>c</sup>	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 <sup>d</sup>	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
<u><i>Lower Cook Inlet</i></u>									
Anchor River	Under	Over	eliminated			Met <sup>e</sup>	Under	Under	Under <sup>f</sup>
Deep Creek	Over	Over	Over	Met	Met	Under	Met	Met	Met
Ninilchik River	Under	Met	Met	Met	Met	Met <sup>g</sup>	Under	Met	Met
<u><i>Prince William Sound</i></u>									
Copper River	Met	Met	Under	Met	Met	Met	Met	Under	Met

Note: NA = data not available; NC = no count; NS = no survey.

<sup>a</sup>Escapement goal reevaluated, point goal changed to a range.

<sup>b</sup>Escapement goal reevaluated, point goal changed to a lower-bound goal.

<sup>c</sup>Previous escapement goal reinstated.

<sup>d</sup>Escapement goal reevaluated, goal range changed.

<sup>e</sup>Escapement goal from 2001-2004 based on aerial surveys, escapement numbers in Table 2 are not comparable.

<sup>f</sup>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									
<u>Kuskokwim Area</u>									
North (Main) Fork Goodnews River	Met	Met	NS <sup>a</sup>	Over	NS	Met	NS	NS	Met
Middle Fork Goodnews River	Under	Met	Over <sup>a</sup>	Over	Over <sup>b</sup>	Met	Met	Met	Met
Kanektok River	Met	Met	Over <sup>a</sup>	Over	NS	Met	NS	Under	NS
Kogruklu River	Met	Met	Over <sup>a</sup>	Over	Met	Met	Met	Met	Met
Kwethluk River	Over	Over	Over	NA	Over <sup>c</sup>	Under	Under	Under	Under
Tuluksak River					Under	Under	Under	Under	Under
George River					Met	Under	Met	Under	Under
Kisaralik River	Under	Met	Over <sup>a</sup>	Over	Met	Met	NS	Under	NS
Aniak River	Met	Met	NS <sup>a</sup>	Over	Over	Over	NS	NS	NS
Salmon River (Aniak R)	Met	Met	Over <sup>a</sup>	NS	Over	Met	NS	NS	Under
Holitna River	NS	Met	Over <sup>a</sup>	Over	NS	Under	NS	Under	NS
Cheeneetnu 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 <sup>a</sup>	Met	Met	Met	Met	Under	Met
<u>Yukon River</u>									
East Fork Andreafsky River	Under	Met	Over <sup>a</sup>	Under	Over	Under	Under	Met <sup>c</sup>	Over
West Fork Andreafsky River	Met	Under	Met <sup>a</sup>	Met	Met	Under	Over	Met	Met
Anvik River	Under	Met	Over <sup>a</sup>	Over	Met	Under	Under	Under	Under
Nulato River	NS	Met	Under <sup>a</sup>	Met	Over	Under	Over	Under	Met
Gisasa River	NS	Met	Met <sup>a</sup>	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 <sup>d</sup>	Met	Met	Met	Met	Met	Under <sup>d</sup>	Met	Under <sup>d</sup>	Met
<u>Norton Sound</u>									
Fish River/Boston Creek	Met	Met	Under <sup>e</sup>	NS	NS	NS	Under	Under	NS
Kwiniuk River	Over	Over	Met <sup>f</sup>	Under	Under	Under	Met	Under	Under
North River (Unalakleet R)	Met	Under	Under <sup>b</sup>	Under	Met	Under	Met	Met	Under
Shaktoolik River	Under	Under	Under <sup>f</sup>	Under	Met	NS	Under	Under	Under
Unalakleet/Old Woman River	Under	Under	Under <sup>f</sup>	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.

<sup>a</sup> Escapement goal reevaluated, lower-bound goal changed to a range.

<sup>b</sup> Escapement goal reevaluated, goal value changed.

<sup>c</sup> Previous escapement goal was based on aerial surveys, replaced with escapement goal based on weir counts. Escapements in Table 3 are weir counts.

<sup>d</sup> Escapement goal revised by The United States and Canada Yukon River Joint Technical Committee (JTC).

<sup>e</sup> Escapement goal reevaluated, goal range changed to a lower-bound goal.

<sup>f</sup> 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									
<u>AK Peninsula</u>									
Nelson River	Met	Over <sup>a</sup>	Over	Met	Met	Over	Under	Met	NA
<u>Chignik</u>									
Chignik River	Over	Over	Over	Over	Met	Met	Met	Over	NA
<u>Kodiak</u>									
Karluk River	Met	Met	Met	Met	Under	Under	Under	Under	Met <sup>a</sup>
Ayakulik River	Over	Over	Met	Under	Met	Under	Under	Met	NA <sup>a</sup>

Note: There are no coho salmon escapement goals in Chignik Area.

<sup>a</sup>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 <sup>a</sup>
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

<sup>a</sup> 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
<b>CHINOOK SALMON</b>		
Blossom River	Peak Aerial Survey <sup>a</sup>	SRA <sup>b</sup>
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

<sup>a</sup> One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.

<sup>b</sup> 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
<b>CHINOOK SALMON</b>		
<u><i>Bristol Bay</i></u>		
Nushagak River	Sonar	SRA <sup>a</sup> , Yield Analysis
Togiak River	Single Aerial Survey <sup>b</sup>	Risk Analysis
Naknek River	Single Aerial Survey	Risk Analysis
Alagnak River	Single Aerial Survey	Risk Analysis
Egegik River	Single Aerial Survey	Risk Analysis
<u><i>Upper Cook Inlet</i></u>		
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
<u><i>Lower Cook Inlet</i></u>		
Anchor River	Sonar, Weir Count	SRA
Deep Creek	Single Aerial Survey	Percentile
Ninilchik River	Weir Count	Percentile
<u><i>Prince William Sound</i></u>		
Copper River	Mark-Recapture	Empirical Observation

<sup>a</sup>SRA = Spawner-recruit analysis.

<sup>b</sup>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
<b>CHINOOK SALMON</b>		
<u>Kuskokwim Area</u>		
North (Main) Fork Goodnews River	Single Aerial Survey <sup>a</sup>	Percentile
Middle Fork Goodnews River	Weir Count	SRA <sup>b</sup>
Kanektok River	Single Aerial Survey	Percentile
Kogruklu 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
<u>Yukon River</u>		
East Fork Andreafsky River	Weir Count	Percentile
West Fork Andreafsky River	Peak Aerial Survey <sup>c</sup>	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)
<u>Norton Sound</u>		
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.

<sup>a</sup>Typically single survey done around time of presumed peak of the run with no expansion of counts.

<sup>b</sup>SRA = Spawner-recruit analysis.

<sup>c</sup>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
<b>CHINOOK SALMON</b>		
<u><i>AK Peninsula</i></u>		
Nelson River	Weir, Peak Aerial Survey <sup>a</sup>	Spawning Habitat Model, SRA <sup>b</sup>
<u><i>Chignik</i></u>		
Chignik River	Weir Count	SRA
<u><i>Kodiak</i></u>		
Karluk River	Weir Count	SRA
Ayakulik River	Weir Count	SRA

<sup>a</sup> One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.

<sup>b</sup> SRA = Spawner-recruit analysis.

## Appendix 2: Description and Analysis of “Rockfish Program PSC Rollover” trailing action alternatives that were not selected for the Council’s final Preferred Alternative (NPFMC 2013)

### Description of Alternatives for the trailing action

- Alternative 1: No action. Council’s initial preferred alternative from the June 2013 meeting will go forward as the final recommendation.
- Alternative 2: The addition of the rollover provision as described in the EA/RIR to the Rockfish Program CV Chinook PSC cap and uncertainty pool.
- Alternative 3: The addition of a provision allowing the rollover of all but 160 Chinook PSC and a Rockfish Program CV uncertainty pool.  
[Staff note: Council clarified that such a rollover would occur on October 1]
- Alternative 4: Rollover all Chinook PSC remaining in the Rockfish Program CV Chinook PSC cap when all Rockfish cooperatives have checked-out of the fishery but no later than November 15, and no uncertainty pool.  
[Staff note: Council clarified that “no uncertainty pool” would only apply to the Rockfish Program CV sector]
- Alternative 5: Roll over all Chinook PSC but ~~50 or 100~~ **150** fish remaining in the Rockfish Program CV sector Chinook cap on October 1. Any salmon remaining when the Rockfish Program fishery closes will be released to the other CV non-pollock fisheries on November 15. No uncertainty buffer would apply to the Rockfish Program CV sector.  
**(Selected for the Council’s final Preferred Alternative for Chinook salmon PSC limits in the GOA non-pollock trawl fisheries)**

#### Alternative 1

Selecting the “no action” alternative would make the Council’s preferred alternative that emerged from the June 2013 meeting the final recommendation for a proposed rule on Chinook salmon PSC limits in the Western and Central GOA non-pollock trawl fisheries. The PA sets a combined annual hard cap at 7,500 Chinook salmon for the three identified harvest sectors as they target non-pollock groundfish species in the regulated areas. Fishing will be closed for a sector if it reaches its apportioned amount of the hard cap. The CP sector will be limited to taking no more than 66% of its annual apportionment prior to June 1<sup>st</sup>. The PA will include the uncertainty pool mechanism, which will be available to all three harvest sectors. Full retention of salmon will be required.

#### Alternative 2

The RIR analyzes an option to roll over some amount of any unused Chinook salmon PSC in the Rockfish Program fishery to the other non-pollock trawl fisheries. The Council’s alternative proposed that such a rollover would occur on October 1, and that the amount would be based on Rockfish Program PSC usage up to that point. Selecting Alternative 2 would add the CV element of that option to the PA, and would not alter the uncertainty pool mechanism described above.

The analysis considered rollovers in the amount of “all but” 200, 300, or 400 of the remaining Rockfish Program Chinook salmon PSC, as of the specified date. This rollover option would have included both the CP and CV sectors, and would have apportioned the year’s rollover amount in the same manner used to apportion the total annual PSC limit between sectors. The Council’s preferred alternative would apportion 52% of allowable Chinook PSC to CVs. Since this alternative would only create a rollover mechanism for the CV fleet, the rollover amounts under consideration are similarly adjusted.

If Alternative 2 were selected, the Council would need to choose one of three potential amounts of the unused Rockfish Program CV Chinook salmon PSC to roll over for use in the fall non-Rockfish Program non-pollock CV trawl fisheries:

- Option 1: All but **104** of the remaining Rockfish Program CV Chinook salmon PSC;
- Option 2: All but **156** of the remaining Rockfish Program CV Chinook salmon PSC;
- Option 3: All but **208** of the remaining Rockfish Program CV Chinook salmon PSC.

Any Chinook salmon PSC taken in the Rockfish Program CV sector between October 1 and November 15 would be debited from the amount of PSC that is not rolled into the non-Rockfish Program fall fisheries – i.e., the pool of between 104 and 208 Chinook salmon.

The Council has not yet clarified whether the rollover amount would be determined according to unused PSC in relation to either the RP CV sector's base apportionment (1,200 Chinook) or, if applicable, the sector's base apportionment plus a 160 Chinook uncertainty buffer carried forward from the previous year (1,360 Chinook). At its October 2013 meeting, however, the Council did note the important difference between these two potential structures. If Alternative 2 is selected, this distinction would need to be made clear during the rulemaking phase. Earning the 160 Chinook uncertainty buffer for the *following* year is contingent upon the RP CV sector taking less than 1,040 Chinook salmon in the current year. Calculating the rollover amount from either 1,200 or 1,360 does not change this fact, but counting from the higher starting point does raise the number of Chinook PSC originating from the RP CV sector's annual allowance that must remain uncaught throughout the entire year from 160 to 320. Calculating the rollover from the higher starting point would likely increase the amount of Chinook PSC that is rolled over to support non-RP fishing on October 1, but the RP CV sector's uncertainty buffer could still be put "at risk" if the entirety of those rolled over Chinook PSC allowances are utilized in the fall.

The actual amount of Chinook PSC to be rolled over in any given year would depend on performance by the Rockfish Program CV fleet, in aggregate. While it is not possible to forecast Chinook PSC levels, Table 22 presents annual PSC outcomes since the implementation of the Rockfish Pilot Program in 2007. The RP CV sector recorded 18 Chinook salmon after October 1 in 2007; in all other years, the sector took all Chinook PSC before the proposed rollover date. Table 23 shows how many Chinook salmon would have been made available to the non-Rockfish Program CV fall fisheries under each of the Alternative 2 options, illustrating the annual variability in PSC levels. These figures provide a sense of how many Chinook salmon were taken in the RP CV sector each year, in relation to the 1,200 Chinook apportioned to the sector in the preferred alternative. The rollover amounts listed in Table 23 would each increase by 160 if the Council specified that "unused" PSC is to be counted in relation to the sector's base apportionment *plus* any 160 Chinook PSC uncertainty buffer that it may have earned in the preceding year. While the fleet took measures to avoid Chinook salmon, it is important to note that a PSC hard cap was not in place, and salmon mitigation was only one among several operating goals.

**Table 22 – Annual Chinook salmon PSC usage by the Rockfish Program CV fleet**

<b>Year</b>	<b>Chinook PSC</b>
2007	483
2008	1,649
2009	773
2010	965
2011	368
2012	817
Average	843

**Table 23 – Historical October 1 Chinook salmon PSC rollover amounts under Alternative 2, had the Alternative been in place from 2007 through 2012**

Chinook PSC rollover			
Year	Option 1	Option 2	Option 3
2007	631	579	527
2008	n/a	n/a	n/a
2009	323	271	219
2010	131	79	27
2011	728	676	624
2012	279	227	175
Average*	418	366	314

\* Includes only years in which a rollover would have occurred

Note: Rollover amounts would increase by 160 if “unused PSC” is to be counted in relation to a starting point of 1,360 Chinook PSC, when applicable.

#### Alternative 3

Alternative 3 is functionally similar to Alternative 2 in that it would, on October 1, allow a portion of unused Chinook PSC in the Rockfish Program CV sector to be rolled over for use in the fall non-Rockfish Program CV fisheries. As above, selecting Alternative 3 would not alter the design of the uncertainty pool mechanism. Alternative 3 would allow the rollover of all but **160** of the remaining Chinook PSC apportioned to the Rockfish Program CV sector. As with Alternative 2, any Chinook PSC occurring in the Rockfish Program CV sector between October 1 and November 15 would be debited against the pool of 160 Chinook salmon that remains with the sector. Table 24 shows how many Chinook salmon would have been made available to the non-Rockfish Program CV fall fisheries between 2007 and 2012; these figures are not significantly different from those under Alternative 2, Option 2. Again, the table figures assume that unused PSC is calculated in relation to the RP CV sector’s base apportionment of 1,200 Chinook PSC.

**Table 24 Historical October 1 Chinook salmon PSC rollover amount under Alternative 3, had the Alternative been in place from 2007 through 2012**

Year	Chinook PSC rollover
2007	575
2008	n/a
2009	267
2010	75
2011	672
2012	223
Average*	362

\* Includes only years in which a rollover would have occurred

Note: Rollover amounts would increase by 160 if “unused PSC” is to be counted in relation to a starting point of 1,360 Chinook PSC, when applicable.

#### Alternative 4

Alternative 4 would allow all Chinook salmon PSC that was not utilized in the Rockfish Program CV sector to be rolled over for use by other non-pollock CVs. This rollover would take place once all RP CV cooperatives have been officially “checked out” of the Program by their respective cooperative manager, or on November 15 – whichever occurs first.

Alternative 4 would also remove the Rockfish Program CV sector from the uncertainty pool mechanism. This is necessary because using *all* of the Chinook PSC rolled over from the RP CV sector to the fall non-Rockfish Program fishery would include the 160 Chinook salmon that the RP CV sector avoided catching in order to earn its uncertainty buffer.<sup>77</sup> Allowing the RP CV sector to access additional Chinook PSC in “Year 2” would essentially reward the Rockfish Program portion of the CV sector for avoiding Chinook that the CV fleet, or a portion of the CV fleet, caught later in the year.

#### Alternative 5

Alternative 5, selected for the Council’s final preferred alternative, combines elements of Alternatives 2 and 4. Like Alternatives 2 and 3, the PPA would create a date-certain October 1 rollover of unused Chinook salmon PSC – less some amount held back – from the RP CV sector to the other non-pollock CV fisheries. The alternative contains two options for the hold-back amount: **50** Chinook salmon (Option 1), or **100** Chinook salmon (Option 2). Like Alternative 4, the PPA removes the RP CV sector from the uncertainty pool mechanism, obviating the need for Chinook PSC allowances to be held back to preserve salmon savings that might be utilized in the form of the following year’s uncertainty buffer. As such, the Chinook PSC that is held back on October 1 serves only to cover any Chinook encounter that occurs within the RP CV sector after the rollover date. Any of the hold-back PSC remaining with the RP CV sector at the end of the RP season (November 15) would be rolled over.

*Note: When the Council took final action on the trailing action (December 2013), this alternative was selected with the modification that **150** Chinook PSC would be held-back at the time of the October 1 rollover.*

**Table 25 – Historical October 1 Chinook salmon PSC rollover amount under Alternative 5, had the Alternative been in place from 2007 through 2012**

<b>Chinook PSC rollover</b>		
<b>Year</b>	<b>Option 1</b>	<b>Option 2</b>
2007	685	635
2008	n/a	n/a
2009	377	327
2010	185	135
2011	782	732
2012	333	283
Average*	472	422

\* Includes only years in which a rollover would have occurred

The RP CV sector has recorded Chinook salmon PSC after October 1 in only one of the six analyzed years. The sector encountered 18 Chinook salmon in October 2007, which would have resulted in a November 15 rollover of 32 or 82 additional Chinook PSC, depending on the option selected. Aside from that year, all 50 or 100 Chinook PSC that were initially held back would have been released to support other non-pollock CV fisheries on November 15.

#### **Analysis of Alternatives for the trailing action**

Each alternative, if selected, could directly affect the amount of Chinook salmon PSC that is available to the GOA non-pollock trawl CV fleet at a given point during the year. The analysis focuses on whether,

<sup>77</sup> 160 = 1,200 – 1,040 Chinook PSC, or the difference between the RP CV sector’s share (16%) of the base PSC limit (7,500) and the sector’s uncertainty pool threshold (6,500).



and to what extent, the considered alternatives increase the likelihood of non-pollock trawl fisheries closing as a result of reaching Chinook PSC limits. The direct impact of any potential closure is roughly measured in terms of when the fishery might close, and how much groundfish is typically harvested by the sector after that point in the season. As before, analysis of potential closures is based on historical PSC data, which varies from year to year without a discernible trend. This analysis reports impacts as they would have occurred if the considered alternatives had been in place, but does not forecast future levels of Chinook salmon PSC.

The downstream effects of a fishery closure, which are no less important, include potential changes in the amount of product delivered to shore-based plants at certain times in the year, changes to employment opportunities at fishery-supporting businesses in GOA port communities, and state and municipal tax revenues. These impacts are treated qualitatively and are detailed in the RIR (Section 4.7).

The considered alternatives would not, under any circumstances, increase the total number of Chinook salmon that are allowed to be taken by the non-pollock CV sector in a given year, relative to the levels analyzed in the RIR. As a result, impacts on non-trawl stakeholders in the Chinook salmon resource are not discussed in detail. However, the RIR notes the importance of Chinook salmon to subsistence, sport, and commercial users, as well as the high cultural value placed on the species (Section 4.7.2). Alternatives that enhance incentives for Chinook PSC avoidance, or that reduce the number of Chinook taken in a given year, may confer a benefit to these non-trawl groups.

#### Alternative 1

##### *Rockfish Program CV sector*

Under the Council's initial June 2013 preferred alternative, the RP CV sector would be allowed up to 1,200 Chinook salmon PSC per year, for use between May 1 and November 15. Considering the uncertainty pool mechanism, the RP CV sector could be allowed up to 1,360 Chinook salmon in a year if it has taken fewer than 1,040 Chinook in the preceding year.

Over the course of the Rockfish (Pilot) Program, the RP CV sector took more than 1,040 Chinook salmon only once, in 2008. The sector recorded 1,649 in that year of particularly high Chinook PSC, which upwardly influences the 2007 to 2012 annual average of 843 Chinook (Table 22). The median value was 795 Chinook per year. During a year when the RP CV sector encounters 795 Chinook, 405 allowable PSC would remain uncaught. Using the sector's highest recorded level of Chinook PSC to gauge the maximum potential impact, the 2008 fishery would have been closed to RP CVs at the end of May. During the remainder of the 2008 fishing year, from June to November 15, the sector produced approximately 5,800 mt of groundfish harvest with an ex-vessel value of \$3.75 million, and a gross first wholesale value to shoreside processors of \$9.9 million.<sup>78</sup> Those revenues, constituting 69% of the \$14.3 million in wholesale value generated that year from the sector's catch, would have been forgone. The average annual gross first wholesale revenue generated from RP CV shoreside deliveries was between \$14 and \$15 million per year, so it is not the case that taking more Chinook salmon produces greater harvest value. In fact, in May of 2008, when the sector encountered 1,187 Chinook salmon, the revenue generated was below the average monthly revenue for May. In short, the RP CV sector has little incentive to fish in a PSC-intensive manner, even if a PSC hard cap is not in effect. Choosing not to avoid Chinook salmon could reduce costs that are associated with relocating or increasing gear selectivity, but gross harvest revenues would not be expected to increase.

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<sup>78</sup> Using the "characteristic year" method, described in Section 4.7.1.2 of the RIR, forgone RP CV harvest from June through mid-November would equal roughly 5,700 mt of groundfish, valued at around \$10 million first wholesale.

RP CV cooperatives have reported taking proactive steps to reduce Chinook salmon PSC levels by changing the timing of their fishing activity. While some CVs have always harvested their rockfish quota in June and July, the majority of CV Program participants have historically focused effort in May and June. Inter-cooperative management reported that the RP CV sector took a voluntary two week standdown during late May 2013, in response to concerns about Chinook PSC rates.<sup>79</sup> Under the no action alternative, such Chinook avoidance efforts could push rockfish harvest to late summer or early fall. These efforts may affect individual vessels differently. For example, vessels that have tendering contracts or shipyard time scheduled for early June may end up harvesting rockfish later in the year if a PSC standdown occurs during May. Similarly, RP CVs that hold AFA endorsements would likely choose to relocate to the Bering Sea around June 10, holding off on GOA rockfish harvest until later in the year.

#### *Non-Rockfish Program CV sector*

If the Council chooses the no action alternative, the non-RP CV sector would be limited to 2,700 Chinook salmon PSC for the entirety of its GOA non-pollock trawl activity. The non-RP CV sector has, on average, taken 2,234 Chinook salmon per year since 2007, with a median value of 1,944 per year. The sector's Chinook encounter is concentrated from March to May, when the predominant target fisheries are arrowtooth flounder and rex sole, and in September and October, during the Pacific cod B season and the beginning of the fall shallow water flatfish fishery. Historical PSC use from June through August has been very low.

If future outcomes resemble the non-RP CV sector's experience from 2007 to 2012, fishery closures may occur in years of above average Chinook PSC encounter. The sector exceeded the 2,700 Chinook salmon PSC cap that would be imposed under the Council's initial June 2013 PA in both 2010 and 2011. Closures would have occurred during those years at the beginning or the middle of October. Had the non-RP CV fishery closed in those years, the sector would have forgone between 4,500 mt and 7,700 mt of groundfish harvest. The ex-vessel values associated with these endpoints were \$1.1 million and \$4 million, and the gross first wholesale revenues to shoreside processors were \$3.2 million and \$9 million. The greatest observed impact would have resulted from the 2011 closure at the beginning of October, which affected 59% of Pacific cod B season production (4,300 mt, \$6 million first wholesale). The 2010 closure would have resulted in far less forgone revenue because the Pacific cod B season finished in late-September of that year, though a September finish is not always the case. The timing of the cod fishery depends somewhat on the timing and location of GOA pollock trawl fishing. The method utilized in the RIR allows the analysis to move away from some of the year-to-year variation in the timing of harvest and PSC by assessing retrospectively simulated closure dates against the level and timing of fishing outcomes in a "typical" year for the sector. Applying that method here, the potential impact of the Council's June 2013 PA in a high-Chinook PSC year would be on the order of 5,600 mt of forgone groundfish harvest, causing the loss of around \$2.6 million in ex-vessel value and \$5.7 million in gross first wholesale revenue to shoreside processors.<sup>80</sup>

Under the uncertainty pool mechanism, the non-RP CV sector could qualify for an additional 360 Chinook salmon PSC if it recorded fewer than 2,340 Chinook in the preceding year. Expanding the allowable amount of Chinook PSC by 360 would not have kept the sector's fall fisheries open for the entirety of its highest PSC years. However, if the sector was approaching its base apportionment of 2,700 Chinook around the beginning of September, the additional PSC would likely have forestalled closure by four to six weeks at the beginning of the valuable Pacific cod B season. The sector's typical weekly PSC

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<sup>79</sup> Personal communication. Alaska Groundfish Data Bank, October 2013.

<sup>80</sup> Recall that ex-vessel and first wholesale values are not additive, as ex-vessel prices paid to CV harvesters are a cost to shoreside processors. The two figures are presented in order to provide more resolution on both the specific impact on harvesters and the general economic impact on communities at the processing level.

during that time of the year is around 50 Chinook, and average weekly wholesale revenues are relatively high – around \$1 million – when that season opens. In practice, it is difficult to predict the point during a calendar year at which the non-RP CV sector might tap into its uncertainty buffer, though it is not unlikely that sector members would cooperate to save the last of the remaining non-pollock PSC apportionment for the Pacific cod B season opener. If the sector made it through the Pacific cod B season on its base apportionment of PSC (2,700) but reached the limit in early or mid-October, the supplemental uncertainty buffer earned in the previous year would likely extend the fishing season by only two or three weeks, as average weekly PSC increases to around 150 Chinook salmon once shallow water flatfish activity predominates. Again, the timing of GOA fall fisheries is difficult to predict; in recent years, the starting date for the fall Pacific cod season has been affected by voluntary cooperative decisions to delay the start of the pollock C season in order to reduce Chinook PSC in that hard-capped fishery.

Table 26 shows the non-RP CV sector's historical Chinook PSC usage and groundfish harvest during the months of October, November and December; these are the months that would have been closed to fishing in 2010 and 2011, and also the months that could be funded with some amount of additional PSC rolled over from the RP CV sector under the action alternatives. As with other GOA time series data, the sector's post-September PSC usage and groundfish harvest vary widely, with no discernible trend or correlation. Taking past measures of central tendency as an indicator, the non-RP CV sector might expect to need around 900 Chinook salmon PSC in order to fully prosecute the fall non-pollock fisheries (Pacific cod and flatfish) at historical levels, meaning that it should limit PSC usage in the spring and summer to around 1,800 Chinook. However, in the highest instances of late-year PSC (2009 and 2010), the sector would have needed to limit early-year usage to around 1,000 Chinook salmon. Pre-October PSC usage in the sector was greater than 1,000 Chinook salmon in three of the six analyzed years (2007, 2010 and 2011), ranging between 1,612 and 2,582.

**Table 26 – Chinook salmon PSC and groundfish harvest (mt) in the GOA non-Rockfish Program CV sector taken from October to December**

	2007	2008	2009	2010	2011	2012	Average
Chinook PSC	257	208	1,776	1,620	967	519	<b>891</b>
Groundfish Harvest	3,379	7,221	4,606	4,627	3,549	6,076	<b>4,910</b>

With a hard cap of 2,700 Chinook salmon PSC and no potential rollover, the non-RP CV sector's ability to make deliveries in the fall could hinge upon its ability to limit PSC in April and May. The sector would not likely face a fall closure if spring PSC conforms to the historical monthly average levels, which combine to equal 850. As with other historical records, annual spring PSC is highly variable around this average, ranging from zero Chinook salmon in 2012 to 2,156 in 2010. As before, years of high spring PSC do not correspond to years of the higher groundfish (flatfish) harvest.

Looking to the future, forthcoming changes in trawl halibut PSC management could increase spring Chinook salmon PSC in the non-RP CV sector relative to historically observed levels. Spring trawl harvest has typically been constrained by the second season limit on trawl halibut PSC, during which the CV and CP sectors share 395 mt of halibut mortality over the April 1 to July 1 period. In the past, 296 mt of this seasonal limit has been apportioned to the deep-water complex, which includes rockfish, arrowtooth flounder and rex sole. Halibut PSC closed the deep-water complex to trawl fishing in June of every analyzed year (2007 to 2012). The complex was closed for the latter half of May 2007, and for all of May from 2008 to 2012. In addition, the complex was closed for the final weeks of April in every year except for 2007. These closures effectively reduced Chinook salmon PSC levels by stopping the arrowtooth flounder and rex sole target fishery for a significant portion of each spring. Upon the implementation of the proposed rule for GOA Amendment 95 (revised halibut PSC limits), the halibut PSC available for the second season deep-water and shallow-water complex may be combined and used

in either complex from May 15 to June 30. This change is likely to increase the amount of halibut mortality available to flatfish trawlers in May and June, and, by extension, could result in additional Chinook salmon PSC being caught and debited against the non-RP CV hard cap. Any such increase has the potential to exacerbate the effects of a potentially constraining sector hard cap that would be experienced in the fall. As a result, the likelihood of fall closures may increase, as could the maximum potential closure impacts noted above.

Whether or not these impacts are realized depends partly upon unpredictable natural variation in Chinook salmon PSC, but also upon the private incentives and business decisions of the vessels involved in the non-RP CV fisheries. Thirty-three of the 72 vessels that were active in the GOA non-pollock trawl fishery at some point since 2007 displayed no participation in the fall non-pollock fisheries, though 19 of those 33 vessels did fish for pollock after September. These vessels may have a low incentive to alter their fishing behavior or refrain from expanding their spring flatfish harvest in order to reserve available PSC for the end of the year.<sup>81</sup>

Should the non-RP CV sector of the GOA non-pollock fishery be closed on PSC, vessels could shift effort to other fisheries. Fifty-seven of the 71 vessels that have participated in the non-RP fishery since 2007 have fished for pollock in the fall seasons. Thirty-nine CVs fished pollock in 2012, though five of those vessels were not involved in any GOA non-pollock fisheries. Twenty-three non-RP CVs are endorsed to fish Bering Sea pollock as part of AFA cooperatives.<sup>82</sup>

## Alternative 2

Alternative 2 would mesh the uncertainty pool mechanism defined in the Council's June 2013 preferred alternative with the rollover provision that was considered at that meeting but not advanced (identified in this document as Alternative 2, Option 4, Suboption 2). The rollover provision would, on October 1, shift some portion of the remaining Rockfish Program CV sector's Chinook salmon PSC apportionment to the non-RP CV sector. Alternative 2 is based on the rollover provision as it is presented in the RIR, which considers a GOA fleet-wide rollover of all unused Chinook PSC from the RP CV sector, *less* either 200, 300 or 400 Chinook. For its final preferred alternative, the Council is only considering a rollover to the CV sector of the non-RP fisheries, so those "hold back" amounts are adjusted in accordance with the non-pollock CV sector's total apportionment of the allowable PSC – 52%, based on historical PSC usage from 2007 to 2011. This adjustment results in three potential October 1 rollovers to consider: (Option 1) all but 104 of the unused RP CV Chinook PSC; (Option 2) all but 156 of the unused RP CV Chinook PSC; and (Option 3) all but 208 of the unused RP CV Chinook PSC. Any remaining PSC that is *not* rolled into the non-RP CV sector on October 1 remains available for use during fishing that occurs under the authority of a RP cooperative between October 1 and November 15.

The general impact of an annual Chinook salmon PSC limit for the RP CV sector is described above (see Alternative 1). Reincorporating the rollover provision introduces an element of strategic behavior into the RP cooperatives' business planning. By and large, vessels participating in the RP CV fishery also participate in the fall non-pollock trawl fisheries. As such, those RP vessels have an interest in ensuring that sufficient Chinook PSC is available to target Pacific cod and flatfish in the post-September months.

Table 22 reports the amount of Chinook salmon PSC taken by the RP CV sector in each historical year, and the annual average over the analyzed period (843 Chinook). Had any of the Alternative 2 options been in place from 2007 to 2012, there would have been an October 1 rollover of PSC to the fall non-RP

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<sup>81</sup> The analyst does not have access to vessel co-ownership information that could reveal whether or not any of the vessels that do not depend on fall harvest might have a shared business interest in the success of the late-year GOA trawl fisheries.

<sup>82</sup> The B season for AFA catcher vessels runs from June 10 to November 1, though fleet activity primarily starts in September due to pollock size distribution, and sometimes slows during October because of high Chinook salmon PSC rates.

CV fishery in all but one year. For each option, Table 23 gives the amount of the rollover that would have occurred, and the period average rollover amount. Aside from one year of particularly high Chinook PSC in the RP CV sector (2008), the average rollover to the fall non-RP CV sector would have been between 314 and 418 Chinook PSC, depending on the selected option. The maximum rollover in any year would have been 728 Chinook PSC, observed under Option 1. The minimum rollover (excluding the year in which the RP CV sector would have used its entire 1,200 Chinook PSC limit) would have been 27 Chinook PSC, observed under Option 3. Noting that the non-RP CV sector averages 891 Chinook PSC after October 1, with wide annual variability around that figure, it is unlikely that the rollover, by itself, could be relied upon to fully meet fall PSC demand in all years.

Depending on pre-October Chinook encounter in the non-RP CV sector, and how much PSC remains from the sector's base apportionment – 2,700 or 3,060 depending on whether or not the sector is carrying a 360 Chinook uncertainty buffer from the previous year – the October 1 rollover could extend the Pacific cod B season and fall flatfish fisheries. Historical weekly PSC levels provide a rough measure of how long a rollover might extend the fishery. If, after receiving the rollover, the non-RP CV sector initially targets Pacific cod, weekly PSC might be on the order of 50 Chinook salmon and the fishery would stay open for at least a month. This might be the case if the non-RP CV sector was closed on PSC during September and is waiting for the rollover to open the Pacific cod fishery. If the non-RP CV sector uses the rollover to target flatfish, or a mix of flatfish and Pacific cod, weekly PSC might be closer to 150 Chinook and the fishery would be extended by around one to three weeks.

Given the unpredictability of annual Chinook salmon encounter, further exploring the permutations of rollover amounts provides little insight. It is sufficient to say that if Chinook salmon PSC in the RP and non-RP CV sectors is low, the RP sector will prosecute the Program fishery in much the same way as it has done historically – that is, avoiding Chinook and halibut PSC to the extent practicable, while focusing on fully harvesting TACs for the primary and secondary managed species that are allocated to the Program. If Chinook PSC in the RP sector is low or average, and PSC in the non-RP sector is high, the RP CV sector would likely continue prosecuting the Program fishery as it has done in the past, with moderate confidence that the rolled over amount of Chinook PSC – on the order of 250 to 550 Chinook salmon, based on the 25<sup>th</sup> and 75<sup>th</sup> percentiles of the historically simulated rollovers – should be sufficient to see the fall non-RP fishery through the valuable Pacific cod B season. Finally, if Chinook PSC is high in both the RP and the spring/summer non-RP fishery, the RP CV sector will face a business decision at the inter-cooperative level, where the marginal benefit of RP harvest will be weighed against some marginal amount of Pacific cod and flatfish harvest. Trading-off one valuable harvest opportunity for another would seem to be a “zero-sum” decision. However, given the nature of a hard-capped fishery, this situation would likely result in greater net benefits during a high PSC year than are available under the “no action” alternative, where the fleet has no second-best solution in seeking an agreeable balance between harvest opportunities in the two fisheries.

A subset of the CV fleet does not participate in the fall non-pollock fisheries; these are overwhelmingly non-RP vessels (one vessel with this participation history spent a single year in the Rockfish Pilot Program). It might be the case that these vessels will fish in a manner that maximizes spring and summer flatfish harvest at the cost of additional Chinook PSC debited against the non-RP CV apportionment. It also bears repeating that the implementation of Amendment 95 could increase non-RP CV sector flatfish harvest – and Chinook PSC – during May and June. If this behavior does emerge, the RP CV sector might feel a burden to “provide” a rollover to support fall fishing. That feeling could re-order some of the priorities in Rockfish co-op management. For example, temporary standdowns to avoid Chinook could slow deliveries to shore-based processors during May and June, even though increasing product flow stability during those months was among the Program's original management goals. The likelihood of this behavior in the non-RP CV sector may depend on the business relationships and ownership linkages between the vessels that do and do not depend on fall fisheries. Such information is not publicly available,

so this report does not speculate on whether this will occur. This potential challenge is more a symptom of the hard cap management structure that has already been determined, than of the considered rollover provision. If anything, allowing a rollover creates at least some possibility of relief for vessels that depend on fall fishing if a race for PSC does emerge.

#### *Interaction of Alternative 2 with the “uncertainty pool” mechanism*

In considering a rollover provision, the Council expressed that the integrity of the annual Chinook PSC hard cap, as envisioned under the uncertainty pool mechanism, should be maintained. Under Alternative 2, the RP CV sector can earn an uncertainty buffer of 160 Chinook salmon to be carried forward into the following year. A key stipulation of the uncertainty pool mechanism is that a sector’s average Chinook PSC over a number of consecutive years must not exceed its base PSC apportionment, which is 1,200 Chinook for the RP CV sector. If the RP CV sector carries over 160 Chinook into Year 2, and then uses that extra allowance in a high-PSC year, then those 160 fish *must* have been truly “saved” in Year 1.

If the Council selects Options 1 or 2 to Alternative 2, only 104 or 156 of the RP CV sector’s unused Chinook PSC would be held back, and the rest would roll over for potential use during the fall. These options allow for a larger rollover amount than Option 3, but they could create scenarios where the some of the RP CV sector’s avoided PSC – for which the sector earned a Year 2 uncertainty buffer – is then caught during the non-RP CV fall fisheries during Year 1. Consider an example where the RP CV sector takes 1,000 Chinook salmon – a high PSC year relative to historical levels, but low enough to qualify for its proportional share of the uncertainty pool in Year 2 (160 Chinook); the RP CV sector then utilizes its full base apportionment plus the earned uncertainty buffer in Year 2 (1,360 Chinook). The RP CV sector would have avoided 200 Chinook PSC in Year 1, relative to its 1,200 Chinook annual hard cap. The non-RP CV sector would have received a rollover of either 96 Chinook (Option 1) or 44 Chinook (Option 2). However, if more than 40 of those rolled-over Chinook are taken, the non-RP CV sector would be dipping into the 160 PSC that the RP CV sector avoided in Year 1 and then utilized in Year 2. Allowing this to happen would violate the Council’s intent that the sector’s average PSC usage over consecutive years be less than or equal to 1,200 Chinook. The only available resolution is that the RP CV sector would have to “lose” its Year 2 uncertainty buffer as soon as the fall fisheries took more than 40 of the rolled-over Chinook. Repeating this logic in a second example: if the RP CV sector took 800 Chinook PSC in Year 1 – again qualifying for the 160 Chinook uncertainty buffer in Year 2 – the non-RP CV sector would need to utilize no more than 240 of those rolled-over Chinook PSC allowances in the fall non-pollock fisheries, even though the rollover amount that it received was 296 Chinook (Option 1) or 244 Chinook (Option 2). At the October 2013 meeting, the Council reviewed several inter-sector PSC transfer methods that might restore the RP CV sector’s Year 2 uncertainty buffer in the case where the fall non-RP fisheries used all of the rolled-over PSC. Ultimately, it became clear that those proposed methods would provide only a small increase in available PSC, while potentially advantaging individuals who participate in fall fisheries at a cost to others, and imposing a high programming burden on NMFS management.

Summarizing to this point, if there is a possibility that the non-RP CV fishery will use *all* of the Chinook PSC available to it – its 2,700 Chinook base apportionment, any uncertainty buffer that it may be carrying from the year before, and any October 1 rollover that it receives from the RP CV sector – then the integrity of the RP CV sector’s uncertainty buffer is best maintained by selecting a rollover option that holds back at least 160 Chinook PSC. This would be accomplished under Option 3 to Alternative 2 (roll over “all but 208” unused Chinook PSC).

Selecting Option 3 does have a downside in that a PSC rollover might not occur in years when it would have if another option had been selected. If the RP CV sector has taken at least 1,041 Chinook salmon by October 1, then it is assured that the sector will not qualify for a 160 Chinook uncertainty buffer in the

following year. As a result, double-counting PSC in that year's fall non-RP fishery and the next year's RP uncertainty buffer is not an issue. Consider an example where the RP CV sector takes 1,050 Chinook salmon and no Year 2 uncertainty buffer is earned. Only 150 Chinook have been avoided, and none could be rolled over under Option 3 (or Option 2, for that matter). Under Option 1, however, the fall non-RP CV fishery could receive 46 Chinook to support additional fishing after October 1, and there would be no risk of that PSC being "re-used" in the following year's RP CV fishery. This circumstance where Option 1 is superior to Option 3 can only occur if the RP CV fishery takes between 1,041 Chinook (no uncertainty buffer earned) and 1,095 Chinook (nothing left to roll over under Option 1). This is a rather narrow window of possibility, and the rollover's marginal benefit to the non-RP CV sector diminishes substantially as the RP CV sector's PSC use gets close to 1,095.

Finally, the Council may wish to consider whether the amount of PSC that is not rolled over (104, 156 or 208 Chinook salmon) is sufficient to support October and November activity in the RP CV sector. The sector's historical PSC usage after the rollover date was very low during the analyzed years. The period average was three Chinook per year, which represents 18 Chinook PSC in one year and zero in the other five. However, randomly high PSC events could occur in the future. Late-summer and fall PSC could increase relative to historical levels if RP harvest shifts to later in the year as a result of early-season standdowns, or if rockfish harvesters are slowed by processors that are unable to take groundfish deliveries during a particularly busy salmon harvesting season.

### Alternative 3

The Council chose to consider holding back precisely 160 Chinook salmon in the RP CV sector because that is the amount of Chinook in the sector's uncertainty buffer. Keeping those 160 Chinook allowances within the sector prevents a scenario where the PSC that is marked for possible use in case of high-PSC during the following year is, instead, caught by the non-RP CV sector in the fall.

Alternative 3 and Option 2 to Alternative 2 differ only in that Alternative 3 requires four additional Chinook salmon PSC to remain with the RP CV sector at the time of the October 1 rollover. As such, the potential impacts on fleet behavior and Chinook avoidance incentives are much the same as those described in the previous section. In short, most RP CVs participate in the non-RP fall fisheries, so they have an incentive to preserve a viable rollover to support that activity. On the other hand, a significant number of non-RP CVs do not participate in the fall at all, and therefore have little cause not to fish up to their sector's base apportionment of 2,700 Chinook by the end of the spring flatfish season. Those vessels have equally little incentive to limit Chinook PSC to the non-RP CV sector's uncertainty pool threshold (2,340), since the benefits of any Year 2 uncertainty buffer are most valued in the fall. In broad terms, the responsibility for keeping the post-September fisheries open could fall on the RP CV sector, forcing the cooperatives to make a harvest-for-harvest trade-off decision. This situation could pose challenges in years of high PSC, and the vessels that are most likely to be impacted are those that depend upon fall Pacific cod and flatfish revenues. That said, these relative advantages and disadvantages are mainly the effect of hard cap PSC limits in general, and incorporating a rollover mechanism is likely to at least provide the fleet with a tool to mitigate the negative impacts of high PSC years.

Table 24 shows how much Chinook PSC would have rolled over to the non-RP CV sector on October 1 under Alternative 3 in each year since implementation of the Rockfish (Pilot) Program. A rollover would have occurred in all but the single highest PSC year for the RP CV sector. The historical rollover amounts ranged between 75 and 672 Chinook PSC. Excluding the year when no rollover would have occurred, the average amount made available to the non-RP CV fall fisheries was 362 Chinook salmon. The median rollover amount would be around 250 Chinook salmon, depending on whether or not the year of abnormally high RP CV PSC is taken into account. As noted in the previous sections, the extent to which a rollover would prolong the fall non-RP CV sector's activity depends on how many Chinook salmon that

sector has encountered up to October 1 in a given year. Earlier sections of the analysis noted that weekly PSC averages around 50 Chinook salmon when the non-RP CV sector is focused mainly on Pacific cod, and increases to around 150 Chinook salmon when flatfish effort increases. It also bears repeating that future spring and summer Chinook salmon encounter in the non-RP CV sector might increase, as changes to the halibut PSC regulations would create new opportunities to extend April flatfish activity into May and June. This change in historical effort patterns could increase the fall fisheries' reliance on a rollover from the RP CV sector.

Rolling over all but 160 of the RP CV sector's allowable PSC to another sector on October 1 brings the RP CV sector right up to its annual threshold for earning the uncertainty buffer in the following year. Consider the example where the RP CV sector takes 1,000 Chinook salmon before October 1. If all but 160 of the remaining 200 Chinook PSC allowances are rolled into the non-RP CV sector, the next Chinook recorded on a Rockfish Program trip would bring the sector's remaining PSC to 159. The RP CV sector would lose the marginal insurance of the uncertainty buffer in the following year, even though only 1,001 Chinook salmon PSC were recorded while fishing within the Rockfish Program.

#### Alternative 4

Under Alternative 4, the Rockfish Program catcher vessel sector could roll over the entirety of its unused Chinook salmon PSC to the non-RP CV sector. There would be no "hold back" requirement, because selecting Alternative 4 removes the RP CV sector from the uncertainty pool program defined in the Council's existing preferred alternative. Without a Year 2 uncertainty buffer to protect from potential double-counting, there is no reason to strand unused Chinook PSC in the RP CV sector, unless it is the Council's intention to build in possible a PSC retirement. Noting that the Council's PA set the total GOA CV Chinook PSC apportionment at a level meant to accommodate the operational type sector's average annual PSC usage – if not its usage in the highest PSC years – without arbitrarily disadvantaging one CV sector relative to the other, this analysis presumes that the entire combined CV apportionment of 3,900 Chinook salmon per year is intended to support historical harvest opportunities to the extent possible.

The primary motivation for removing the RP CV sector from the uncertainty pool mechanism is to facilitate the full rollover of all unused PSC. Historical PSC levels in the sector (average of 843, median of 795) suggest that a rollover is likely to occur in most years. Furthermore, the PA apportions the RP CV sector more "excess" PSC, relative to its annual average, than it does for the other GOA non-pollock trawl sectors. In a future year that conforms to historical measures of central tendency, one might view the RP CV sector's Chinook PSC allowance as over-funded – potentially at the expense of the fall fisheries. Fishery participants, particularly those who are active in the fall, are likely to benefit more from maximizing the size of the Chinook PSC rollover than from ensuring the RP CV sector's opportunity to receive a 160 Chinook uncertainty buffer in a subsequent year. As noted above, recent history suggests that the RP CV sector will only benefit from its uncertainty buffer in the rare years that its PSC level is greater than 1,200. By contrast, it is more likely that the prosecution of fall Pacific cod and flatfish fisheries will depend on full use of annual Chinook PSC allowances; this likelihood might increase even more as new regulations for halibut PSC could increase flatfish trawling in the late spring and early summer.

As discussed in the RIR, managing Chinook salmon encounter with hard caps carries an inherent perverse incentive to utilize PSC up to the limit. The uncertainty pool mechanism was, in part, included in the Council's PA to lower the level of Chinook PSC up to which a sector would be indifferent. One must at least acknowledge the possibility that, without the uncertainty buffer incentive, the RP CV sector would be just as well off taking all of the 1,200 Chinook salmon it is permitted as it would be when limiting Chinook PSC to the greatest extent practicable. However, this analysis suggests that the RP CV sector is likely to actively avoid Chinook PSC and provide a rollover. On average, 87% of the CVs that are active



in the Rockfish Program also participate in the non-RP fall fisheries; those that do not fish in the fall still have an interest in maintaining positive business relationships with their cooperative partners.

Moving forward under the assumption that RP CVs generally have a vested interest in making PSC available to the fall Pacific cod and flatfish fisheries, the cooperatives' greatest challenge under Alternative 4 would be determining when to execute the rollover. The alternative states that the rollover will occur either when all RP cooperatives have checked out of the fishery or on November 15, whichever comes first.

Historical cooperative management decisions are not informative about *when* co-ops would prefer a coordinated end to Rockfish Program fishing, because they have had no reason to do so in the past. Under existing regulations, there is no incentive to conclude the RP season early unless halibut PSC is constraining the post-September (5<sup>th</sup> halibut PSC season) non-RP fishery. If it were, RP cooperatives could check out – one at a time, if others were still active in the Program fishery – and roll 55% of their unused halibut PSC into the unapportioned halibut mortality limit for the October 1 through December 31 period. Since the (Pilot) Program was implemented in 2007, the RP has not approached its own limit for halibut mortality<sup>83</sup>, and post-September halibut PSC has never been so constraining that all of the cooperatives had to check out of the Rockfish Program.

The timing of any coordinated check-out by the RP CV cooperatives would be determined by three factors: (1) the amount of allocated RP harvest quota remaining at a given time; (2) the amount of Chinook PSC remaining in the non-RP CV sector's apportionment, which is largely determined by the amount of Chinook salmon taken in the spring flatfish fishery; and (3) the anticipated start date for the Pacific cod B season, or the related start date for the pollock C season.

The first factor is fairly straight-forward, as harvest of rockfish and its secondary species is highly valued. Given the fact that *all* RP cooperatives must check out in order to roll over Chinook PSC, it is possible that one cooperative could hold up the rollover in order to finish harvesting its RP quota. If this issue were to arise, it would likely force an inter-cooperative decision in September, when both pollock and Pacific cod fisheries could potentially be open. If the need for a rollover looks imminent, cooperatives are more likely to shift their Program harvest to earlier in the year, as opposed to leaving it unharvested. The RP CV sector historically lands around 800 mt of groundfish in September, 475 mt in October, and 300 mt in November (from a total average annual sector harvest of 9,200 mt). Shifting this harvest to earlier in the summer could impact processor operations, where predictability and distribution of product delivery over time are not only among the objectives of the Rockfish Program, but also important to employment patterns, product value and profitability. Pressure to harvest earlier in the year could particularly impact vessels whose annual business plans depend on tapping other revenue streams in June, such as tendering contracts or harvesting AFA pollock in the Bering Sea. The PSC impact of moving up RP harvest to accommodate an earlier rollover are not clear; Chinook PSC rates in the Program tend to be lower in July and August than in September, but racing to harvest rockfish quota quickly could carry a marginal trade-off in efforts made to avoid Chinook salmon.

The second factor can be gauged using historical data, with the caution that seasonal PSC usage patterns have varied greatly from year to year. In a characteristic year, the non-RP CV sector uses 930 Chinook PSC by the end of April, and 1,141 by the end of August. Neither one of those benchmark levels would raise concern in the RP CV sector about the need to terminate the Program fishery early in order to support the opening of the Pacific cod B season. However, the non-RP CV sector's cumulative PSC use at the end of April has ranged from 148 Chinook salmon (2007) to 2,516 (2011). This is notwithstanding the possible future increase in Chinook PSC encounter during May and June, which have typically been

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<sup>83</sup> The highest level of halibut PSC in the RP fishery was 87 mt of the 191.4 mt allocated, in 2012.

periods of very low PSC use. The non-RP sector's cumulative PSC use at the end of August has ranged from 216 Chinook salmon (2009) to 2,575 (2011). If the RP CV sector experiences negative effects from shifting or curtailing its harvest in order to fund PSC demand in the fall fisheries, it is likely because the non-RP CV sector recorded high PSC rates in the spring. If those high PSC rates were the result of either increased effort or revenue-maximizing PSC-intensive practices, then one might conclude that the non-RP participants who do not fish in the fall expropriated rents from the rest of the CV fleet.

If, by the end of August, the non-RP CV sector has used most or all of its base PSC apportionment and any uncertainty buffer that it is carrying from the previous year, pressure on the RP CV sector to check out of the Program fishery and roll unused PSC into the non-RP sector would increase. The Pacific cod fall fishery does not always begin on the September 1 opening date defined in regulation. Sometimes actions are coordinated with the pollock C season, which may itself coordinate a voluntary standdown during late August and early September to avoid high PSC rates or to negotiate with processors on an ex-vessel price. A delayed start might not necessarily affect the total season's harvest value as long as the TAC is eventually harvested, but it could disrupt planned product flows from processors to markets. The fishery could lose some amount of harvest efficiency if the fleet is ready to begin the pollock season, but retention of Pacific cod is still restricted due to Chinook PSC, and awaiting a rollover from the RP sector.

#### Alternative 5

The Council selected Alternative 5 for its final Preferred Alternative for PSC limits in the GOA non-pollock trawl fisheries. The impacts of this alternative are described in Section 4.9 of the RIR.

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# **Finding of No Significant Impact for the Environmental Assessment for Chinook Salmon Prohibited Species Catch in the Gulf of Alaska Non-Pollock Trawl Fisheries**

**August 2014**

National Marine Fisheries Service

National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of “context” and “intensity.” Each criterion listed below is relevant in making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ’s context and intensity criteria. These include:

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

No. No significant adverse impacts on target species were identified. Under any of the action alternatives, a reduction in prohibited species catch (PSC) may result in the Gulf of Alaska (GOA) non-pollock groundfish trawl fisheries closing before the total allowable catch (TAC) is reached, while a higher PSC limit would allow for most GOA groundfish fisheries to operate at current levels in most years with little 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 (EA Section 3.2).

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

No. All of the action alternatives analyzed in the EA propose PSC limits for Chinook salmon in the Western and Central GOA non-pollock groundfish trawl fisheries. To the extent that Chinook salmon PSC is controlled or reduced as a result of the alternatives, 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 all the action alternatives 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 (EA Section 3.2).

- 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 any of the action alternatives on ocean or coastal habitats or essential fish habitat (EFH). The impact of the GOA non-pollock groundfish trawl fisheries on benthic habitat is unlikely to change substantially as a result of the alternatives analyzed because PSC limits are unlikely to change the general footprint of the fishery. The implementation of a lower PSC limit compared to the status quo may result in the non-pollock groundfish trawl fisheries closing before

the TACs are reached, which is likely to reduce overall impact on benthic habitat (EA/RIR/IRFA Section 3.6 and 3.7).

*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 proposed action under the Preferred Alternative will not change fishing methods (including gear types), nor will it substantially change timing of fishing, which is largely dictated by Steller sea lion protection measures (EA/RIR/IRFA Section 7.1).

*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 no significant impacts from the Preferred Alternative are anticipated for ESA-listed species (marine mammals, seabirds, and salmon), designated critical habitat, and unlisted marine mammals. The only critical habitat designated for ESA-listed species in the GOA is for Steller sea lions and Cook Inlet beluga whale. The Preferred Alternative would not change the Steller sea lion protection measures, ensuring the action would not 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 any of the alternatives in a way 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. Through informal ESA consultations with Protected Resources Division, Alaska Region and West Coast 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 have no effect beyond those effects analyzed in previous section 7 consultations. Therefore, the proposed action would not affect ESA-listed species or their designated critical habitat (EA Section 3.4 and RIR Section 4.9).

NMFS determined that fishing activities conducted under this action will have no adverse impacts on marine mammals because the PSC limit for Chinook salmon in the non-pollock trawl fisheries may 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). In addition, Chinook salmon PSC limits may increase the availability of groundfish species to marine mammals if the limits curtail groundfish fisheries prior to the seasonal groundfish TACs being reached.

*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 any of the alternatives analyzed in the EA. No significant effects are expected on biodiversity, the ecosystem, marine mammals, or seabirds, as overall the GOA non-pollock groundfish trawl fleet is constrained in the location and timing of the fishery by regulatory constraints (EA Chapter 3).

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

No. Socioeconomic impacts of the alternatives analyzed would result from the potential that the non-pollock groundfish fisheries will be closed before TACs are achieved or additional costs associated with voluntary efforts of the fleet to avoid areas with high PSC rates. These impacts are a direct result, for any of the alternatives, of imposing PSC limits on the fisheries and are independent of the natural or physical

effects and not expected to be significant on the physical environment. Beneficial but not significant 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 (RIR Section 4.9 and IRFA Section 6.8).

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

No.. There is uncertainty associated with the estimates of Chinook salmon PSC for the unobserved portion of the groundfish fleet, and uncertainty surrounding the origin of Chinook salmon stocks caught as PSC 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, any of the alternatives analyzed are considered to be high-interest but not highly controversial for understanding the impacts of this action on the human environment (RIR Section 4.9).

*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. The alternatives analyzed would not affect any categories of areas on shore. This action takes place in the geographic area of the Western and Central GOA. The land adjacent to this marine area may contain archeological sites of native villages. Any of the alternatives analyzed 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 total allowable catch (TAC) harvest levels, and the alternatives provide protection to EFH and ecologically critical near shore areas. Shipwreck sites may be located in the action area but these sites are identified on nautical charts and avoided by fishermen to protect their gear. The alternatives considered would not change this behavior, and therefore, is not expected to result in substantial impacts to shipwreck sites.

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

No. The potential effects of any of the alternatives analyzed in the EA 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 (EA Sections 3.2, 3.3, 3.4, and 3.5). The potential impacts of different gear types on habitat also are well understood, as described in the EIS for EFH Identification and Conservation in Alaska (EA Section 3.7). The effects of the action alternatives would reduce salmon PSC, particularly in years of high Chinook salmon encounters, 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. No past or present cumulative impact issues were identified in the EA. 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 components analyzed and are therefore not significant (EA Section 3.8).

*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. None of the alternatives analyzed in the EA would effect 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. Besides shipwrecks, which are addressed under question 9, there are no known cultural, scientific, or historical resources present in the marine waters of the action area.

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

No. None of the alternatives analyzed in the EA poses a risk of the introduction or spread of nonindigenous species into the GOA beyond those previously identified because they do 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. This action would control the risk of high Chinook salmon PSC occurring in the GOA non-pollock groundfish 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 (EA Section 3.8).

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## DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for Chinook salmon bycatch in the Gulf of Alaska non-pollock groundfish trawl fisheries, it is hereby determined that this action will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

  
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James W. Balsiger, Ph.D.

  
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