Marine Stewardship Council
3rd Reassessment Report

Alaska Salmon Fishery

Final Report and Determination

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MRAG Americas, Inc.

8950 Martin Luther King Jr St N, Suite 202, St Petersburg, FL 33702, USA

Amanda Stern-Pirlot
Raymond Beamesderfer
Scott Marshall

CLIENT DETAILS:

Pacific Seafood Processors Association

1900 West Emerson Place, Suite 205, Seattle, WA 98119

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1 EXECUTIVE SUMMARY

This Final Report and Determination sets out the results of the Marine Stewardship Council (MSC) assessment of the Alaska Salmon fisheries against the MSC Principles and Criteria for Sustainable Fishing. This is the fourth MSC full assessment for thirteen of the fourteen Units of Assessment listed in Table 1. For the Prince William Sound (PWS) unit this is the first re-assessment following the addition of the unit to the certified fishery in 2016. The previous full assessment for this fishery was undertaken by Intertek Moody Marine (IMM) in 2012 with the process concluding in certification in November, 2013. There are 14 Units of Certification (UoC) covered by this assessment, comprising all Salmon fisheries in the state of Alaska including those in PWS.

The Alaska salmon fishery targets five Pacific salmon species (Chinook – *Oncorhynchus tshawytscha*, Sockeye – *Oncorhynchus nerka*, Pink – *Oncorhynchus gorbuscha*, Chum – *Oncorhynchus keta* and Coho – *Oncorhynchus kisutch*). All five species are anadromous, spawning and hatching in freshwater but living and feeding in the ocean, before heading back to freshwater to repeat the spawning and hatching cycle. Pink salmon is the smallest but most numerous species, and Chinook salmon is the largest but least numerous species. All five species that occur in Alaska have strong commercial markets and varying levels of subsistence, personal use, and sport fishing importance.

Six separate gear types are utilized in the Alaska salmon fishery; these are purse seine, drift gillnet, set gillnet, troll, beach seine (Yukon River, Kodiak, Alaska Peninsula), and fishwheel (Yukon River), and these are used variously within 14 separate Units of Certification (UoC).

The 14 UoCs are based on Management Areas contained within the four Alaska Management Regions – Southeast Region (Southeast and Yakutat UoCs), Central Region (Prince William Sound, Copper/Bering Districts, Lower Cook Inlet, Upper Cook Inlet and Bristol Bay UoCs), Arctic-Yukon-Kuskokwim Region (Yukon River, Kuskokwim, Kotzebue and Norton Sound UoCs) and Westward Region (Kodiak, Chignik, and Peninsula/Aleutian Islands [Area M] UoCs). There is no commercial harvest of salmon in the Northern Management Area of the Arctic-Yukon-Kuskokwim Region (i.e., north of Kotzebue), and this Management Area is therefore not included as a UoC. There are a number of non-local stocks (i.e. those that spawn outside of Alaska rivers) and some non-target stocks (i.e. species of salmon that are not specifically targeted in a certain UoA but may occur from time to time in catches while targeting another species) that are assessed under the salmon-specific "insepreable or practicably inseparable (IPI)" species requirements laid out in MSC FCR v2.0 Section SC6. Assessment of these stocks, when not part of Prinicple 1, is specifically handled Principle 2, including justifications as to how the IPI eligibility and assessment requirements are met. Non-target IPI stocks are assessed under Principle 2 primary species. Per the IPI requirements for salmon, some non-local stocks are also assessed against P2 primary species requirements, while others are covered under ETP.

The assessment was undertaken in accordance with the MSC Fisheries Certification Requirements (v. 2.0) and using the MSC Guidance to MSC Fisheries Certification Requirements (v2.0) including the default assessment tree for salmon fisheries contained therein, which set out the assessment and certification process.

The following steps have been undertaken as part of the full reassessment process:

- Announcement of the assessment, including assessment team, use of the default assessment tree for enhanced Salmon fisheries, and notification of the site visit.
- Undertaking of the site visit
- Production of the client draft report that describes the background to the fisheries, the fishery management operations and the evaluation procedure and results.

- Inclusion of the client action plan and production of the peer review draft report.
- Responses to peer review comments and production of the Public Comment Draft Report.

This assessment was undertaken by Ray Beamesderfer, Scott Marshall and Amanda Stern-Pirlot. Amanda Stern-Pirlot was the Assessment Team Leader.

A site visit was conducted concurrently with the fourth surveillance site visit in Kodiak, Anchorage, and Juneau, AK on November 13-17, 2017. During the site visits, the assessment team met with scientists, fishery managers and stakeholders as well as clients and harvester representatives. There were no meetings requested from additional stakeholders and no written submissions were received prior to the site visit.

The following strengths and weakness were identified with respect to

Principle 1:

Strengths: Key strengths of the Alaska salmon fishery include the long period of time over which catch and escapement data have been collected, the strong management focus on achieving sustainable escapements of wild salmon, Alaska's relatively pristine habitats, and the knowledge and experience of the staff of the Alaska Department of Fish and Game (ADF&G).

Weaknesses: A significant proportion of the harvest in some UoCs is made up of hatchery-reared fish. The 'hatch and catch' rearing system is intended to supplement, not supplant, the wild stock production, and takes advantage of the natural homing instinct of Pacific salmon that typically bring them back to their natal rivers to spawn after the marine feeding phase. Although the first Alaska hatcheries were established in the 1890s, a major expansion in salmon aquaculture research and production began in the 1970s. Emerging science has since identified significant risks of hatchery production to wild stocks and potential impacts on portions of the marine ecosystem.

Principle 2:

Strengths: Commercial salmon fishing gear is highly selective for target salmon species with a very low incidence of incidental harvest or interaction of other species.

Weaknesses: Questions remain in some quarters regarding the potential ecosystem effects of large scale hatchery production of salmon throughout the Pacific.

Principle 3

Strengths: The commercial fishery is subject to a well-defined and transparent regulatory system subject to both local management control which optimizes harvest and sustainability, and regional oversight in the form of management plans developed in a public process by a Board of Fisheries. All related information is well publicized and accessable on a timely basis.

Weaknesses: While the management system is subject to extensive internal review, independent external review is generally limited and focused on specific technical issues.

Based on the information available to date, the Alaska Salmon fishery achieved the following overall scores for each Principle:

Table 1. Principle-level scores per Unit of Certification.

Unit	Regulatory Area	Gear types	Species	Principle		
				1	2	3
1	Southeast	Purse seine, drift gillnet, troll	Sockeye, Chinook, Coho, Pink, Chum	82.1	85.0	95.1
2	Yakutat	Set gillnet, troll	Sockeye, Chinook, Coho, Pink	97.5	85.0	95.1

3	Prince William Sound	Purse seine, drift gillnet, set gillnet	Sockeye, Pink, Chum	87.6	85.0	95.1
4	Copper/Bering Districts	Drift gillnet	Sockeye, Chinook, Coho	96.2	85.0	95.1
5	Lower Cook Inlet	Purse seine, set gillnet	Sockeye, Pink, Chum	87.6	85.0	95.1
6	Upper Cook Inlet	Drift gillnet, set gillnet	Sockeye, Chinook, Coho, Pink, Chum	92.1	85.0	95.1
7	Bristol Bay	Drift gillnet, set gillnet	Sockeye, Chinook, Coho, Pink, Chum	99.6	85.0	95.1
8	Yukon River	Beach seine, drift gillnet, set gillnet, fish wheel, dip net	Chinook, Coho, Chum	92.1	85.0	95.1
9	Kuskokwim	Drift gillnet, set gillnet	Sockeye, Chinook, Coho, Pink, Chum	95.8	85.0	95.1
10	Kotzebue	Set gillnet	Chum	92.1	85.0	95.1
11	Norton Sound	Set gillnet	Coho, Pink, Chum	90.4	85.0	95.1
12	Kodiak	Purse seine, beach seine, set gillnet	Sockeye, Chinook, Coho, Pink, Chum	81.0	85.0	95.1
13	Chignik	Purse seine	Sockeye, Chinook, Pink, Chum	99.6	85.0	95.1
14	Peninsula/Aleutian Islands	Purse seine, beach seine, drift gillnet, set gillnet	Sockeye, Chinook, Coho, Pink, Chum	99.6	85.0	95.1

On the basis of the assessment team's evaluation, and peer and public review, MRAG Americas has determined that the Alaska Salmon fishery should be recertified against the MSC Standard, as no indicator scored less than 60, and all overall principle scores were above 80. **Note this is a draft determination and not a final certification result.**

- Eight conditions of certification were placed on the Alaska Salmon fishery (**Table 2**). The conditions and milestones for the fishery are detailed in Appendix 1.2 of this report.

Table 2. Conditions identified by the assessment for the Alaska commercial salmon fisheries with numbering retained from the 2013 assessment (IMM 2013) and Prince William Sound scope extension (MRAG 2017).

Condition number	Condition	Performance Indicator
1-SEAK	By the end of 2023, the SG 80 scoring requirements must be met in full. This will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a): It is highly likely that the Chum salmon enhancement activities in SEAK do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Chum salmon stocks.	**1.3.1**
5-Kodiak	By the end of the ninth year of certification, the SG 80 scoring requirements for PI 1.3.1 and PI 1.3.3 must be met in full. With respect to the current hatchery programs at Pillar Creek and Kitoi Bay for Chinook, Coho, Pink and Chum salmon, this will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a) it is highly likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or	**1.3.1** **1.3.3**

Condition number	Condition	Performance Indicator
	diversity of wild stocks. b) (PI 1.3.3, SG80a) sufficient relevant information is available on the contribution of enhanced Chinook, Coho, Pink and Chum salmon to the harvest and wild escapement of the stocks. c) (PI 1.3.3, SG80b) the assessment includes estimates of the impacts of enhancement activities on wild stock status, productivity and diversity.	
PWS1	Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness.	**1.3.1**
PWS2	Demonstrate an objective basis for confidence that the enhancement strategy is effective for protecting wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.	**1.3.2**
PWS3	Provide information on the contribution of enhanced fish to the wild escapement of Pink and Chum Salmon, and relative fitness of hatchery-origin fish sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.	**1.3.3**
LCI1	Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness.	**1.3.1**
LCI2	Demonstrate an objective basis for confidence that the enhancement strategy is effective for protecting wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.	**1.3.2**
LCI3	Provide information on the contribution of enhanced fish to the wild escapement of Pink Salmon, and relative fitness of hatchery-origin fish sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.	**1.3.3**

In addition one non-binding recommendation has been made with respect to the marine gill net fisheries of Cook Inlet, Kodiak, the AK Penninsula, Bristol Bay and AYK (Yukon, Kuskokwim and Kotzebue) to repeat the earlier observation of test fisheries or conduct an equivalent study to update verification of the degree of interaction between these fisheries and seabirds (relevant for PIs 2.3.1 and 2.3.3).

2 AUTHORSHIP AND PEER REVIEWERS

2.1 Assessment Team

The assessment team consists of Ms. Amanda Stern-Pirlot (team leader), Mr. Ray Beamesderfer and Mr. Scott Marshall, and qualifications of the team are:

Amanda Stern-Pirlot Is the team leader for the assessment. Ms. Stern-Pirlot is an M.Sc graduate of the University of Bremen, Center for Marine Tropical Ecology (ZMT) in marine ecology and fisheries biology. Ms. Stern-Pirlot joined MRAG Americas in mid-June, 2014 and is now Director of the Fisheries Certification division, a role involving oversight of and participation in MSC assessment activities, and has since served as a member and leader on several assessment teams. She has worked together with other scientists, conservationists, fisheries managers and producer groups on international fisheries sustainability issues for over 10 years. With the Institute for Marine Research (IFM-GEOMAR) in Kiel, Germany, she led a work package on simple indicators for sustainable within the EU-funded international cooperation project INCOFISH, followed by five years within the Standards Department at the Marine Stewardship Council (MSC) in London, developing standards, policies and assessment methods informed by best practices in fisheries management around the globe. She has also worked with the Alaska pollock industry as a resources analyst, within the North Pacific Fisheries Management Council process, focusing on bycatch and ecosystem-based management issues, and managing the day-to-day operations of the offshore pollock cooperative. She has co-authored a dozen publications on fisheries sustainability in the developing world and the functioning of certification schemes as an instrument for transforming fisheries to a sustainable basis.

Ray Beamesderfer, M.Sc., Principle Fish Scientist, Fish Science Solutions, USA. Mr. Beamesderfer holds a bachelor's degree in Wildlife and Fisheries Biology from the University of California, Davis, and a Master's in Fishery Resources from the University of Idaho. Ray worked in fish research, fishery management, and policy analysis for the Oregon Department of Fish and Wildlife for 17 years and has been a consultant since 2000. He has completed a wide variety of projects in fishery management, biological assessment, and conservation/recovery planning. Ray has extensive experience in use of quantitative analysis and computer modeling to solve difficult fish problems, and in synthesizing and translating scientific analyses. He is an expert in salmon stock assessment and fishery management. He is the author of numerous reports, biological assessments, management plans, and scientific articles on fish population dynamics, fish conservation, fishery, and hatchery management, sampling, and species interactions. Ray has served on MRAG and other fishery assessment teams for salmon fisheries in Alaska, Japan and Russia since 2000 and brings perspective and harmonization among salmon fishery assessments in the Pacific.

Scott Marshall earned a B.S. in Fisheries from Oregon State University, and a M.S. in Fisheries Science from the University of Washington. He has held multiple positions in fisheries, including Project Leader at the Fisheries Research Institute (UW); Research Project Leader, Principal Fishery Scientist and SE Region Supervisor for the Division of Commercial Fisheries for the Alaska Department of Fish and Game; staff biologist for Idaho Department of Fish and Game; and Fisheries Administrator in charge of the Lower Snake River Compensation Plan for the US Fish and Wildlife Service. He has served on Scientific and Statistical Committee of the North Pacific Fisheries Management Council and as Co-Chairman of the Transboundary Rivers Panel of the Pacific Salmon commission.

2.2 Peer Reviewers

Hal Michael

Hal Michael retired in 2010 following 34 years in life history and population dynamics research, front-line commercial and recreational fisheries management, environmental law compliance, and design and implementation of restoration programs primarily focused on Pacific salmon primarily in the eastern Pacific with an emphasis on Washington and British Columbia. The primary focus of research and program development in the later years was examination of the ecological relationships between spawning salmon and ecosystem (terrestrial and aquatic) that they affected. Fisheries management activities were primarily development and implementation of mathematical models to estimate stock size and then participate in the scheduling of fisheries. Management was complicated by the need to meet both International and Internal sharing of catch in addition to meeting spawner escapements that maintained the long-term productivity of each stock. Worked extensively in salmonid aquaculture, particularly in the environmental siting and management of facilities. Also produced journal articles, reviews, book chapters and book editor on fisheries and ecosystem publications. Have been working with Sustainable fisheries Foundation and ecologists Without Borders on various projects.

Jocelyn Druggan

Dr Jocelyn Drugan has over 12 years of fisheries science experience, having received her B. Sc. in Ecology and Evolutionary Biology from Yale University and her M. Sc. and Ph.D. in Fisheries Science from the University of Washington. Her graduate work focused on populations genetics and ecoevolutionary dynamics of wild salmon populations. In 2013 she was a postdoctoral research associate at the NOAA Alaska Fisheries Science Center in Seattle, developing a model for simulating effects of fish movement on population genetic structure in five groundfish species. She is currently a fisheries scientist with Ocean Outcomes, a global fishery improvement organization that works with high-risk fisheries that face big conservation challenges. She has participated in MSC pre-assessments of two Russian salmon fisheries and assessed U.S. West Coast and British Columbia salmon fisheries for the Monterey Bay Aquarium Seafood Watch Program. She has also evaluated the sustainability of eleven important fishery species in Japan. In addition to native proficiency in English, Jocelyn has language skills in Japanese and Mandarin Chinese.

2.3 Unit(s) of Assessment (UoA) and Scope of Certification Sought

3.1.1 UoA and Proposed Unit of Certification (UoC)

The UoA are the stocks of Pacific salmon, Chinook, Chum, Coho, Pink and Sockeye salmon that spawn in Alaskan waters or are produced at enhancement facilities in Alaska that are captured in drift gillnets, set gillnets, troll gear, purse seines, beach seines and fish wheels by vessels licensed by and individuals permitted by the Alaska Commercial Fisheries Entry Commission.

There are 14 individual UoAs and MRAG Americas has confirmed that these units are within scope for the MSC certification sought. Some units have hatchery enhancement, however there are sufficient linkage to the wild stocks as described in section 3.1.3.

Table 3. The units of assessment and certification consist of:

Species	Salmon (Pink) (*Oncorhynchus gorbuscha*), Salmon (Chum) (*Oncorhynchus keta*), Salmon (Coho-silver) (*Oncorhynchus kisutch*), Salmon (Sockeye-red) (*Oncorhynchus nerka*), Salmon (Chinook) (*Oncorhynchus tshawytscha*)
Geographical range of fishing operations	Arctic Sea (FAO Area 18), Northeast Pacific (FAO Area 67), Alaska marine and freshwaters
Method of capture	Gillnets And Entangling Nets - Driftnets, Gillnets and Entangling Nets - Gillnets, Hooks And Lines - Trolling lines, Seine Nets, Surrounding Nets - With purse lines (purse seines), Traps - Barriers, fences, weirs, etc.
Stock	Populations of Pacific salmon spawning in Alaska, and potentially intercepted populations
Management	Alaska Department of Fish and Game
Client group	The clients for this assessment are: Pacific Seafood Processors Association 1900 West Emerson Place, Suite 205 Seattle, WA 98119 Contact: Glenn Reed Email: mailto:admin@pspafish.net

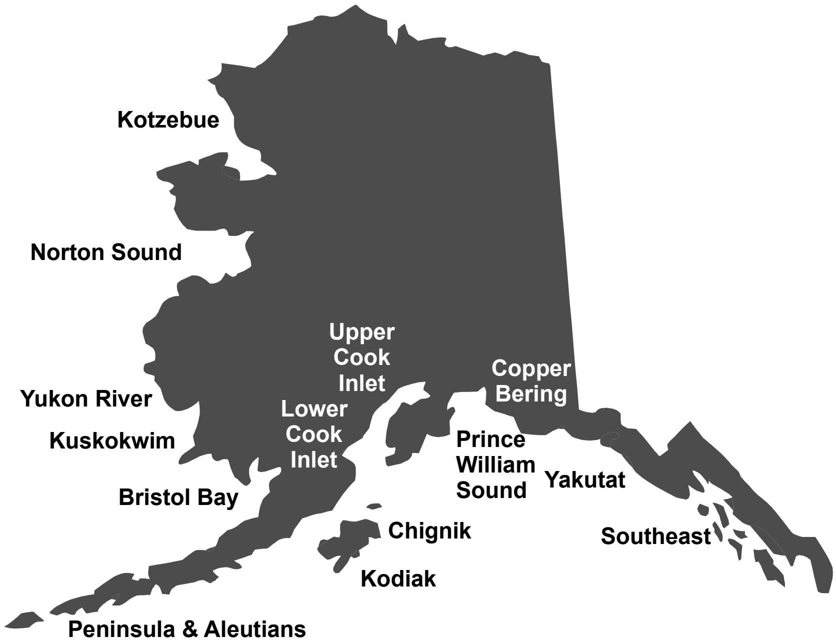


Figure 3-1. Fishery areas included in the Alaska commercial salmon fishery certification.

Table 4. Gear types and target species by unit of certification.

Units	Regulatory Area	Gear [a]	Target Species				
			Sockeye	Chinook	Coho	Pink	Chum
1	Southeast	Drift gillnet, purse seine, troll	X	X	X	X	X
2	Yakutat	Set Gillnet, troll	X	X	X	X	--
3	Prince William Sound	Seine, Drift gillnet, Set gillnet	X	--	--	X	X
4	Copper/Bering Districts	Drift Gillnet	X	X	X	--	--
5	Lower Cook Inlet	Purse seine, Set Gillnet	X	--	--	X	X
6	Upper Cook Inlet	Drift gillnet, Set gillnet	X	X	X	X	X
7	Bristol Bay	Drift gillnet, Set gillnet	X	X	X	X	X
8	Yukon River	Beach seine, Drift gillnet, Set gillnet, Fish wheel	--	X	X	--	X
9	Kuskokwim	Drift gillnet, Set gillnet	X	X	X	X	X
10	Kotzebue	Set gillnet	--	--	--	--	X
11	Norton Sound	Set gillnet	--	--	X	X	X
12	Kodiak	Set gillnet, Purse seine, Beach seine	X	X	X	X	X
13	Chignik	Purse seine	X	X	--	X	X
14	Peninsula/ Aleutian Is.	Purse seine, Beach seine, Drift gillnet, Set gillnet	X	X	X	X	X

[a] *Unless noted, gillnet gear can include either drift or set nets.*

3.1.2 Total Allowable Catch and Catch Data

Table 5. TAC and Catch Data. Note TACs are not provided because this fishery is not managed through a TAC. Note 2016 does not include the PWS unit because it was not part of the certified fishery in 2016

TAC	**Year**	**2017**	**Amount**	n/a	
UoA share of TAC	**Year**	**2017**	**Amount**	n/a	
UoC share of TAC	**Year**	**2017**	**Amount**	n/a	
Total green weight catch by UoC	**Year (most recent)**	**2017**	**Amount**	**Species**	**Catch (tons)**
				Chinook	1,518
				Chum	97,575
				Coho	15,827
				Pink	261,203
				Sockeye	144,400
	Year (second most recent)	**2016**	**Amount**	**Species**	**Catch (tons)**
				Chinook	2,428
				Chum	59,826
				Coho	13,863
				Pink	77,777
				Sockeye	140,627

Table 6. Preliminary 2017 Alaska commerical salmon harvests by fishing area and species in thousands of fish (from: http://www.adfg.alaska.gov/Static/fishing/pdfs/commercial/2017_preliminary_salmon_summary_table.pdf)

	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast	165	664	2,751	34,611	11,332	49,523
Prince William Sound	14	1,427	554	48,701	5,423	56,119
Cook Inlet	8	2,131	305	2,162	439	5,045
Bristol Bay	39	37,683	240	35	1,780	39,777
Kodiak	7	2,467	360	27,102	1,891	31,827
Chignik	4	894	226	7,064	609	8,797
AK Peninsula North	3	3,799	7	7	29	3,845
AK Peninsula South	11	3,318	351	21,896	2,023	27,599
Kuskokwim	0	0	0	0	0	0
Yukon	0.2	0	137	0	1,044	1,181
Norton	0	3	191	19	163	376
Kotzebue	0	0	0	0	463	463
Total	251	52,386	5,122	141,597	25,196	224,552

Table 7. 2016 Catch Data in thousands of pounds (Brenner & Munro 2017).

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Tota
Southeast Region Total[a]	3,668	8,501	16,121	72,828	72,958	174,07
Prince William Sound	230	10,414	4,346	51,637	21,977	88,60
Lower Cook Inlet[b]	9	1,221	10	446	507	2,19
Upper Cook Inlet	186	13,841	925	1,657	878	17,48
Bristol Bay	372	201,584	530	3,007	6,254	211,74
Central Region Total	797	227,061	5,811	56,747	29,617	320,03
Kodiak Area	63	10,649	1,520	14,898	2,766	29,89
Chignik	155	8,208	658	563	805	10,39
South Peninsula and Aleutians	115	14,199	1,087	8,607	2,668	26,67
North Peninsula	35	19,622	554	44	660	20,91
Westward Region Total	368	52,678	3,819	24,112	6,899	87,87
Arctic-Yukon-Kuskokwim Region Total	2	16	1,969	1,193	10,165	13,34
Total Alaska	4,834	288,256	27,719	154,880	119,639	595,32

Table 8. 2017 Catch Data in thousands of pounds (Brenner & Munro 2018).

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total[a]	1,976	4,487	16,197	127,951	95,204	245,816
Prince William Sound	298	8,072	4,504	187,489	40,534	240,897
Lower Cook Inlet[b]	11	1,393	90	7,065	1,550	10,109
Upper Cook Inlet	168	10,598	1,902	596	1,992	15,255
Bristol Bay	477	208,073	1,531	129	9,501	219,711
Central Region Total	953	228,135	8,027	195,280	53,577	485,972
Kodiak Area	66	12,904	2,822	99,403	14,467	129,660
Chignik	37	5,484	1,562	25,305	4,644	37,033
South Peninsula and Aleutians	102	17,998	2,055	74,838	13,431	108,423
North Peninsula	47	22,571	43	39	576	23,275
Westward Region Total	252	58,956	6,482	199,584	33,117	298,391
Arctic-Yukon-Kuskokwim Region Total	4	17	2,181	73	11,848	14,123
Total Alaska	3,185	291,596	32,886	522,888	193,746	1,044,301

3.1.3 Scope of Assessment in Relation to Enhanced Fisheries

The Alaska Salmon fishery is partially enhanced (i.e., some of the fishery is entirely based on wild runs, while the rest of the fishery is based on a 'hatch and catch' enhancement system).[1] The fishery meets the scope criteria for enhanced fisheries, as described by the MSC (MSC 2013a, Table C1) based on the following:

Linkages to and maintenance of a wild stock

A(i): That the fishery relies upon the capture of fish from the wild environment,

A(ii): The five Salmon species are native to the Alaska region,

A(iii): There are natural reproductive components of the stock from which the fishery's catch originates that maintain themselves without having to be restocked every year, and

A(iv): Stocking as part of the 'hatch and catch' system does not form a major part of a current rebuilding plan for depleted stocks.

Feeding and husbandry

B(i): The 'hatch and catch' production system operates without substantial augmentation of food supply, and feeding is used only to grow the salmon to a small size prior to release, and

B(ii): Is not relevant to the Alaska Salmon fishery as it applies to 'catch and grow' systems.

Habitat and ecosystem impacts

C(i): Any modifications to the habitat of the stock do not cause serious or irreversible harm to the natural ecosystem's structure and function (noting that Salmon fry farms permitted to be in-scope).

3.1.4 Scope of Assessment in Relation to Introduced Species Based Fisheries

This is not a fishery based on introduced species.

3.1.5 Final UoC(s)

The Final UoCs are identical to the proposed UoCs.

[1] *Hatch and catch systems are defined in the MSC scheme as production systems that involve the introduction of fish either as eggs, larvae or juveniles into the wild and subsequent recapture.*

2.4 Overview of the Fishery

2.4.1 History

Commercial salmon fisheries have a long history in Alaska beginning with establishment of the first saltery in 1868 and the first cannery a year later (Clark et al. 2006). By 1898, 59 canneries were operating in Alaska and by 1920, 160 canneries were operating. Early commercial salmon fisheries were largely unregulated and catches expanded rapidly during the eary 1900s to peak in the 1930s before a 20-year decline. Regulatory efforts gradually increased over this period.

The lack of self-rule in salmon management and the influence of the major lower 48 canning companies on federal salmon management were primary forces in Alaska for statehood. Of the 434 fish traps licensed in 1948, only 38 (9%) belonged to Alaskan residents while 245 (56%) were owned and operated by the 8 largest canning companies. Alaska achieved statehood in 1959 and fisheries management responsibility was transferred to the state in 1960.

The Alaska constitution provided policy guidance. At statehood, the Alaska legislature created the Department of Fish and Game and the Division of Commercial Fisheries and gave them a mandated fishery management mission. The Alaska legislature has passed laws since statehood providing further authority and guidance. The Alaska Board of Fish and Game and later the Alaska Board of Fisheries (BOF) has promulgated a diverse set of regulations and plans for management of Alaska's subsistence and commercial salmon fisheries that provide guidance for day-to-day management by area biologists of the Division of Commercial Fisheries.

2.4.2 Alaska Commercial Salmon Fishery Users

In 1973, the Alaska legislature passed a bill creating the first comprehensive limited entry program in the United States. The limited entry program implemented for commercial salmon fisheries in Alaska stabilized the number of fishermen and therefore the amount of gear used in each of the State's salmon fisheries. Fishermen can now only participate in the commercial salmon fisheries in Alaska by holding a limited entry permit or by working as a crew member for a limited entry permit holder.

As of 2018 there were a total of 10,818 active commercial salmon limited entry permits. Each limited entry permit is valid for a specific gear type and area in Alaska. Gill net permits (set and drift combined) are the most common gear, representing about 70% of all valid permits to fish for salmon in Alaska. Limited entry permits are bought and sold on the open market and their value is based upon gear type and area.

Based on average market value in 2004, the most valuable limited entry permit type in Alaska were purse seine permits in the Chignik area with an estimated value of about $182,000. The least valuable permits, based upon permit transactions in 2004 were gill net permits to fish in the Kotzebue salmon fishery, their value was $2,000. Across Alaska, the most valuable permit type was drift gill net permits with a weighted average value of about $32,700 and the least valued type of permit was hand troll permits with an average value of about $4,100. Based upon the number of valid permits issued and average value per permit, the estimated value of the 11,301 commercial salmon limited entry permits in 2004 was about $228 million.

Not all permits are fished each year. As prices paid to commercial fishermen declined in the 1990's due to the availability of farmed salmon, the number of permits fished in Alaska commercial salmon fisheries declined and then as the prices started to increase in the last couple of years, the number of permits fished has increased. In 2004, 7,179 of the valid limited entry permits in Alaska were fished (64%). Each of the limited permits for commercial salmon fishing in Alaska represent the equivalent of a small independent business. When the permit is fished it represents a business with employees as in most cases, a crew is used for commercial salmon fishing and thus jobs are created, wages are paid, and the fishing activity adds to the economic foundation within Alaska.

2.4.3 Fishing Methods

Purse seine

Purse seines are encircling nets that are deployed around schools of fish. A key feature of their design is a rope (called a 'purse line') that can be drawn in to close the bottom of the net to prevent fish from swimming down and escaping. To set a purse seine, a small boat or 'skiff' is used to draw the net around an identified fish school, before returning the end of the net to the purse seine vessel to complete the encirclement. The top of the net is kept at the surface by buoys or corks, while a weighted lead line is used to quickly sink the bottom of the net when being set.

After drawing in the purse line, the net is winched in by running it up through a hydraulic block so that it can be stacked on the back deck of the main vessel.. Once the net is almost entirely retrieved and the salmon are corralled closely beside the fishing vessel, a small dip net is used to brail the catch in to the fish hold. The main target species are Pink and Chum, but other species may also be taken, for example, the purse seine fishery for Sockeye salmon in Chignik. Purse seine vessels are limited in Alaska to a maximum of 58’ length (ADF&G 2009b), and can easily be identified by their skiffs which are either carried-piggy-back style while travelling to and from the fishing grounds, or towed behind the boat.

http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.main#seiner

Figure 3-2. A salmon purse-seine vessel with net deployed.

Drift gillnet

Drift gillnets are deployed from vessels, with the gillnets being suspended at the surface with buoys or floats, such that the gear hangs down in the water column to catch fish swimming at or near to the surface. Buoys are attached along the length of the nets, but no anchors or weights are used to hold the nets in position. As such, vessels must stand by the gear so that it can be monitored and retrieved.

The size of fish being targeted can be managed effectively through using nets of specific mesh size, as the gear works by allowing the heads of the fish to pass sufficiently far through the net that they become caught on the mesh behind the gills. The fish are therefore prevented from backing out of the net, while the thicker body of the fish prevents them from swimming straight through. If the fish are too large or too small to be gilled, the catch rate declines considerably, although a small proportion of such fish that encounter the net may become entangled through being caught on fin rays or teeth and then rolling.

http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.main#gillnetter

Figure 3-3. Salmon drift gillnetter.

Set gillnet

Set gillnets are similar to drift gillnets in that fish are taken through being 'gilled', and the mesh size must be matched to the target fish size in order that the catch rate is maximised. However, set gillnets are held in position with anchors or weights, and may be fished from the shore.

When fished from the shore, the gear can be set out by boat, or set on a pulley and ring system so that it can be hauled in and cleared of fish from the beach, before being reset during the fishing period. The nets may also be cleared from a boat, with the net being run across or along the vessel to remove fish, before being passed back over the side to continue fishing. In this way, only the section of the net that is being cleared is out of the water during the fishing period.

<u>Troll</u>

Trolling is the practice of towing lures, baited hooks or a combination of both behind a moving vessel. There are two types of salmon troll permits in Alaska; hand and power. A hand troll permit is allowed the use of two had operated gurdies or four sport fishing poles (a downrigger may not be used in conjuction). A power troll permit is allowed the use of four power assisted gurdies except in federal waters north and west of Cape Spencer. The gear can be worked at varying depths, from the surface to deeper in the water column. Troll vessels come in a variety of shapes and configurations, ranging from small skiffs using hand-wound gear, to large, ocean going vessels of 50’ or more in length which use hydraulic reels. Trolling mainly targets Chinook and Coho salmon, although other species may be taken in smaller numbers, and Chum salmon have become a target species for some troll fishermen in recent seasons.

Figure 3-4. A set net being cleared by boat.

http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.main#troller

Figure 3-5. A salmon trolling vessel.

Fish wheels (Yukon River only)

Fish wheels are a legal commercial gear type in the upper portion of the Yukon River. Fish wheels are located on floating rafts anchored near to the bank, and use flowing river water to turn a net mechanism around a central shaft. Usually, two nets are used, one on each side of the shaft, with a paddles set in alternating positions around the shaft to help drive the nets around. Salmon are caught as they migrate upriver by swimming in to the nets of the fish wheel when in the down position. As the nets rotate around, they fish are scooped up before dropping to a ramp positioned at an angle in the net, from where they slide in to a holding pool or collection box. All salmon species that occur in the river may be taken, but relative species abundance in the Yukon, and the proximity of the gear to the river bank, mean that Chum salmon dominate catches. Fish wheels can operate autonomously, although they are vulnerable to ice floes and floating debris.

Source: US Fish and Wildlife Service

Figure 6. Fish wheel with nets in the horizontal position and paddles in the vertical position.

Beach seine (Yukon River, Kodiak, Alaska Peninsula)

Beach seines are non-gilling nets with a floatline that always stays at the surface and a leadline that runs along the bottom. During deployment, one end of the net remains on shore while the body of the net is run out and around fish swimming near to the shore. This is usually accomplished using a small boat or tender. The other end of the net is then returned to the shore and the two ends are drawn in and together to bag any fish contained within the fished area. In Alaska, hydraulic power may be used to set, retrieve, or purse a beach seine.

2.4.4 Historical Harvests

The annual average Alaskan commercial harvest from 1900 to 1910 was about 30 million salmon but doubled in the next decade to about 65 million salmon. Between 1930 and 1939, commercial harvest averaged about 90 million salmon but by the 1950s had decreased to an average of about 40 million. In the last year of federal management of the commercial salmon fishery in Alaska (1959), harvest totalled only 25 million salmon -similar to lows seen during the early 1970s.

State managers in the 1960's made judgment calls concerning appropriate escapement levels needed and took management actions to achieve the spawning goals. The salmon stock assessment program improved in the 1970's, goal setting improved, and salmon managers used emergency order authority to achieve the spawning goals. These improvements, in conjunction with an extended period of favorable marine conditions beginning in the late 1970s, led to an extended period of high salmon harvests which continues today. The decade average harvest level in the 1980's increased to 122 million salmon commercially harvested. Average commercial harvests in the 1990's were about 175 million salmon. Average harvest since the 2000's has been similar. Hatchery production has contributed a significant portion of the commercial salmon harvest since the 1980s.

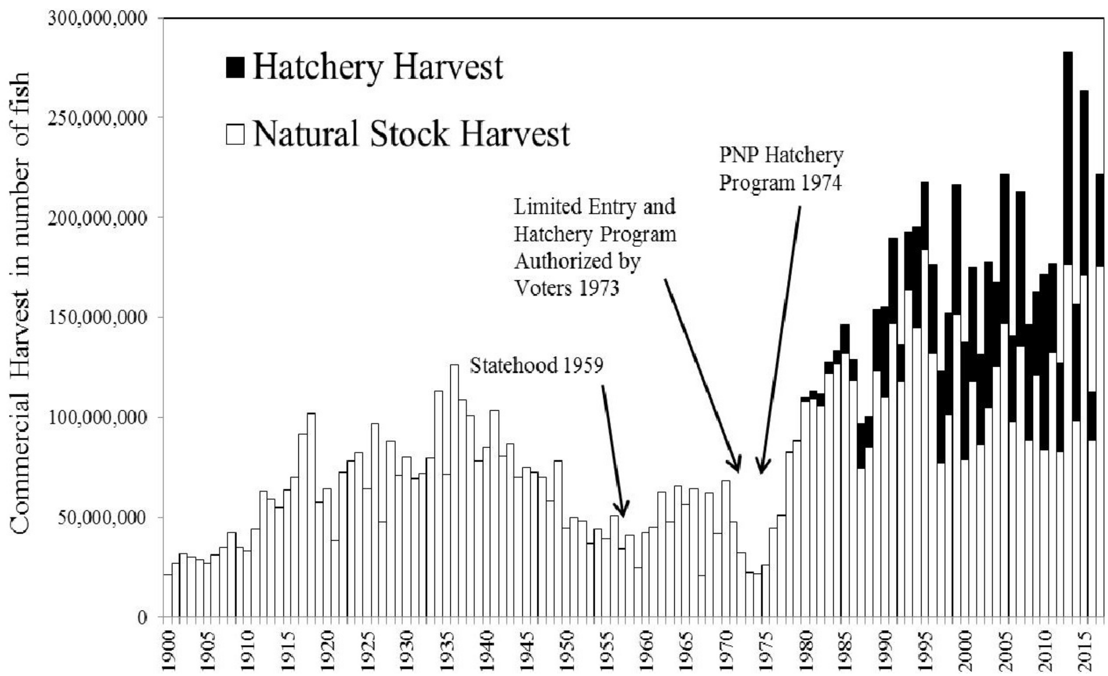
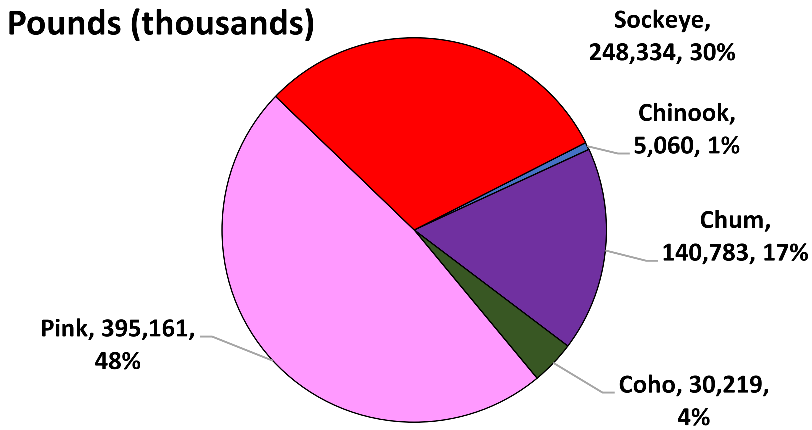


Figure 3-6. Historic commercial catch of salmon in Alaska showing the contribution of fish from enhancement activities, 1900 – 2017 (Stopha 2018).

Pink Salmon account for the largest proportion of the Alaska commercial salmon harvest, followed by Sockeye, Chum, Coho and Chinook (Figure 3-73-7). Trends by species in the commercial salmon harvests have been variable (Figure 3-83-8). Pink salmon harvest have steadily increased since the 1970s and currently fluctuate around 110 million per year – annual ranges can be very large. Chum Salmon have similarly increased to fluctuate around 20 million per year. Sockeye harvests peaked at over 60 million in the early 1990s and have fluctuated around 40 million per year since. Coho Salmon harvest increased to a peak over 9 million in 1994 but more recently declined to about 4 million on average. After an extended period of high harvests from 1980-1997, Chinook harvest have been highly variable and often poor since the late 2000s.



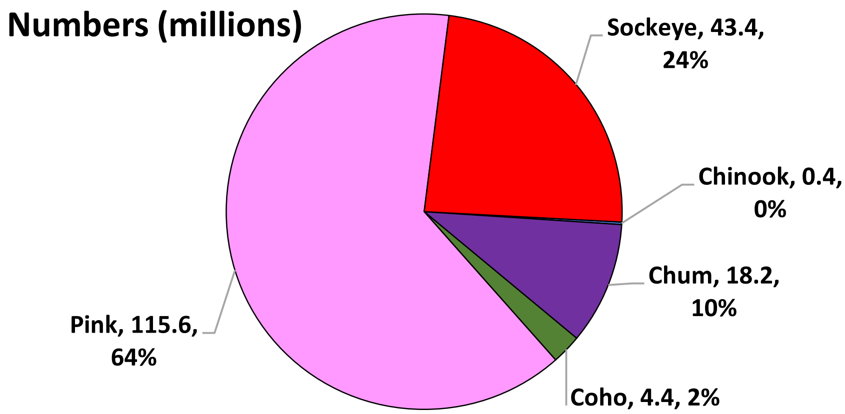


Figure 3-7. Average species composition of the Alaska commercial salmon harvest, 2008-2017.

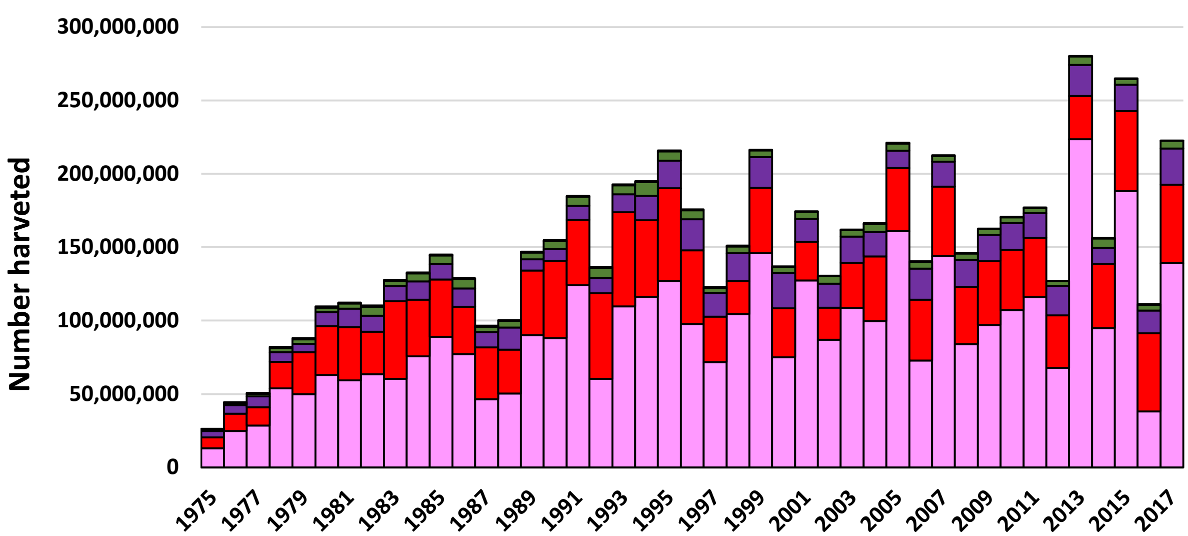


Figure 3-8. Trends in Alaska commercial salmon harvest by species http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.salmon_grossearnings_byspecies.

Table 9. Annual salmon harvest in combined Alaska commercial fisheries http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.salmon_grossearnings_byspecies.

Year	Chinook	Chum	Coho	Pink	Sockeye	Grand Total
1975	455,173	4,322,689	1,011,015	12,987,397	7,458,342	26,234,616
1976	531,442	5,924,098	1,430,100	24,755,133	11,779,393	44,420,166
1977	619,961	7,325,863	1,788,691	28,554,911	12,464,692	50,754,118
1978	835,327	6,674,564	2,818,642	53,728,919	18,137,969	82,195,421
1979	777,802	5,603,674	3,114,490	49,874,090	28,687,532	88,057,588
1980	672,229	9,594,670	3,112,908	62,932,782	33,283,521	109,596,110
1981	820,513	12,607,015	3,408,323	59,225,178	36,337,544	112,398,573
1982	875,630	10,988,502	6,035,183	63,490,064	28,944,666	110,334,045
1983	827,370	10,217,534	3,634,973	60,346,702	52,861,150	127,887,729
1984	664,344	12,632,682	5,376,021	75,752,728	38,439,981	132,865,756
1985	720,872	10,581,804	5,744,094	89,062,838	38,951,987	145,061,595
1986	615,040	12,501,763	6,291,412	77,276,105	32,176,350	128,860,670
1987	680,008	10,511,059	3,486,016	46,416,502	35,398,491	96,492,076
1988	585,929	15,085,253	4,462,907	50,302,446	29,976,294	100,412,829
1989	571,186	7,730,593	4,626,727	90,066,985	44,030,349	147,025,840
1990	661,988	7,968,965	5,453,137	88,159,485	52,630,263	154,873,838
1991	609,499	9,719,053	6,099,272	123,994,096	44,551,121	184,973,041
1992	603,015	10,187,488	7,069,123	60,475,939	58,177,212	136,512,777
1993	662,683	12,222,417	6,050,150	109,733,293	64,181,587	192,850,130
1994	631,813	16,448,636	9,484,543	116,178,871	52,272,676	195,016,539
1995	653,665	18,690,846	6,446,876	126,886,593	63,351,685	216,029,665
1996	521,897	21,175,086	6,119,695	97,746,365	50,156,177	175,719,220
1997	654,625	16,184,924	3,178,881	71,742,840	30,946,932	122,708,202
1998	579,210	18,998,030	4,644,794	104,378,743	22,539,205	151,139,982
1999	433,932	20,906,781	4,625,364	145,966,045	44,529,866	216,461,988
2000	349,103	24,186,028	4,133,586	75,018,839	33,291,046	136,978,602
2001	368,874	15,416,089	4,905,694	127,456,797	26,347,416	174,494,870
2002	552,058	16,182,582	5,032,187	86,935,715	21,991,423	130,693,965
2003	607,887	17,958,773	4,176,818	108,704,115	30,714,500	162,162,093
2004	794,946	16,453,599	5,428,500	99,646,858	44,151,890	166,475,793
2005	679,264	11,725,809	4,783,597	160,878,045	43,150,685	221,217,400
2006	624,265	21,047,210	4,409,913	72,760,456	41,569,090	140,410,934
2007	562,314	17,200,759	3,626,010	143,894,292	47,336,190	212,619,565
2008	344,895	18,282,649	4,444,311	84,043,425	38,928,312	146,043,592
2009	361,168	17,940,186	4,114,532	97,130,272	43,234,509	162,780,667
2010	378,772	18,126,927	4,020,886	107,132,139	41,183,719	170,842,443
2011	459,798	16,985,907	3,474,827	116,100,487	40,193,196	177,214,215
2012	342,223	20,172,545	3,137,578	67,848,666	35,750,052	127,251,064
2013	321,955	21,089,833	5,738,863	223,647,950	29,523,930	280,322,531
2014	490,077	10,937,792	6,244,600	94,750,792	44,009,585	156,432,846
2015	506,734	18,064,015	3,848,801	188,301,358	54,453,171	265,174,079
2016	408,761	15,614,994	3,904,171	38,164,591	53,148,599	111,241,116
2017	263,170	24,643,067	5,238,962	139,199,259	53,487,333	222,831,791

2.4.5 *Alaska Salmon Hatcheries*

Current Programs

Alaska salmon numbers are enhanced by significant hatchery production, particularly in Southeast Alaska and Prince William Sound (Figure 3-9). The Alaska salmon enhancement program currently consists of twenty-five private non-profit salmon hatcheries, which are funded primarily from the sale of a portion of the hatchery returns (Stopha 2017). Two sport fish hatcheries are operated by the state, one research hatchery by the National Marine Fisheries Service, and one production hatchery by the Metlakatla Indian Community.

The modern Alaska hatchery program was initiated in the early 1970s, in response to a period of depressed commercial salmon fisheries in Alaska. The new program was intended to supplement, not supplant, wild stock production. In 1971, the Alaska Legislature created the Fisheries Rehabilitation, Enhancement and Development Division (FRED) of ADF&G to develop a coordinated salmon enhancement program. By the early 1980's, ADF&G was involved with construction and or operation of about 20 salmon aquaculture facilities. Following a decline in North Slope oil revenues to Alaska in the 1980's, Alaska explored the option of private sector operation of State salmon enhancement programs. By the mid-1990's, most State run salmon aquaculture facilities were taken over by the private non profit (PNP) sector. State aquaculture facilities that primarily produced fish caught in sport fisheries were transferred to the Division of Sport Fish and by the later 1990's, the Commercial Fisheries Division neither funded nor operated salmon hatcheries. The Division of Commercial Fisheries continued to provide technical support to all of the salmon aquaculture facilities operated in Alaska such as was provided by FRED Division while in existence; technical support such as disease screening and production evaluation.

Current Alaska hatchery releases are approximately 1.7 billion per year (Table 10). Pink and Chum salmon are the predominant species produced by Alaska hatcheries, followed by Sockeye, Coho, and Chinook salmon. Pink ad Chum are preferred as the fry migrate to salt water soon after hatching resulting in less cost compared to the other species which require being held and fed in fresh watter for an additional year. Hatcheries return about 50 million salmon per year (Figure 3-10) and comprise about one third of the total commercial salmon harvest (Figure 3-11). While hatchery releases in Alaska have been relatively stable over the last five years, there have been small changes to address the operators desire to better meet the needs of their constituents and because of operational constraints such as broodstock availability. Among those changes have been increases in Chum Salmon production In Southeast, and high variability in Pink Salmon releases in Lower Cook Inlet as the operators strive to build production to the permitted level.

Formal policies and regulations were developed and enacted to minimize the potential for adverse effects of the enhancement program on wild stocks. These included a rigorous hatchery permitting process requiring location of hatcheries away from significant wild stocks and use of local brood sources, development of a genetics policy and pathology guidelines, and hatchery fish marking requirements. While hatcheries play an important role in Alaska's salmon production, the practice of finfish farming, defined as raising fish to maturity in captivity for commercial purposes, is outlawed in Alaska.

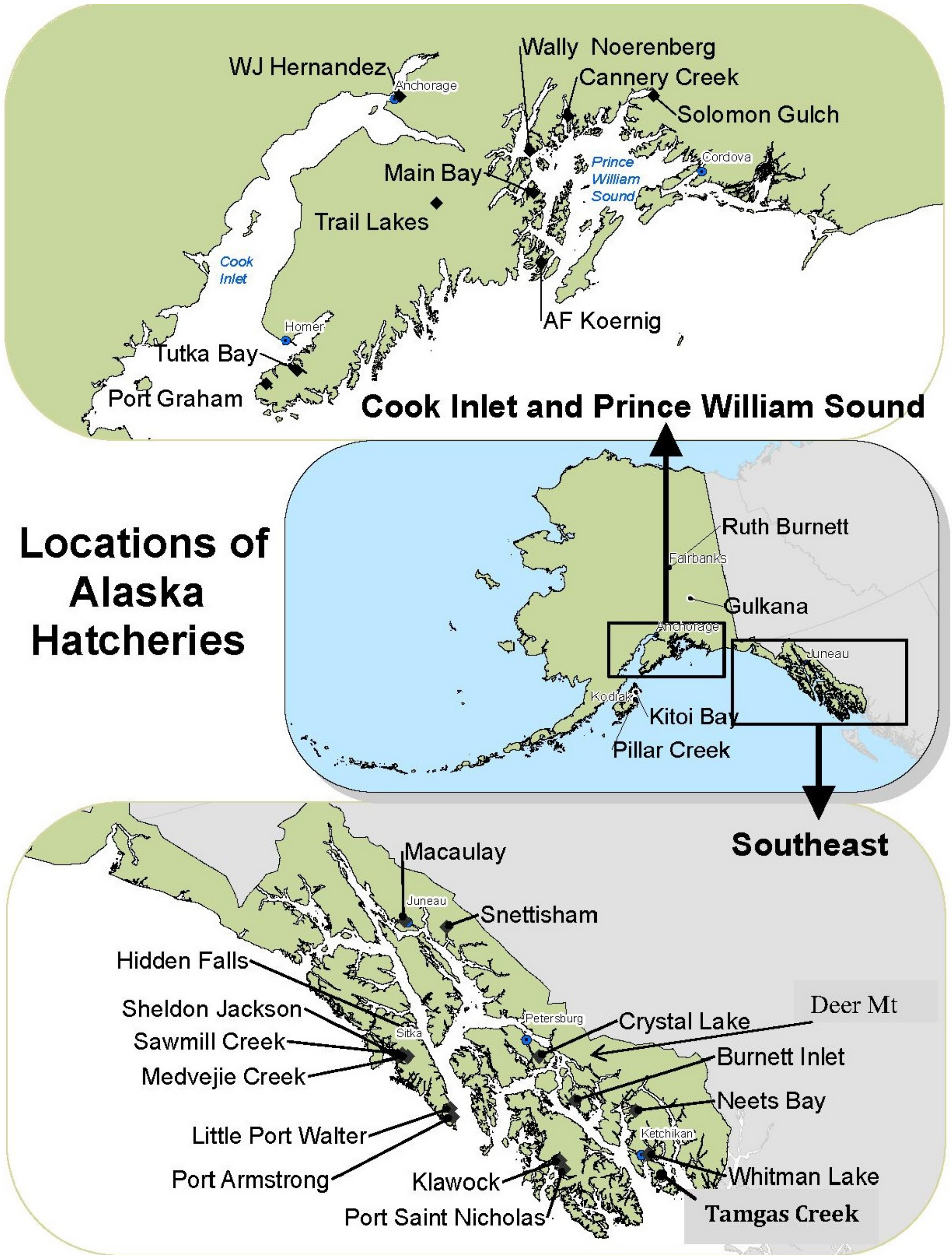


Figure 3-9. Salmon hatcheries currently operating in Alaska (Stopha 2018).

Table 10. Annual hatchery production (number released) by species and unit of certification in millions of fish 2012 – 2016.

Region	Year	Releases in Millions of Fish					
		Pink	Chum	Sockeye	Coho	Chinook	Total
Southeast	2012	101.5	466	15.1	18.1	7.4	608.1
	2013	71.9	493.9	13.5	20.2	7.2	606.7
	2014	100.3	477.7	13.2	23.1	7	621.3
	2015	90.8	470.8	13.3	21.1	6.1	602.1
	2016	99.8	514.9	12.7	23.3	8.5	659.2
Copper - Bering River	2012			16.9			16.9
	2013			12.6			12.6
	2014			16			16
	2015			16			16
	2016			16			16
Prince William Sound	2012	673.5	140.3	11	2.9	0.4	828.1
	2013	599.6	148.3	11.5	4.9	0.3	764.6
	2014	672.9	151.5	11.5	2.7	0.2	838.8
	2015	665.2	108.9	10.7	2.2	0.3	787.3
	2016	643.1	133.2	10	1.9	0.2	788.4
Lower Cook Inlet	2012	11.2		8	0.7	0.7	20.6
	2013	18.6		8.7	0.8	0.5	28.6
	2014	51.3		7.7	0.7	0.6	60.3
	2015	14.5		6.8	0.9	0.8	23
	2016	12.7		4.8	0.9	0.9	19.3
Upper Cook Inlet	2012			0.9	0.4	0.7	2
	2013			0.9	0.6	0.6	2.1
	2014			1.6	0.4	1.1	3.1
	2015			1.5	0.6	1.2	3.3
	2016			1.2	0.6	1	2.8
Kodiak	2012	156.6	22.2	3.1	0.7	0.1	182.7
	2013	107	16.8	4.2	1.6	0.1	129.7
	2014	191.5	21.9	4.2	1.2	0.3	219.1
	2015	177.2	29.8	4.3	0.8	0.3	212.4
	2016	138.1	29.1	4	1.5	0	172.7
Total	2012	942.8	628.5	55	22.8	9.3	1,658.4
	2013	797.1	659	51.4	28.1	8.7	1,544.3
	2014	1016	651.1	54.2	28.1	9.2	1,758.6
	2015	947.7	609.5	52.6	25.6	8.7	1,644.1
	2016	893.7	677.2	48.7	28.2	10.6	1,658.4

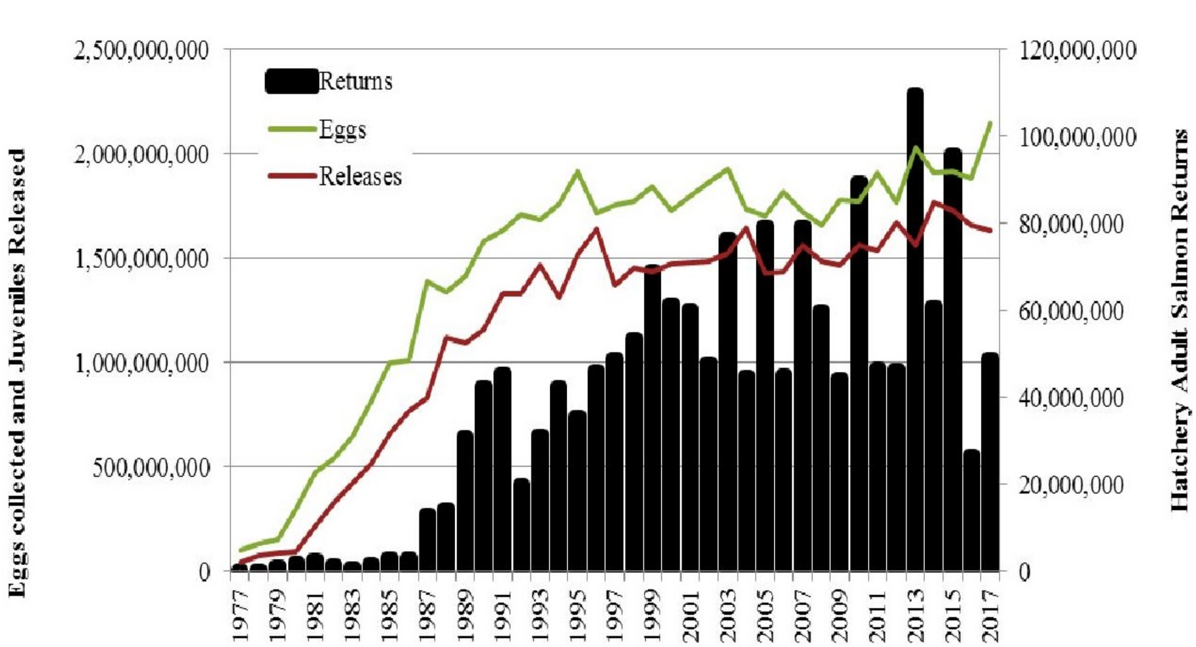


Figure 3-10.Total salmon eggs collected, juveniles released and adult returns for Alaska salmon hatchery programs, 1977–2017 (Stopha 2018).

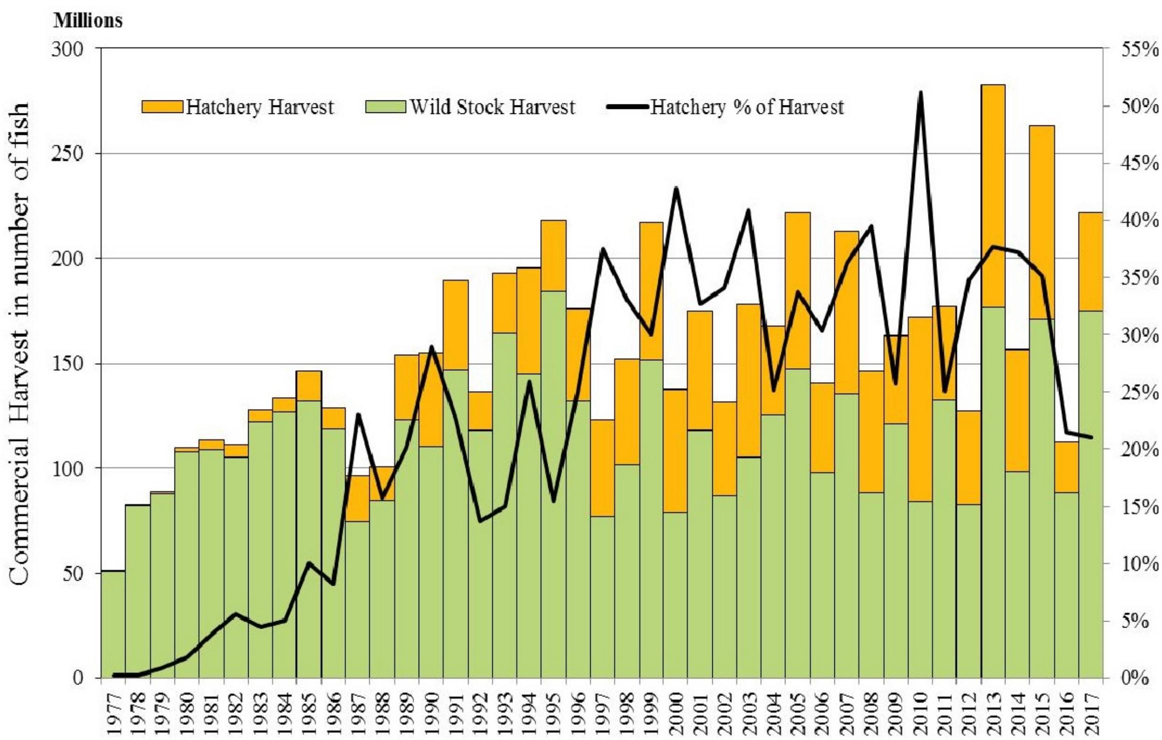


Figure 3-11.Alaska commercial harvest of hatchery stocks, wild stocks and the hatchery contribution to the harvest, during the modern hatchery era in Alaska, 1977 to 2017 (Stopha 2018).

2.4.6 *Commercial Fishery Management*

Escapement Goals

Alaska salmon fisheries are generally managed to achieve spawning escapement goals determined to ensure conservation and long term sustainability. Escapement goals are defined in ranges which function as target reference points for fishery management. Goals are established for key reference species and stocks in each fishing area.

There are several types of escapement goals.[2] A biological escapement goal is the number of salmon in a particular stock that ADF&G has determined should be allowed to escape the fishery to spawn to achieve the maximum sustained yield (human use). A sustainable escapement goal is an estimate based on historical performance and other factors known to conserve stock over a five to 10 year period. It is used in situations where a biological escapement goal cannot be estimated due to the absence of a stock-specific catch estimate. Biological and sustainable escapement goals are set by ADF&G based on biological information about the fish stock in question. An optimum escapement goal allows for sustainable runs based on biological needs of the stock and ensures healthy returns for commercial, sport, subsistence, cost-recovery, and personal use harvests. Optimum escapement goals are set by the Board of Fisheries.

ADF&G uses a variety a methods to establish escapement goals, depending on the type and quality of data that are acquired. Escapement goal methods and evaluation of whether the goals were met in response to harvest management actions are reviewed in technical reports every three years in accordance with BOF Reviews. Thus, each management area has a recent escapement goal report, which also includes references to or included historical data on which the goals were developed. The technical reports are available online (www.ADF&G.alaska.gov).

Inseason Management

Although pre-season forecasts are made, fisheries are managed inseason based on abundance to achieve target escapement goal ranges. To achieve minimum escapement goals, directed fishing stops and incidental harvests are reduced at low run sizes.Fisheries are liberalized when abundance is high. Fishing effort and harvest is generally regulated over the course of the return based on time and area openings and closures. In high value fisheries, management can be intensive with decisions made on a day to day or even hour to hour schedule.

Commercial harvests of salmon in Alaska are monitored through the fish ticket system, which are sales receipts issued to commercial fishermen upon selling their catch to processors. As a result, harvest data is available by fishing district and opening date, generally on a real time basis for use in inseason management decisions. ADF&G has also been implementing electronic fish tickets which can result in almost instantaneous reporting of harvest in some fisheries (Bristol Bay). Inseason data on escapement, catch, catch rates and biological characteristics can effectively be used to regulate harvest rates based on a abundance because most Alaska salmon harvest occurs in terminal fishing areas.

Stocks of Concern

The Alaska Department of Fish and Game (ADF&G) and the Board of Fisheries (BOF) have a process to designate and classify a salmon stock as a “Stock of Concern” (SOC). A SOC designation may be appropriate if a stock is not meeting expectations for harvest, and/or escapement. If a stock is not

[2] http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=123

consistently meeting harvest levels even though escapement levels are being met, it may be classified as a "Stock of Yield Concern". If a stock has not met its escapement goal in three of five years it may be classified a "Stock of Management Concern".

The BOF makes the designation based on a recommendation by ADF&G. The SOC designation triggers the requirement to identify factors likely causing the decline, and to develop a plan to increase abundance and/or harvests. When a stock is classified as one of Yield Concern, research is typically directed at the run to better understand limiting factor(s) while ensuring management action continues to provide for escapements to remain with the goal range.

As of April 2018, there are 13 stocks of management stocks of concern, and five stocks of yield concern.

Table 11. Statewide summary of salmon stocks of concern in Alaska within the different UoCs (http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.akfishstocks).

System	Species	Area	Year Designated	Level of Concern	Year Last Reviewed
Chilkat River	Chinook	Southeast	2017	Management	2017
King Salmon River	Chinook	Southeast	2017	Management	2017
Unuk River	Chinook	Southeast	2017	Management	2017
McDonald Lake	Sockeye	Southeast	2017	Management	2017
McNeil River	Chum	Cook Inlet	2016	Management	2016
Susitna (Yentna) River	Sockeye	Cook Inlet	2007	Yield	2016
Chuitna River	Chinook	Cook Inlet	2010	Management	2016
Theodore River	Chinook	Cook Inlet	2010	Management	2016
Lewis River	Chinook	Cook Inlet	2010	Management	2016
Alexander Creek	Chinook	Cook Inlet	2010	Management	2016
Willow Creek	Chinook	Cook Inlet	2010	Yield	2016
Goose Creek	Chinook	Cook Inlet	2010	Management	2016
Sheep Creek	Chinook	Cook Inlet	2013	Management	2016
Karluk River	Chinook	Kodiak	2010	Management	2016
Swanson Lagoon	Sockeye	Alaska Peninsula	2012	Management	2015
Yukon River	Chinook	Yukon	2000	Yield	2015
Norton Sound Sub-district 5 & 6	Chinook	Norton Sound	2003	Yield	2015
Norton Sound Sub-district 2 & 3	Chum	Norton Sound	2000	Yield	2015

2.4.7 *Target Species*

Sockeye salmon – Oncorhynchus nerka[3]

Description

Sockeye salmon are one of the smaller species of Pacific salmon, measuring 18 to 31inches in length and weighing 4-15 pounds. Sockeye salmon provide high-value commercial fisheries because they are prized for their firm, bright-orange flesh.

Like all species of Pacific salmon, Sockeye salmon are anadromous, living in the ocean but entering fresh water to spawn. Sockeye salmon spend one to four years in fresh water and one to three years in the ocean. In Alaska, most Sockeye salmon return to spawn in June and July in freshwater drainages that contain one or more lakes. Spawning itself usually occurs in rivers, streams, and upwelling areas along lake beaches. During this time 2,000 – 5,000 eggs are deposited in one or more redds, which the female digs with her tail over several days. Males and females both die within a few weeks after spawning.

Eggs hatch during the winter, and the young alevins remain in the gravel, living off their yolk sacs. In the spring, the fish emerge from the gravel as fry and move to rearing areas. In systems with lakes, juveniles usually spend one to three years in fresh water, feeding on zooplankton and small crustaceans, before migrating to the ocean in the spring as smolts. However, in systems without lakes, many juveniles migrate to the ocean soon after emerging from the gravel.Smolts weigh only a few ounces upon entering salt water, but they grow quickly during their 1-3 years in the ocean, feeding on plankton, insects, small crustaceans, and occasionally squid and small fish. Alaska Sockeye salmon travel thousands of miles during this time, drifting in the counterclockwise current of the Alaska Gyre in the Gulf of Alaska. Eventually they return to spawn in the same freshwater system where they were hatched.

The largest Sockeye salmon populations are in the Kvichak, Naknek, Ugashik, Egegik, Wood, and Nushagak Rivers that flow into Alaska's Bristol Bay. In good years, these runs can number in the tens of millions of fish.

Sockeye salmon are difficult to culture because susceptibility to the IHN virus often causes epizootics. Enhancement activities include hatchery culture stream-side incubators. Fishways have also been effective with major runs established on barren systems where migration barriers existed.

Harvest

The 2016 Sockeye harvest was well above the recent 10-year average harvest, primarily because of the strong return to Bristol Bay. Significant catches were also seen in the Alaska Peninsula, Kodiak, Upper Cook Inlet and Southeast management areas.

Escapements

An exceptionally large escapement was observed in the AYK region because of large return to the Kuskokwim River; there was no commercial harvest of these fish. Within the Central Region, all stocks in Bristol Bay met their escapement goals. The few stocks that failed to meet goals in the Central Region were small to medium sized runs in the Upper and Lower Cook Inlet areas, Prince William Sound and Copper-Bering Area. Within the Westward Region only one small stock on the Alaska Peninsula did not meet its escapement goal. Within the Southeast Region three stocks, failed to meet their goals.

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[3] Adapted from: http://www.adfg.alaska.gov/index.cfm?adfg=Sockeyesalmon.main

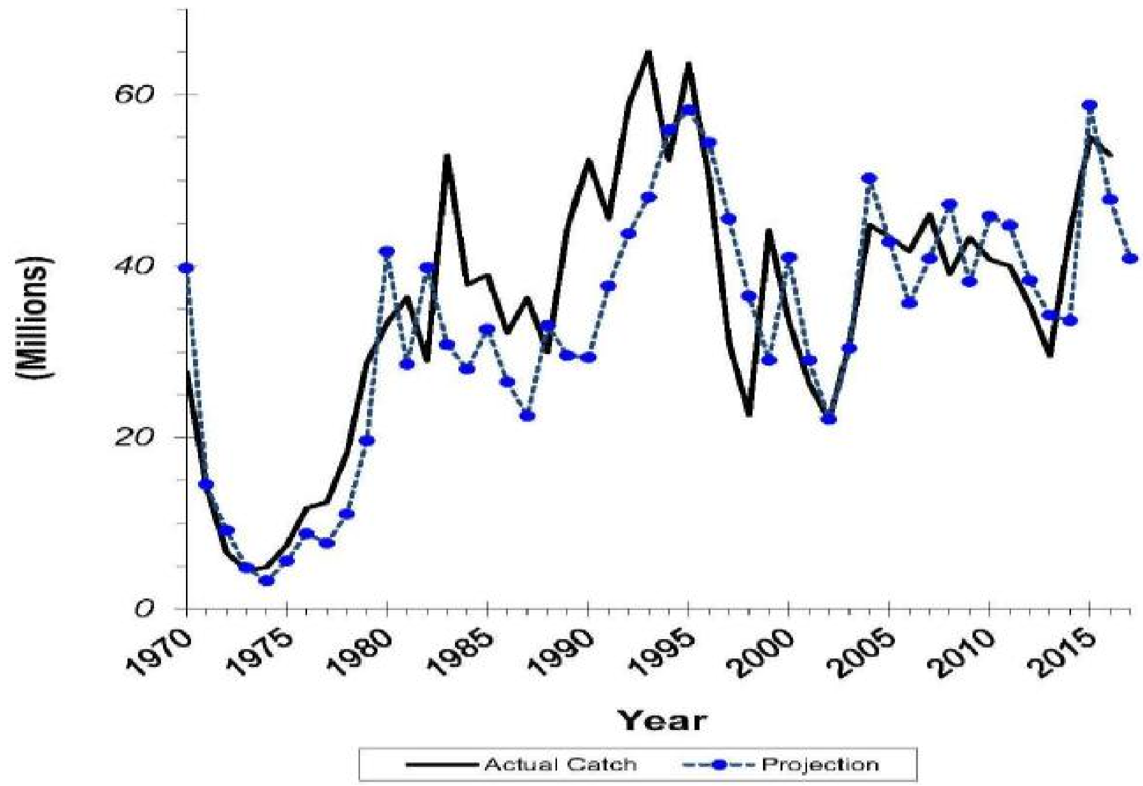

Figure 3-12.Trends in annual Sockeye Salmon harvest in Alaska commercial fisheries (Brenner & Munro 2017). Projections are preseason forecasts.

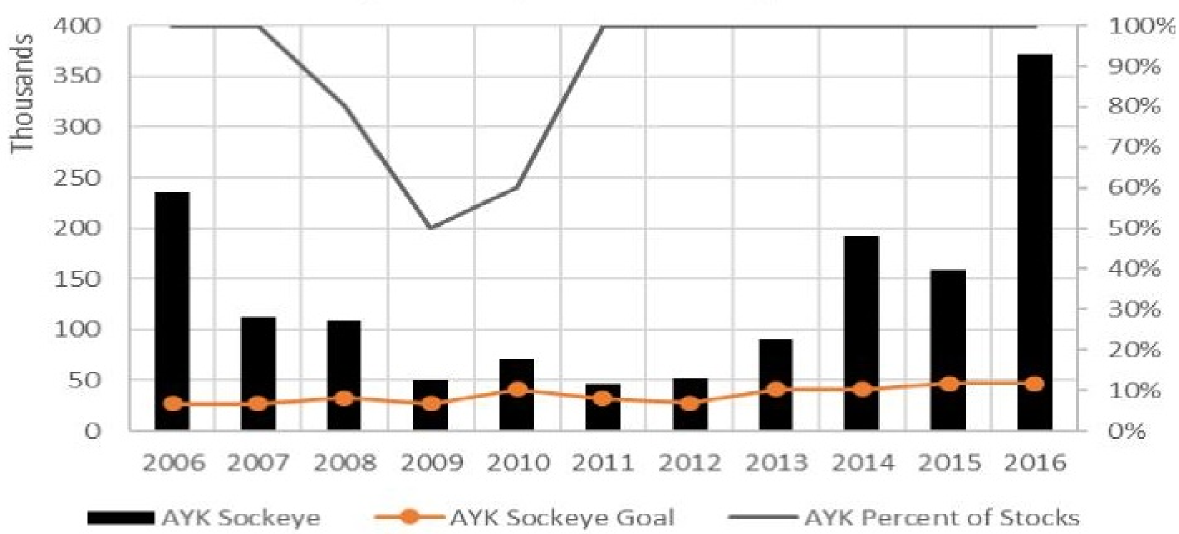

Figure 3-13.Escapements of Sockeye Salmon in the A-Y-K Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 -2016.

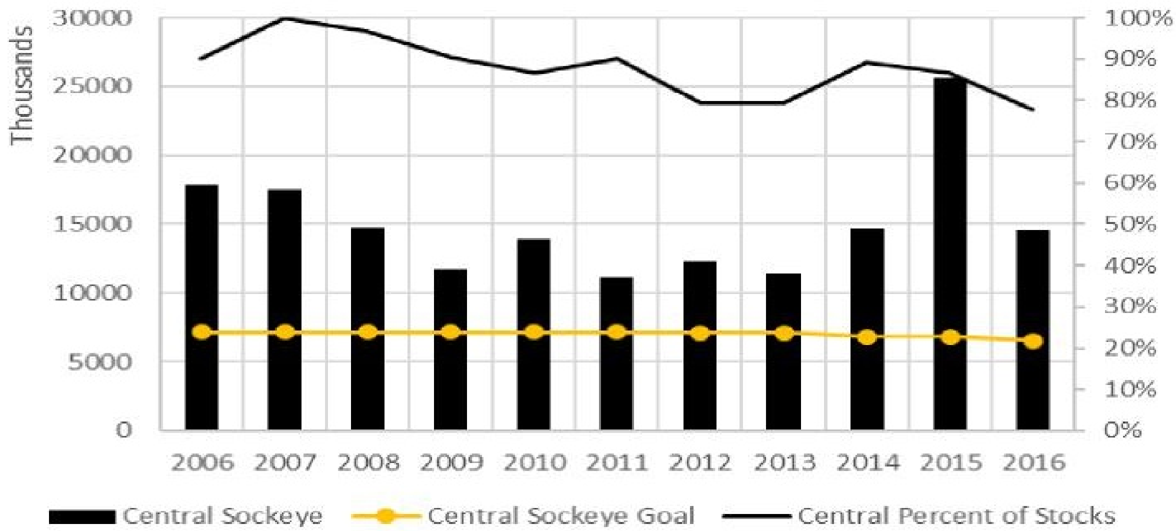

Figure 3-14.Escapements of Sockeye Salmon in the Central Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

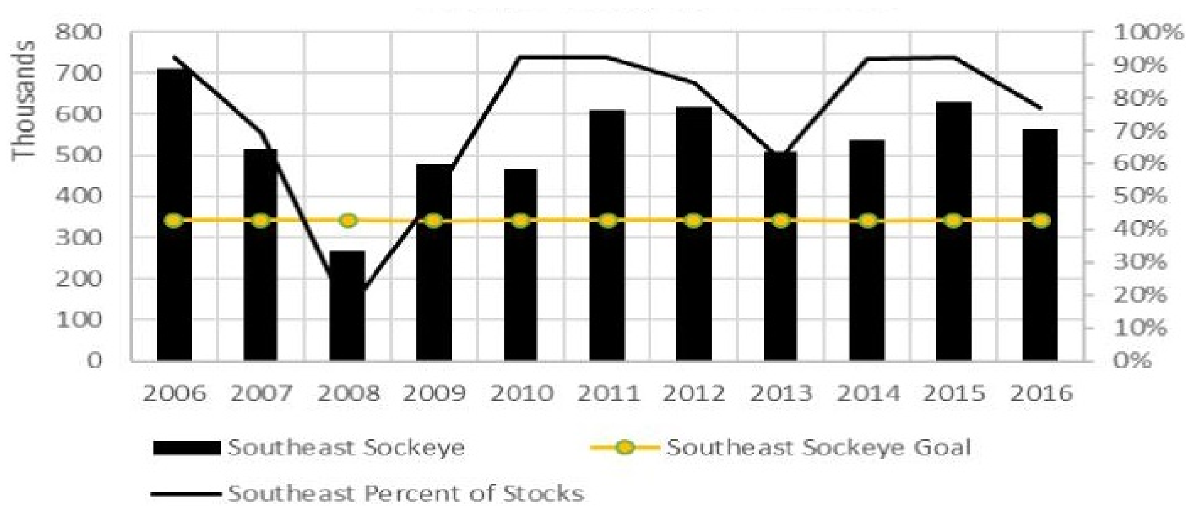

Figure 3-15.Escapements of Sockeye Salmon in the Southeast Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

Chinook salmon – *Oncorhynchus tshawytscha*[4]

Description

The Chinook salmon is the largest of all Pacific salmon, typically measuring up to 36 inches in length and 30 pounds in weight. Adults are distinguished by the black irregular spotting on the back and dorsal fins and on both lobes of the caudal or tail fin.

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 smolts and migrate to the salt water estuary. They then spend anywhere from 1-5 years feeding in the ocean, and 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. For example, a mature 3-year-old will probably weigh less than 4 pounds, while a mature 7-year-old may exceed 50 pounds. 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 Chinook salmon that mature after spending only one winter in the ocean are commonly referred to as "jacks," and are typically male. 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 extreme 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 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. Chinook juveniles divide into two types: ocean type and stream type. Ocean type Chinook migrate to saltwater in their first year. Stream type Chinook spend one full year in fresh water before migrating to the ocean. 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 of life and are therefore considered to be “stream type.”

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

Fresh water streams and estuaries provide important habitat for spawning Chinook, and they also serve as nursery grounds for developing eggs, fry, and juveniles. In Alaska, Chinook salmon are abundant from the southeastern panhandle to the Yukon River. Major populations return to the Yukon, Kuskokwim, Nushagak, Susitna, Kenai, Copper, Alsek, Taku, and Stikine rivers. Important runs also occur in many smaller streams.

Chinook salmon are expensive to culture because of the requirement for long-term freshwater rearing. Hatchery enhancement occurs primarily in Southeast Alaska in support of Pacific Salmon Treaty

[4] Adapted from: http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main

activities that support recreational and troll fisheries. Comparatifely small hatchery realeases occur in Southcentral Alaska to support recreational fisheries.

Harvest

Recent Chinook salmon harvests, have been well below the longterm average. There was little to no commercial harvest in the Yukon and Kuskokwim areas. Catches permitted under the Pacific Salmon Treaty in Southeast Alaska rebounded substantially because far north migrating stocks that spawn in the Pacific Northwest and Southern British Columbia were healthy. To address concerns for poor productivity of Chinook Salmon stocks the state embarked on a major research project to understand the reason(s) for the decline. http://www.adfg.alaska.gov/index.cfm?adfg=Chinookinitiative.main

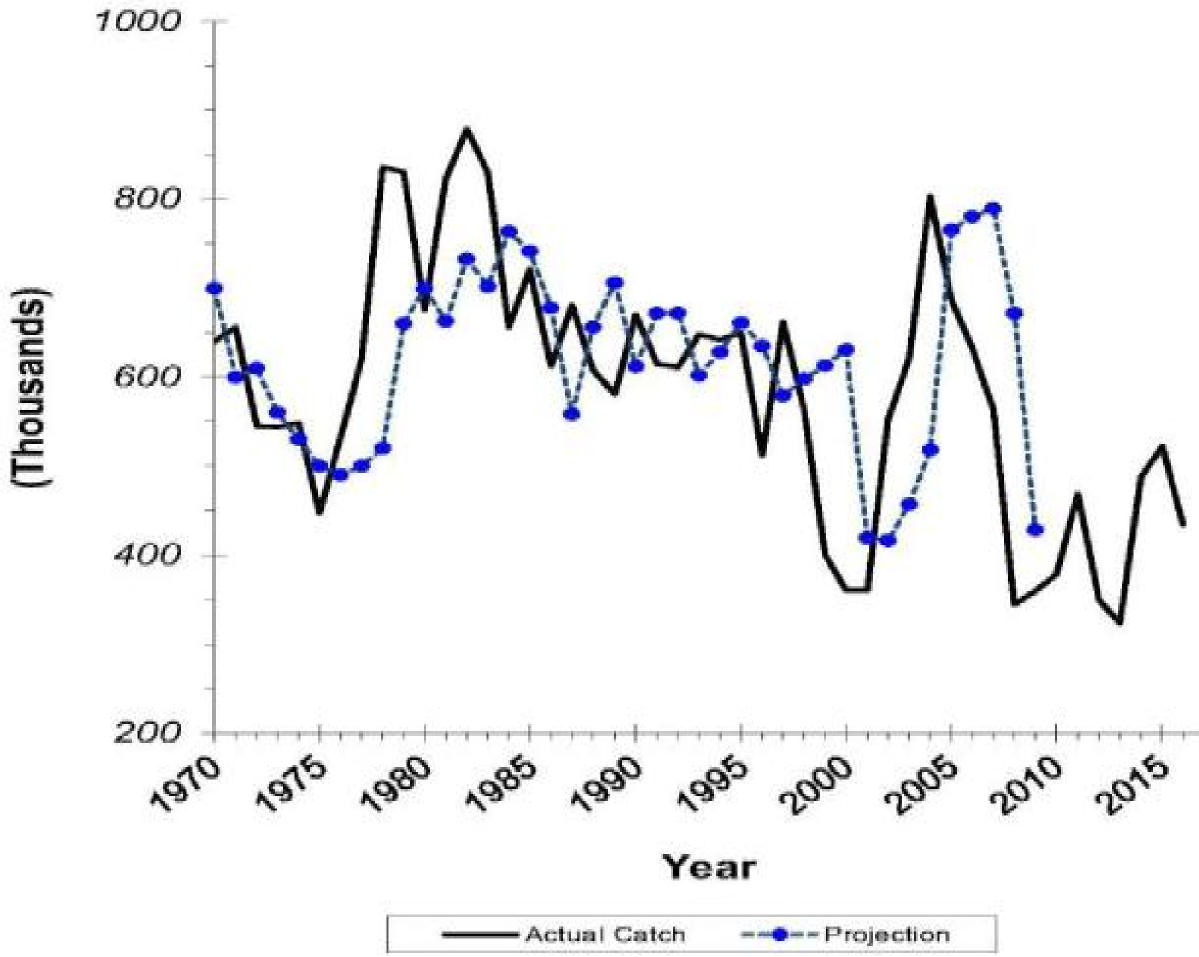

Figure 3-16.Trends in annual Chinook Salmon harvest in Alaska commercial fisheries (Brenner & Munro 2017). Projections are preseason forecasts.

Escapement

Except for one small stock in Norton Sound, and two small stocks in Kuskokwim Bay, the Yukon and Kuskokwim rivers are the only stocks with escapement goals in the AYK Region. Yukon escapement goals are based on achieving a number of fish into the Canadian portion of the river and for observed numbers in three tributaries in the Alaska portion of the drainage. Escapements into the Kuskokwim are based on achieving a total number for the entire river (there are also goals for individual stocks within the Kuskokwim). Escapements in the AYK Region have rebounded substantially since the period from

2010 to 2013. Escapement goals into the Canadian portion of the Yukon River have been met for the last three years.

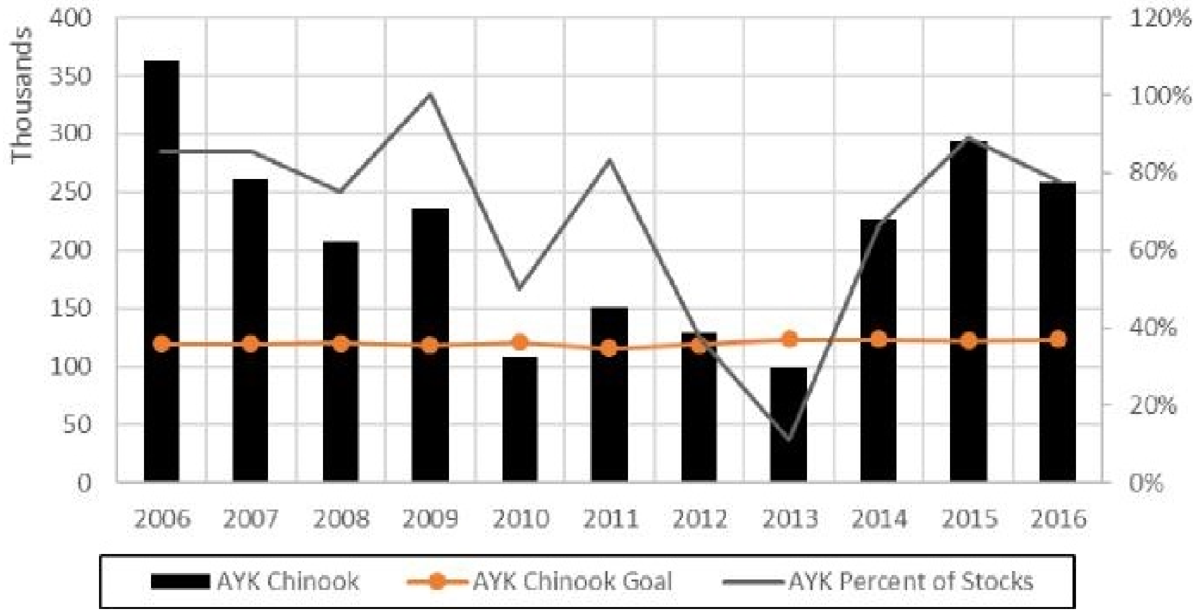

Figure 3-17.Escapements of Chinook Salmon in the A-Y-K Region, in relation to the lower bound of the goal and percent of stocks above goal 2006 - 2017.

The primary Chinook Salmon stocks in the Central Region are the Nushagak (Bristol Bay Area), Kenai River and Susitna Rivers (Upper Cook Inlet Area), and the Copper River (Copper-Bering Area). Data are not available yet for the 2015 and 2016 runs into the Copper River or for the 2016 run into the Kenai River. There is no annual estimate made for the total run into the Susitna, but goals are established for some tributaries. In addition, there are several moderate to smaller stocks with goals in the Upper Cook Inlet Area. Currently available data show a pattern very similar to that observed in Western Alaska, with a sharp decline in the percent of stocks reaching their goals during the period 2010 through 2013. If recent years data was available for the Kenai and Copper Rivers, the rebound in the total number of fish escaping would be substantially more evident.

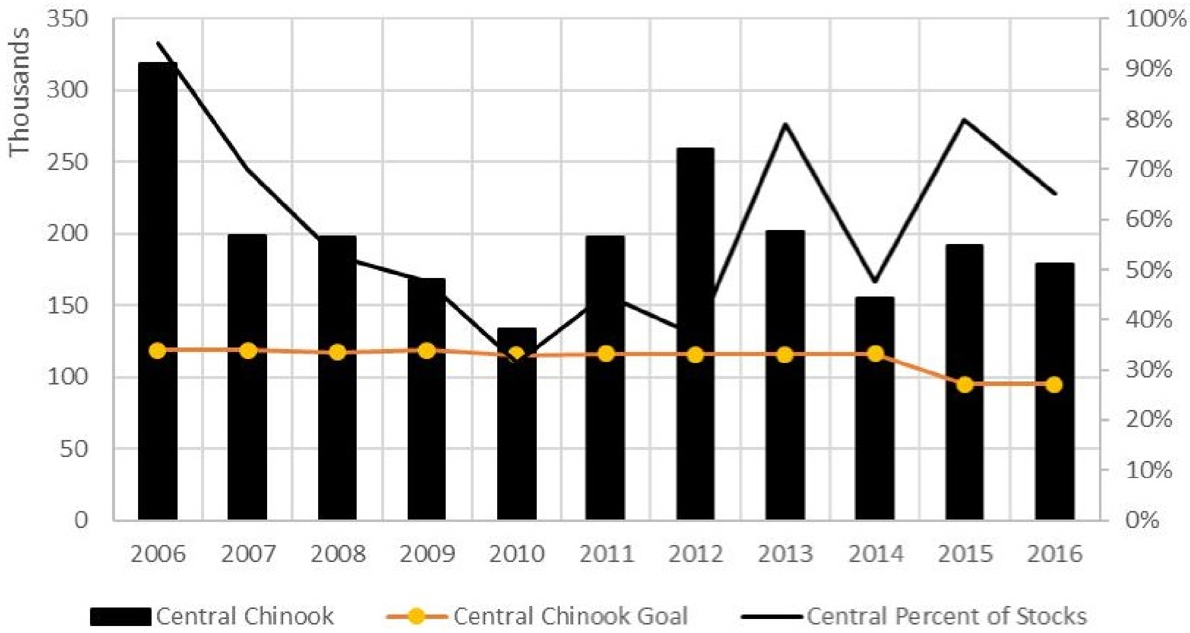

Figure 3-18.Escapements of Chinook Salmon in the Central Region (Bristol Bay, Upper and Lower Cook Inlet, Prince William Sound and Copper-Bering Management Areas) in relation to the lower bound of the goal and percent of stocks above goal, 2006 -2016.

There are only four Chinook Salmon stocks with goals in the Westward Region (three in the Kodiak Area and one in the Chignik Area) and these runs are much smaller than those in the AYK or Central regions. These stocks are primarily caught incidentally during early season Sockeye Salmon fisheries. In recent years, time and area restrictions and non-retention and non-sale regulations have been in place in the Kodiak Area. Escapements since 2006 have been near, or below minimums for one or more of the four stocks.

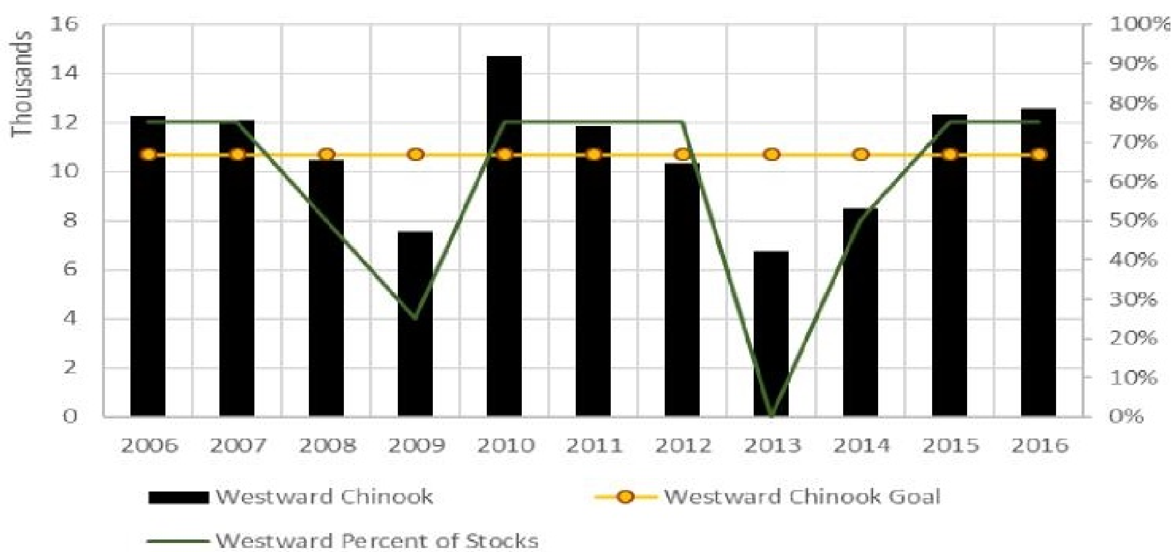

Figure 3-19.Escapement of Chinook Salmon in the Westward Region (North and South Alaska Peninsula areas, Chignik and Kodiak management areas) in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

The Southeast Region has two large runs of Chinook Salmon, the Taku and Stikine rivers (Southeast Area), three moderately sized runs, the Alsek (Yakutat Area), Chilkat and Unuk Rivers (Southeast Area) and six small runs. The pronounced drop in escapements seen in other regions of the state between 2010 and 2013 was not evident in this region, but a dramatic decline occurred in 2016. Similar low levels of escapement were documented in 2017 (Munro 2018).

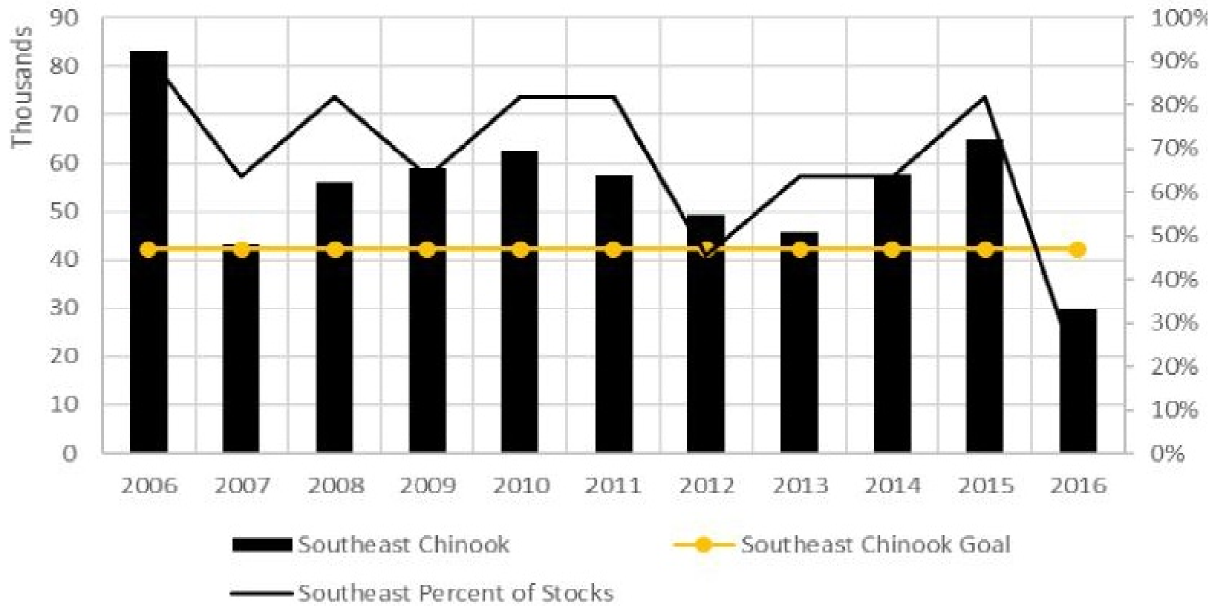

Figure 3-20.Escapement of Chinook Salmon in the Southeast Region (Yakutat and Southeast management areas) in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

Coho salmon – *Oncorhynchus kisutch*[5]

Description

Adult Coho usually weigh 8 to 12 pounds and are 24 to 30 inches long, but individuals weighing 31 pounds have been landed. Coho salmon enter spawning streams from July to November, usually during periods of high runoff. The female digs a redd and deposits 2,400 to 4,500 eggs. As the eggs are deposited, they are fertilized with milt from the male. The eggs develop during the winter, hatch in early spring, and the alevins remain in the gravel utilizing their egg yolk until they emerge in May or June. During the fall, juvenile Coho may travel miles before locating off-channel habitat where they pass the winter free of floods. Some fish leave fresh water in the spring and rear in brackish estuarine ponds and then migrate back into fresh water in the fall. They generally spend one to three winters in streams and may spend up to five winters in lakes before migrating to the sea as smolt. Time spent at sea varies. Some males (called jacks) mature and return after only 6 months at sea at a length of about 12 inches, while most fish stay 18 months (one winter) before returning as full size adults. In freshwater, Coho fry feed voraciously on a wide range of aquatic insects, small fishes, and plankton. They also consume eggs deposited by adult spawning salmon. Their diet at sea consists mainly of fish and squid, and some zooplanktonCohoCoho.

[5] Adapted from: http://www.adfg.alaska.gov/index.cfm?adfg=cohosalmon.main

Little is known about the ocean migrations of Coho salmon. High seas tagging shows that maturing Southeast Alaska Coho move northward throughout the spring and appear to concentrate in the central Gulf of Alaska in June. They later disperse towards shore and migrate along the shoreline until they reach their stream of origin.

The emergent fry occupy shallow stream margins, and, as they grow, establish territories which they defend from other salmonids. Coho fry live in ponds, lakes, and pools within streams and rivers, usually among submerged, woody debris- in quiet areas free of current.

Coho are found in coastal waters of Alaska from Southeast to Point Hope on the Chukchi Sea and in the Yukon River to the Alaska-Yukon border. Coho are extremely adaptable and occur in nearly all accessible bodies of fresh water, from large trans-boundary watersheds to small tributaries.

Hatchery culture of Coho salmon is similar to that of Chinook salmon: long-term freshwater rearing is required and activities are largely limited to Southeast Alaska to support Pacific Salmon Treaty activities that involve recreational and troll fisheries.

Harvest

The catch of Coho Salmon was similar to that observed over the last 20 years. As usual, Southeast Alaska accounts for the largest portion of the catch.

Escapement

All stocks in the A-Y-K Region met their escapement goal. Within the Central Region, estimates of escapement were made from 2012 – 2014 for the Nushagak River and this accounts for the large numbers observed in those years. Among the large stocks in the region (Copper River, Bering River and Little Susitna River) only the Little Susitna missed its goal (10,100 fish) by only 50 fish. Within the Westward Region, Two of the four small stocks on Kodiak Island missed their goal, while the stocks on the Alaska Peninsula met their goals. Within the Southeast Region, one large stock (Chilkat River) and two small stocks did not meet their escapement goal.

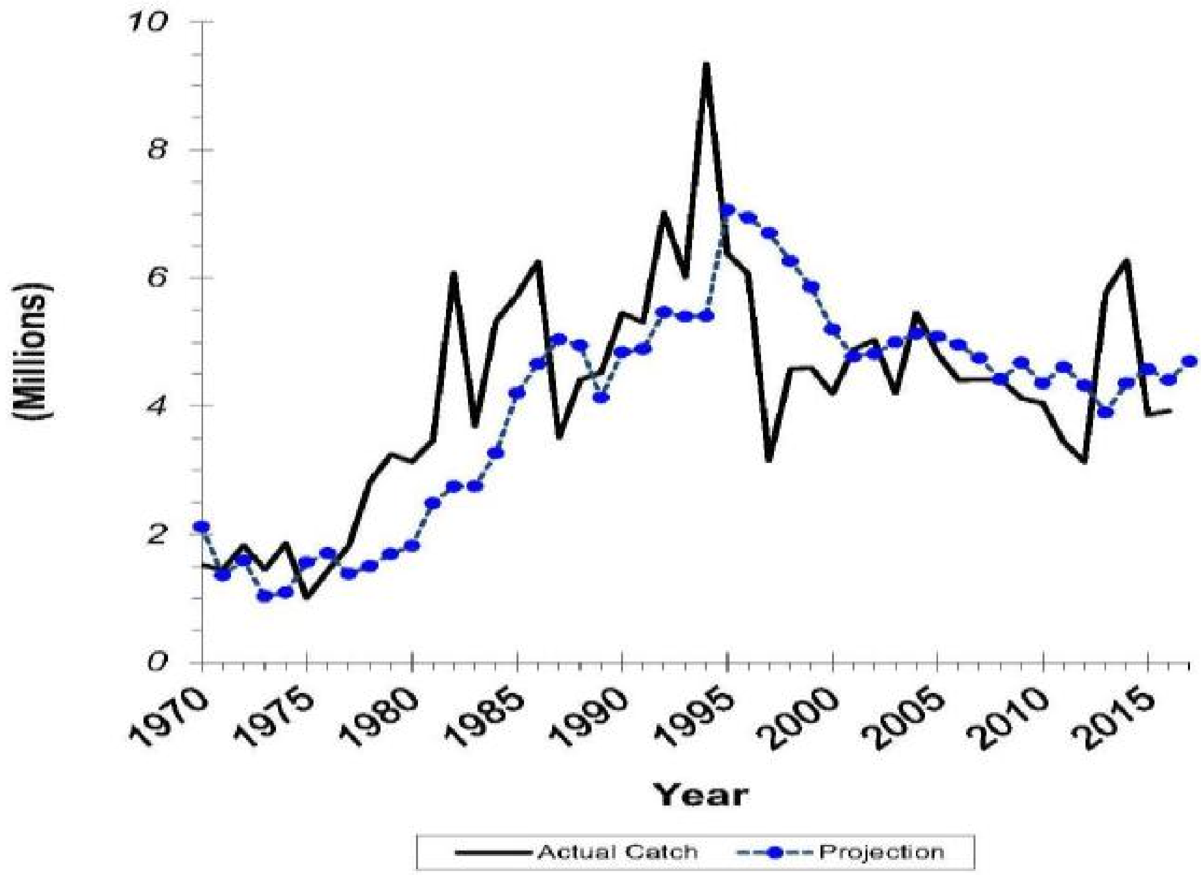

Figure 3-21.Trends in annual Coho Salmon harvest in Alaska commercial fisheries (Brenner & Munro 2017). Projections are preseason forecasts.

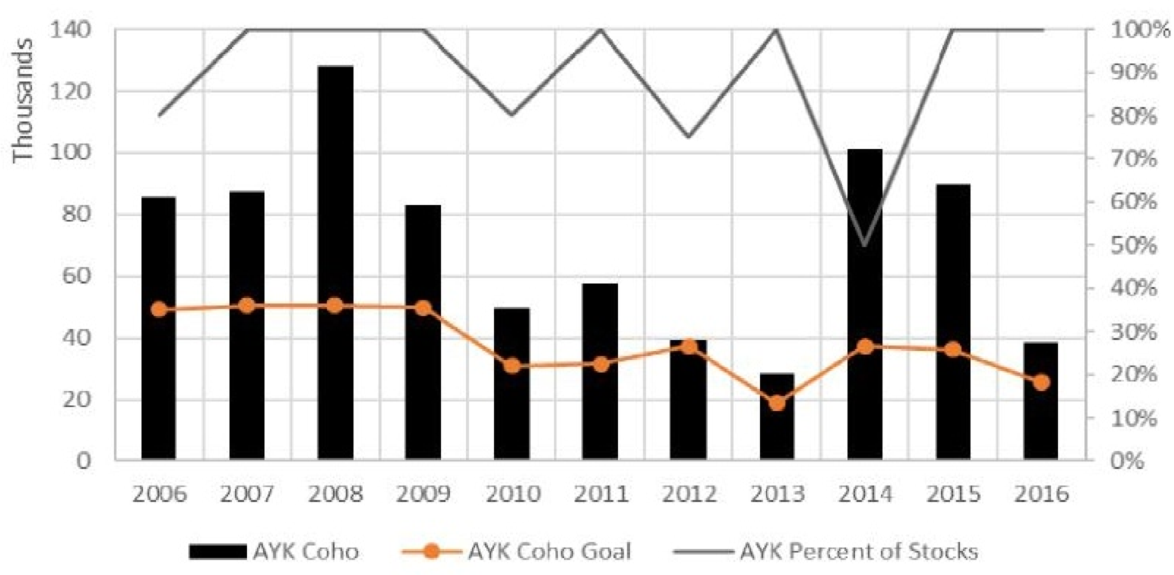

Figure 3-22.Escapements of Coho Salmon the A-Y-K Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

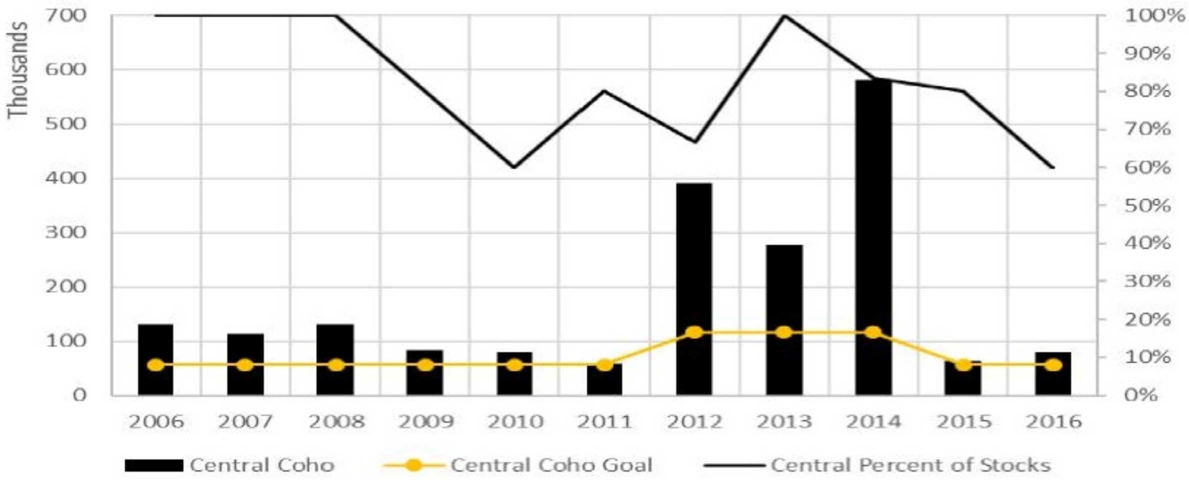

Figure 3-23.Escapements of Coho Salmon in the Central Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 – 2016.

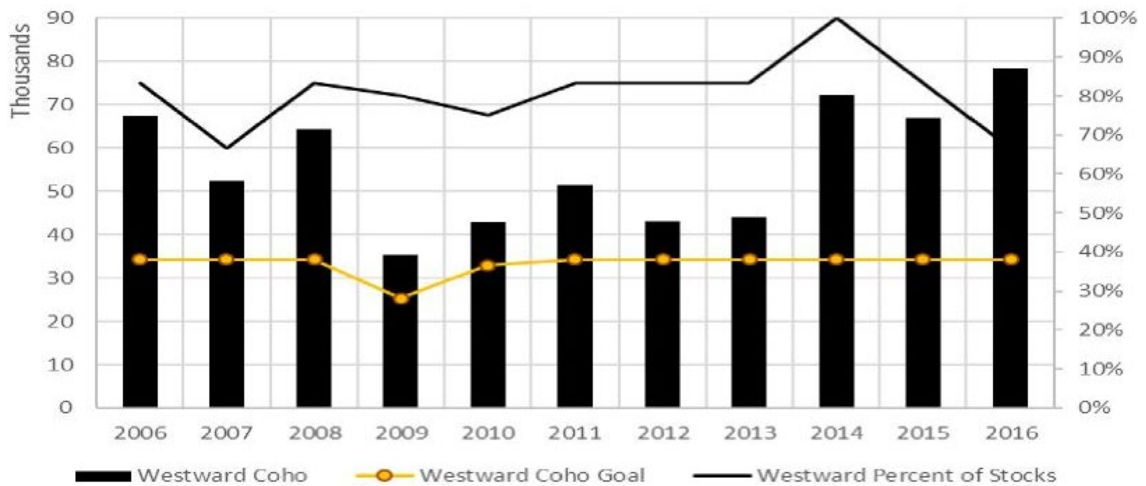

Figure 3-24.Escapements of Coho Salmon in the Westward Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

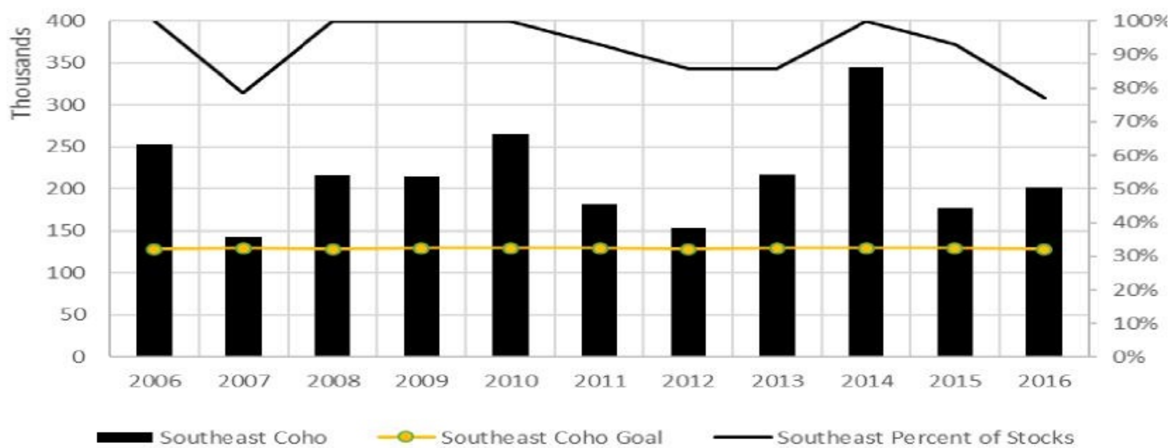

Figure 3-25.Escapements of Coho Salmon in the Southeast Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 -2016.

Pink salmon – *Oncorhynchus gorbuscha*[6]

Description

Pink salmon are the smallest of the Pacific salmon found in North America weighing on average between 3.5 and 5 pounds, with an average length of 20-25 inches. They are the most numerous Pacific salmon and have been harvested and canned commercially in Alaska since the late 1800's.

Pink salmon have the shortest lifespan of all the Pacific salmon found in North America. They mature and complete their entire life cycle in two years. This consistent two-year life cycle has created genetically distinct odd-year and even-year populations of Pink salmon. Fish coming in odd years are unrelated to the individuals returning in even years. Odd-year and even-year populations do not interbreed with each other even when they return to the same spawning grounds. Many times individual streams will tend to have one of the populations (odd-year or even-year) producing more fish. However, in some streams both odd and even years produce about the same number of Pink salmon. Occasionally this will shift, and the previously weak year will become the most abundant.

As soon as Pink salmon fry emerge from the gravel on the bottom of the river, they swim to the ocean. Once there, they begin feeding on plankton, larval fishes, and occasional aquatic insects. After 18 months of feeding and growing in saltwater, they reach maturity and return to the river they were born to spawn between late June and mid-October. Pink salmon generally spawn in small rivers near the coast, and in estuaries near the mouths of rivers. Most Pink salmon do not travel farther than 40 miles up a river to spawn. However, in Alaska they have been known to go greater distances in larger river systems, such as the Yukon, Kuskokwim and Nushagak. In Southcentral Alaska, Pink salmon have been documented going as far as 130 miles up the Susitna River. On the Mulchatna River, Pink salmon have gone as far as 250 miles upstream before spawning. After young Pink salmon emerge from the gravel and migrate to saltwater, they gather in schools and remain in estuaries and along the beaches. Eventually, they begin spending more time feeding in the deeper offshore waters, such as the Gulf of Alaska and Aleutian Islands.

In Alaska, Pink salmon are widely distributed along the coast, with only a few in the Copper River delta and none in the upper Copper River drainage. Pink salmon are easy to culture because no freshwater rearing is required, and many hatcheries in in Southcentral and Southeast Alaska and Kodiak release very large numbers of fry annually.

Harvest

The 2016 Pink Salmon catch was lowest since the late 1970's. The dismal harvest in Kodiak, Prince William Sound and Southeast led the Governor to declare a disaster for these fisheries and seek federal aid.

Escapements

Within the AYK Region, Norton Sound is the only Management Area with Pink Salmon escapement goals, and with little commercial interest in this far northerly region, when a large run occurs, as it did in 2016, most of the fish escape to spawn.

Within the Central Region, Bristol Bay has one stock with an escapement goal (Nushagak River) but little commercial interest makes estimating the annual escapement a low priority and the stock was not surveyed in 2016. In the Lower Cook Inlet Management Area, 12 of the 16 individual runs did not

[6] Adapted from: http://www.adfg.alaska.gov/index.cfm?adfg=pinksalmon.main

achieve their escapement goals. Within Prince William Sound goals are set by District, and all escapement goals were met.

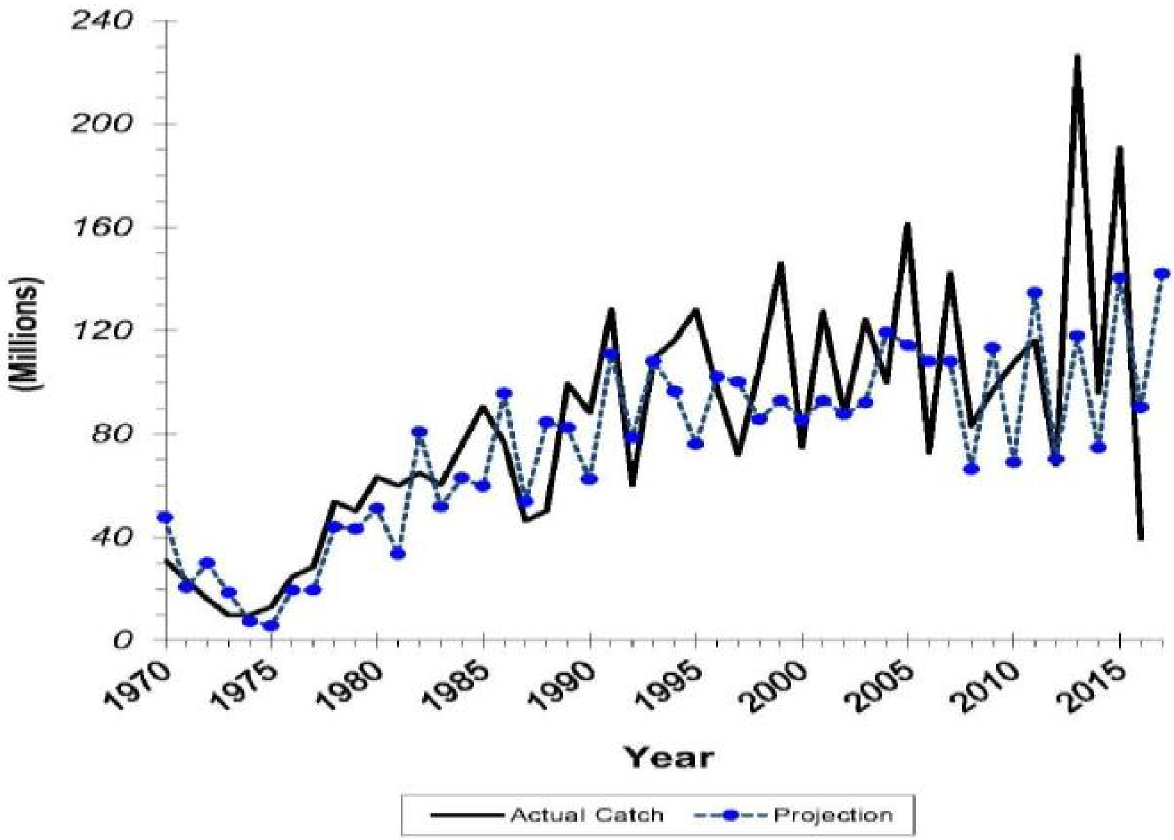

Figure 3-26.Trends in annual Pink Salmon harvest in Alaska commercial fisheries (Brenner & Munro 2017). Projections are preseason forecasts.

Within the Westward Region, Pink Salmon escapement goals are set for the entire Chignik Area and South Peninsula Area, and for the Kodiak Mainland and Kodiak Island Archipelago Districts. None of the four escapement goals were met within the Westward Region in 2016.

Within the Southeast Region there is one stock with a goal in the Yakutat Area (Situk River) and it did not meet its goal. Within the Southeast Area, there are three aggregate goals, the goals for the Southern portion of the region and for the Northern Outside portion met their goals while the goal for the Northern Inside portion of the region failed to meet its goal.

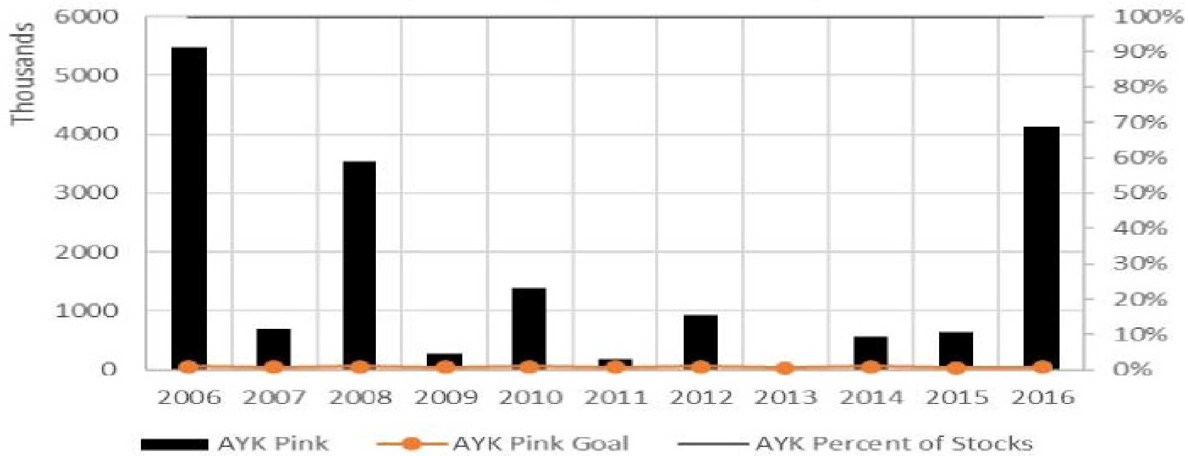

Figure 3-27.Escapements of Pink Salmon in the A-Y-K Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

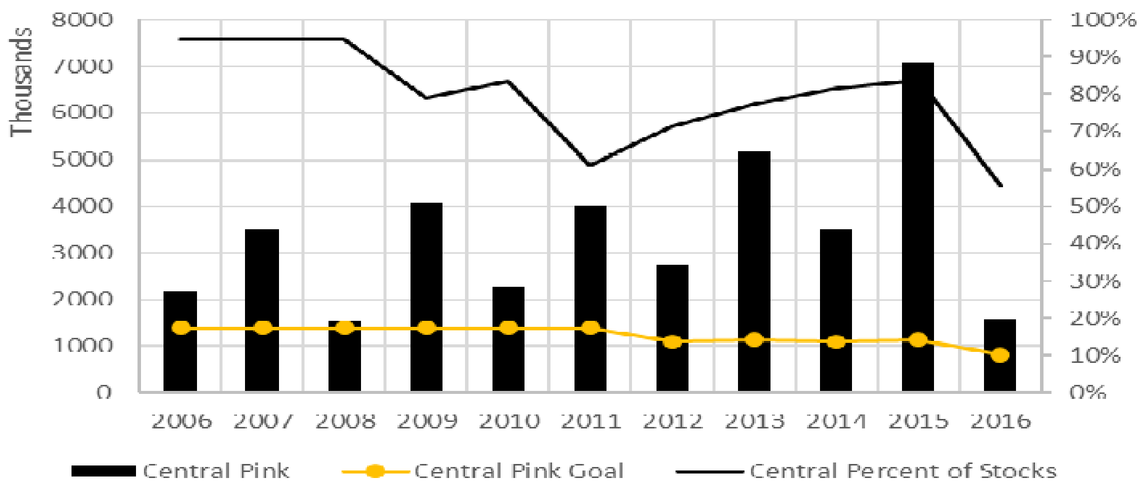

Figure 3-28.Escapements of Pink Salmon in the Central Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 – 2016.

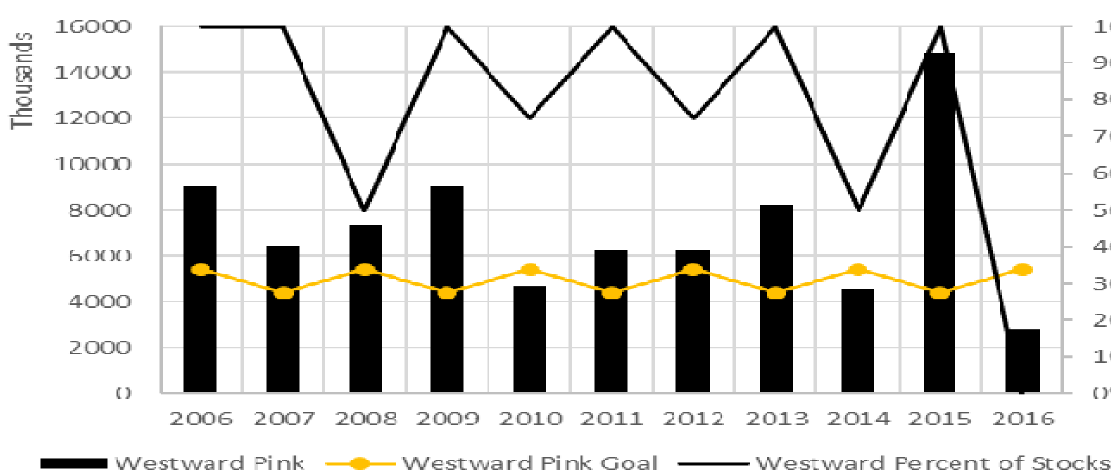

Figure 3-29.Escapements of Pink Salmon in the Westward Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

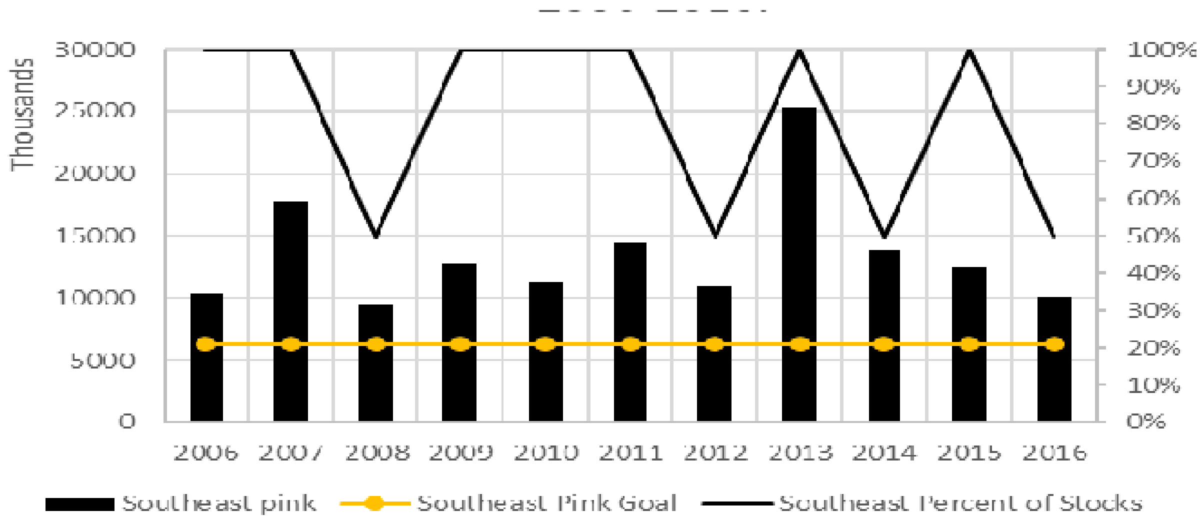

Figure 3-30.Escapements of Pink Salmon in the Southeast Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016

Chum salmon – *Oncorhynchus keta*[7]

Description

Chum salmon, also known as dog salmon, are the most widely distributed of all the Pacific salmon and generally occur throughout Alaska. Like most other Pacific salmon species, Chum salmon spend most of their life feeding in saltwater, then return to freshwater when mature to spawn once in the fall then die. As adults, they almost always return from feeding areas in the ocean to spawn in the very same stream and site where they were spawned. Most Chum salmon populations do not travel far upstream to spawn; however, some travel up to 2,000 miles upstream to the headwaters of the Yukon River. No freshwater-resident or landlocked populations have been found. Although generally regarded as one of the less desirable species of salmon, in Arctic, Northwestern, and Interior Alaska, Chum salmon are highly prized as a traditional source of dried winter food. Since the 1980s, commercial Chum salmon harvests in Alaska have more than doubled as a result of the Alaska hatchery program and increased foreign sales.

Like other Pacific salmon species, Chum salmon usually spawn in the fall. They can be found in two distinct races based on spawning-run timing: the earlier-running race is referred to as summer Chum salmon, and the later-running race is called fall Chum salmon. Small to medium, slow-flowing, spring-fed side channels are often their preferred spawning habitat, but they spawn in a wide variety of habitats including large muddy rivers, cold, clear headwater streams, and in the mouths of rivers below the high-tide line. As with other Pacific salmon, a female Chum salmon excavates depressions (redds) in the gravel and deposits her eggs as one or more males simultaneously releases its sperm resulting in fertilization. The female then covers the fertilized eggs with gravel and guards the redd until she eventually becomes too weak to hold position in the stream.

Chum salmon embryos hatch from eggs after 3–4 months, depending on water temperature. Hatchlings (alevin) remain in the gravel while continuing to absorb nutrients from the egg yolk for an additional 60–90 days before emerging. They begin their migration to the sea within days or weeks. Newly hatched Chum salmon migrate, sometimes great distances, down their natal (home) rivers toward their feeding grounds in the sea.At sea, juvenile Chum salmon spend several months near shore then disperse into the open ocean. They grow rapidly in the ocean, reaching 12 or more pounds over the next 3–4 years, with the most rapid growth taking place during their final year at sea.

Chum salmon are relatively easy to culture because of the comparatively short freshwater rearing requirement. Hatcheries in Kodiak, Southcentral, and primarily Southeast Alaska release very large numbes of hatchery fry.

Harvest

Catches of Chum Salmon have increased dramatically since large scale enhancement came online in Southeast and Prince William Sound in the mid 1990's. In 2016, significant wild stock catches occurred in the AYK Region, Bristol Bay, South Peninsula and Kodiak.

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[7] Adapted from: http://www.adfg.alaska.gov/index.cfm?adfg=chumsalmon.main

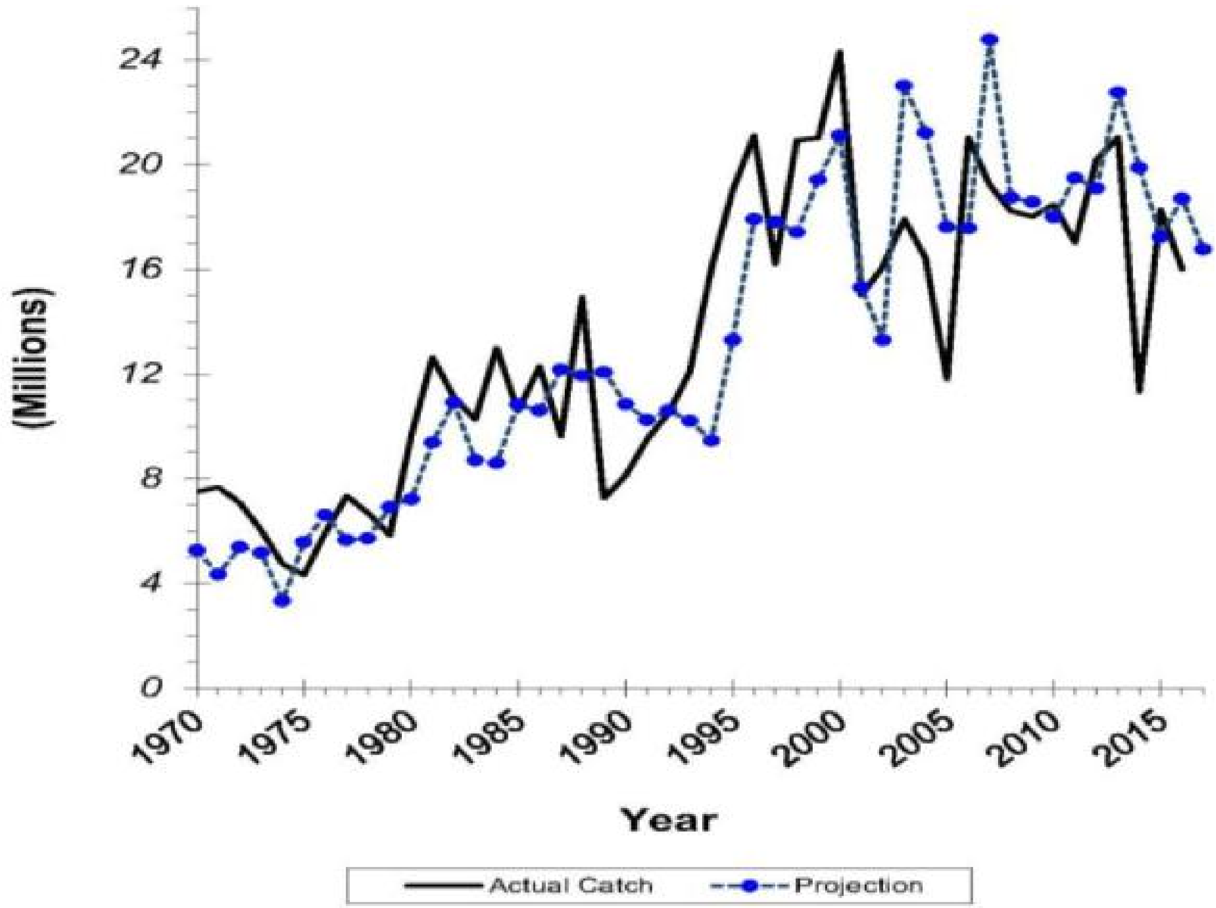

Figure 3-31. Trends in annual Chum Salmon harvest in Alaska commercial fisheries (Brenner & Munro 2017). Projections are preseason forecasts.

Escapements

Escapements in the AYK Region were strong. While most stocks met their minimum escapement goal in the Central Region overall numbers were much lower than seen between 2006 and 2014. This apparent decline is an artifact because no escapement data are available for the very large Nushagak River run in 2015 and 2016. Within the Westward Region, only the Kodiak Area escapement was below its goal. In the Southeast Region, the large Northern Inside summer aggregate index was below goal as was the Excursion Inlet fall run.

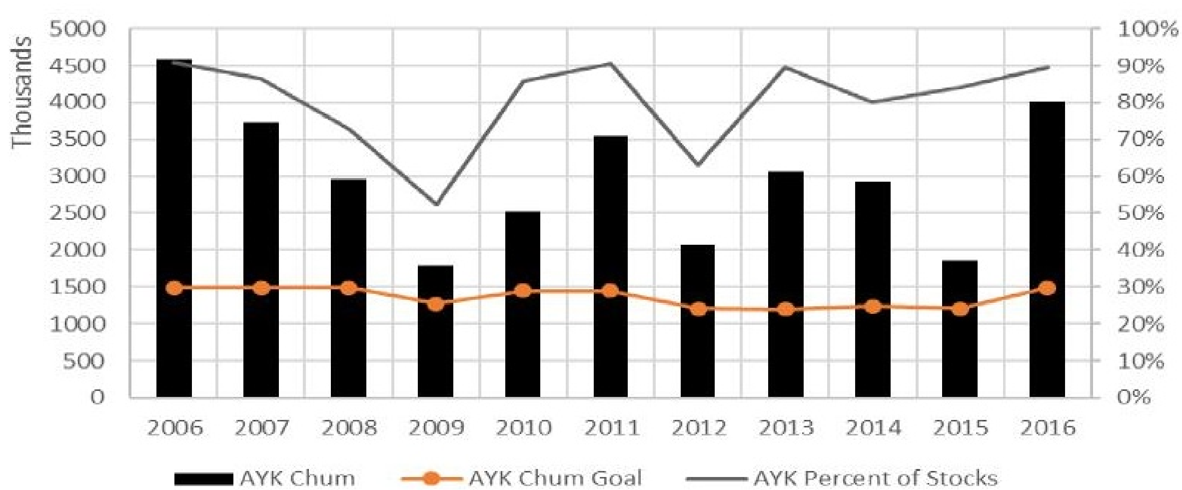

Figure 3-32.Escapements of Chum Salmon in the A-Y-K Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

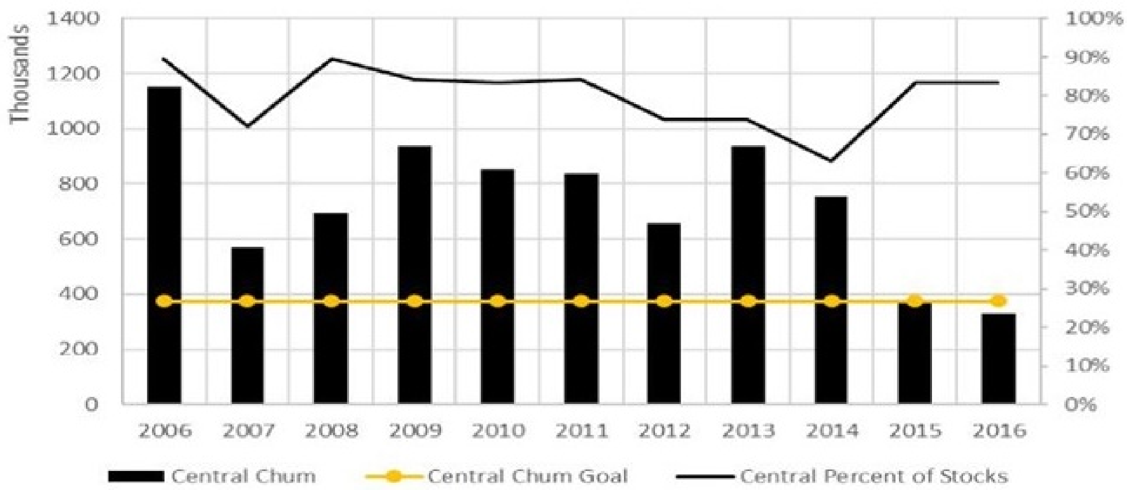

Figure 3-33.Escapements of Chum Salmon in the Central Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 - 2016.

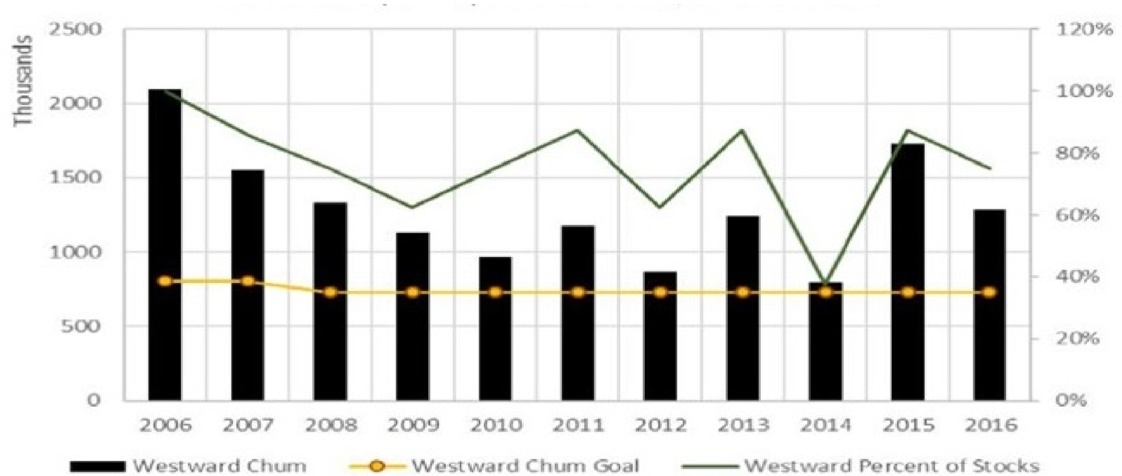

Figure 3-34.Escapements of Chum Salmon in the Westward Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 – 2016.

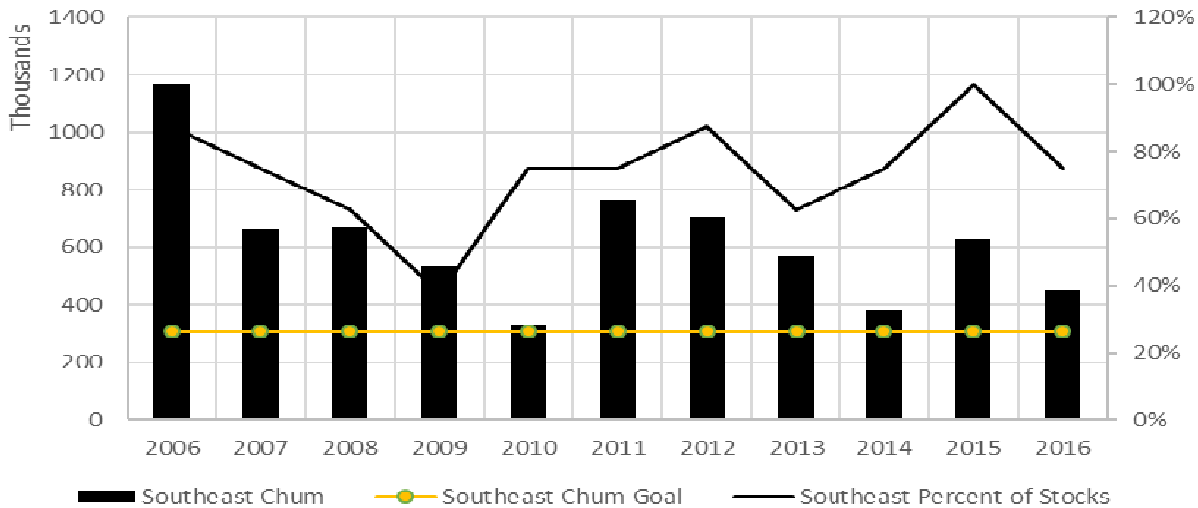

Figure 3-35.Escapements of Chum Salmon in the Southeast Region in relation to the lower bound of the goal and percent of stocks above goal, 2006 -2016.

2.5 Principle 1—Target Species Backgrond

Information in this section is presented by Unit of Assessment/Certification with all species targeted in each unit falling within each UoC subsection.

2.5.1 UoC 1 – Southeast Alaska (SEAK)

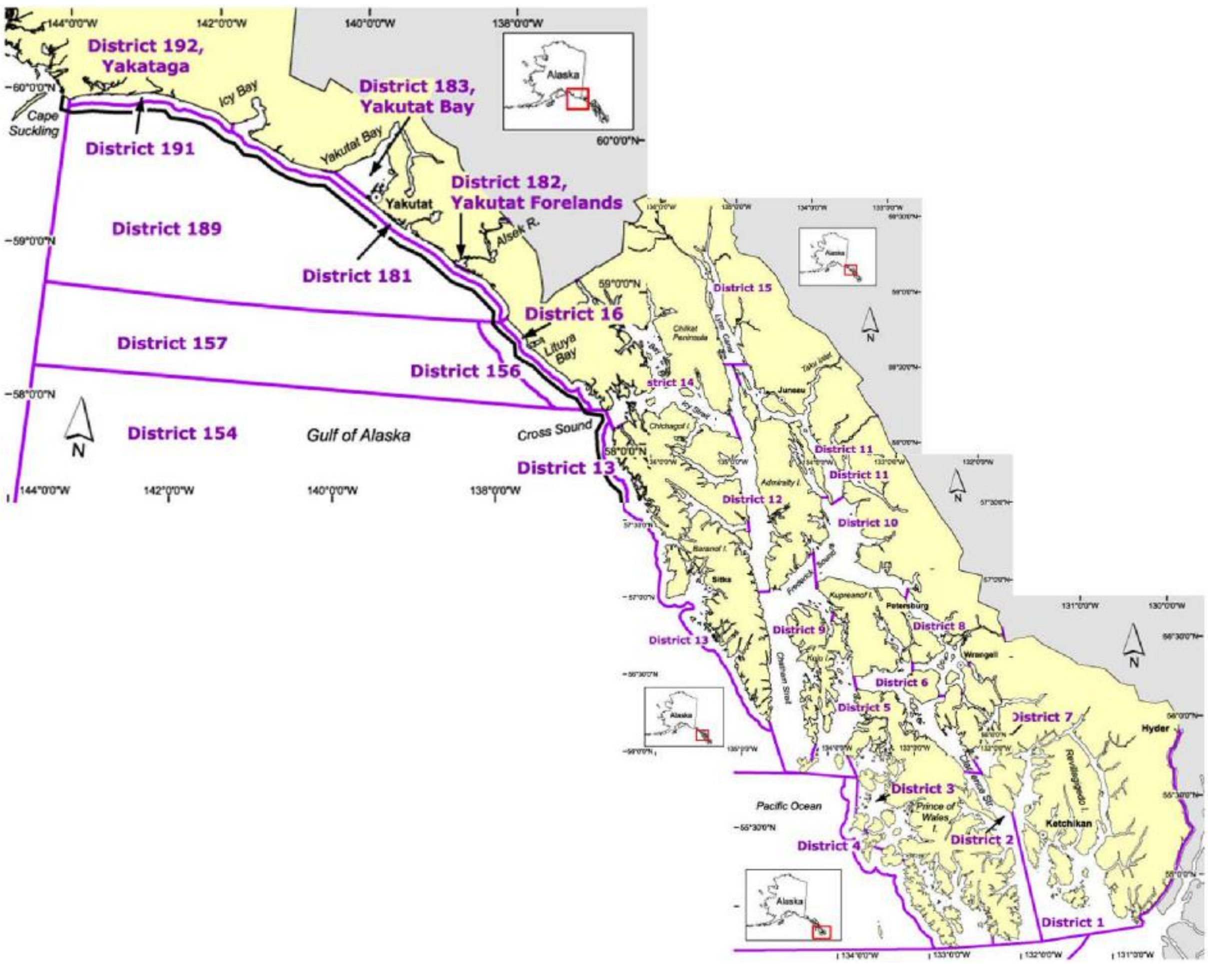

Figure 3-36.The Southeast Region (= SEAK + Yakutat UoCs)

<u>Fishery</u>

Southeast Alaska (SEAK) salmon fisheries are prosecuted with drift gillnets, purse seines and troll gear.

The SEAK drift gillnet fisheries occur in five traditional fishing districts located in the inside waters of Southeast Alaska, and in several hatchery terminal harvest areas. Target species and stocks vary among the fishing districts. The fisheries target Sockeye, Pink and summer Chum salmon from mid-June through mid-August and Coho and fall run Chum salmon thereafter through late September or early October. Targeted fishing for transboundary Taku and Stikine River Chinook salmon in May through early June was re-instituted in 2005 in districts at the mouths of the rivers, following a closure of almost 30 years to allow for stock rebuilding and finalization of negotiated agreements with Canada on joint management and harvest sharing of the runs. Chum and Sockeye salmon typically represent the highest total ex-vessel value to the drift gillnet fisheries. Hatcheries contribute significant amounts of Chum, Coho and Sockeye salmon to the drift gillnet fisheries. Management of four of the five traditional fishing districts is affected by harvest sharing and management provisions of the U.S./Canada Pacific Salmon Treaty.

The Purse seine fishery has accounted for approximately 77% of the total commercial salmon harvest in numbers of fish in the Southeast Alaska region from 1960-2015. Pink salmon is the primary species targeted by the purse seine fleet, and therefore most management actions are based on inseason assessments of the abundance of pink salmon. In traditional purse seine fisheries, other salmon species are harvested incidentally to pink salmon. Fishing seasons and periods are established in 14 fishing Districts. Although these specified areas are traditionally open or available for purse seine fisheries, regulations mandate that specific open areas and fishing periods be established by emergency order. In 2016, purse seining also took place in 6 terminal harvest areas and special harvest areas and 16 hatchery cost recovery locations.

The Southeast Alaska commercial troll fishery operates in state waters of the Southeast Alaska/Yakutat area, and in federal waters of the Exclusive Economic Zone east of the latitude of Cape Spencer. We have separated the Yakutat area as a separate Unit of Certification and it will be addressed in a different section of this document.

The troll fishery targets Chinook and Coho salmon, and, with few exceptions, other species are harvested incidentally and comprise much smaller portions of the fishery’s total exvessel value. Pink and Chum salmon are targeted in a small fishery in Cross Sound during June, and hatchery Chum salmon are targeted in and near terminal harvest areas in Sitka Sound and Neets Bay. Hatchery Chum have become increasingly important over the last 15 years. The Chinook salmon troll fishery is separated into winter and summer seasons. During the October – April winter season, trolling is limited to the inside waters of the region. The summer season lasts from May through September and is further divided into spring and summer fisheries. The spring fisheries, which occur primarily in inside waters near hatchery release sites or along migration routes of returning hatchery fish, are intended to increase the harvest of Alaska hatchery Chinook salmon. The majority of the annual troll harvest of Chinook salmon is taken during the summer fishery which opens in early July.

In order to implement complex international harvest sharing agreements, ADF&G operates intensive stock identification programs for Sockeye (scale pattern analysis and parasite incidence) and Chinook salmon – coded wire tag (CWT) and recently genetic stock identification (GSI) – in the drift gillnet fisheries. Thermal otolith marks are used to estimate the contributions of hatchery Sockeye, use of thermal marks is replacing CWT to estimate contributions of hatchery Chum salmon, while CWT is used to estimate contributions of hatchery and wild indicator stocks of Chinook and Coho salmon. The drift gillnet fisheries are managed through in-season assessment of run strength, although pre-season forecasts of Taku and Stikine River Chinook and Stikine River Sockeye salmon guide the season’s initial openings in specific districts. Managers monitor fishery performance (catch and catch-per-unit-effort), stock composition data, escapement information, test fisheries, and statistical run forecasting models to assess run strength in-season. Contribution of hatchery stocks to harvests is taken into account, particularly in areas where fishery performance is used as a primary management tool.

Pink Salmon

The large number of rivers in which spawning populations occur necessitates a strategic approach to monitoring escapement. These vary among species (Geiger & McPherson 2004). Pink salmon spawn in 2,500 streams in the Southeast and Yakutat area. Of these 718 have been designated index streams, based on the fact that they were surveyed a minimum of 7 years between 1986 and 1997. Each of the index streams is associated with one of 45 management "stock groups". Escapement goals were developed from the dependence of aggregate production on aggregate spawners for three subregions of these, Northern Southeast Outside (NSO), Northern Southeast Inside (NSI) and Southern Southeast (SS). The escapement goals developed for each of these were divided among the 45 stock groups.

Chum Salmon

Chum salmon spawn in about 1,200 streams in SEAK. Many have had aerial surveys at some time, and a few have had foot surveys. Escapement trend data is available for 82 Chum populations. Mark-recapture programs and forecasting models are used to estimate escapements in the largest glacial rivers that contribute significantly to the drift gillnet fisheries (Chilkat, Taku and Stikine rivers). Weirs, aerial and foot surveys are used to monitor other escapements. Escapements of Pink and Chum salmon are monitored primarily by aerial surveys. Escapement goals are in place for the primary target stocks of Chinook, Sockeye, Coho and Pink salmon that contribute to the drift gillnet fisheries.

The primary conservation interests on Chum salmon centre around the straying of remote hatchery returns into wild streams (Piston & Heinl 2012a). The Northern Southeast Inside (NSI) subregion investigations by these authors indicated a subregion wide estimate of 9.8% of the escapement of wild Chum salmon streams randomly selected in this area were composed of hatchery released fish, with ranges in individual stream from 0% to 65%, with Sawmill Creek and Wilson River at ~65% and ~25% respectively. A brief examination of NSI streams with high rates of straying (e.g., Sawmill and Wilson River) versus streams with low rates of straying (Piston & Heinl 2012a, Piston & Heinl 2012b) did not indicate that there was any correspondence of reduced wildstock return rates (Piston & Heinl 2011a), with the incidence of hatchery fish on the spawning ground. ADF&G (2012f) are currently conducting a long term research program addressing the impacts of hatchery releases on wild stock productivity.

Sockeye Salmon

Hugh Smith Lake Sockeye salmon are harvested in the region's drift gillnet and purse seine fisheries. The stock was classified as a SOC (management concern) in 2003, but was removed from the list in 2006 after experiencing three consecutive years of escapements above the upper end of the escapement goal range. The Hugh Smith Lake enhancement operation (Sockeye were planted as smolts) ceased in 2003 and the last adults from that stocking progam returned to the lake as 3-ocean adults in 2007 (Brunette & Piston 2011).

Chinook Salmon

The harvest of Chinook salmon in Southeast Alaska fisheries is controlled by the Pacific Salmon Treaty, with annual harvest quotas determined by the Pacific Salmon Commissions' Chinook Technical Committee based on forecasts of the aggregate abundance of Chinook salmon stocks in Southeast Alaska. Quotas do not include Alaska hatchery Chinook salmon above a pre-Treaty base level of 5,000 fish. Alaska BOF regulations allocate the region's total Chinook harvest to commercial troll, gillnet and purse seine fisheries and sport fisheries. The troll fishery is the primary harvester of Chinook salmon in Southeast Alaska.

Chinook salmon in SEAK are managed on the basis of assessments of 11 indicator stocks. Three of these are major systems (escapements in the tens of thousands), seven are medium systems (escapements in the thousands) and one is a minor system (escapements in the hundreds). Seven are outside rearing stocks and four are inside rearing stocks (i.e., streams flow into the Pacific Ocean vs. the inside passageway). Weirs, mark-recapture programs and helicopter surveys are used to monitor escapements and wild stock CWT programs have been conducted on most of the rivers to estimate harvests. Biological escapement goals based on productivity data are in place for all eleven index systems.

Coho Salmon

Coho salmon in SEAK are believed to spawn in 2,500 streams, and these are managed on the basis of indicator stocks. Indicator stocks are distributed geographically across the region and assessments are categorized as full indicator stocks (juvenile CWT and adult harvest and escapement monitoring) or escapement indicator stocks. There are currently seven full long-term indicator stock programs in the region, the majority of which were established in the early 1980s. Escapement indicator stocks include 14 streams near Ketchikan, six near Sitka, five near Juneau and four near Yakutat. Escapement goals, most based on stock recruit analyses, are currently in place for 13 individual stocks or aggregated stock groups.

Coho harvest is managed for conservation and allocation among user groups in accordance with BOF Regulations. Chum harvest occurs primarily in terminal harvest areas associated with the Medvejie, Hidden Falls, and Neets Bay hatcheries. In-season management of the commercial troll fishery is accomplished through monitoring harvest and fishing effort, CWT data that provides information on run strength of wild indicator stocks and hatchery stocks, and escapement monitoring programs.

2.5.2 UoC 2 – Yakutat

Set net fisheries in the Yakutat UoC target Sockeye salmon during June and July and Coho salmon during August through September, with the exception of a targeted Sockeye salmon fishery on the East Alsek River that typically occurs from late July through August (Woods & Zeiser 2012a). Historically, the harvest of Pink salmon and very small numbers of Chum was incidental. Increasing prices in 2011 provided economic incentive to target Pink salmon. Set gillnetting is largely restricted to the intertidal areas of the rivers and streams where BEGs are established with the exception of two (goals for Lost River Coho and Sockeye salmon are considered sustainable escapement goals – SEGs). As such, the fishery is managed to meet 19 escapement goals for Sockeye, Chinook, Coho and Pink salmon (Munro & Volk 2011, Woods & Zeiser 2012a).

The set gill net fisheries are managed primarily through in-season escapement monitoring, including weirs on the Situk River and aerial, boat or foot surveys of other systems. Monitoring of catch and catch-per-unit effort is used for glacial systems where visual enumeration of escapement is difficult (Woods & Zeiser 2012a). A weir is also operated by the Canadian Department of Fisheries and Oceans (DFO) to count escapement into the Klukshu River, a Canadian headwater index tributary for the transboundary Alsek River.

Yakutat Area troll fisheries are managed and reported as a part of the activities in the Southeast Alaska Region (Skannes *et al.* 2012) and are addressed primarily in the assessment of the SEAK UoC.

There are no hatcheries in the Yakutat area.

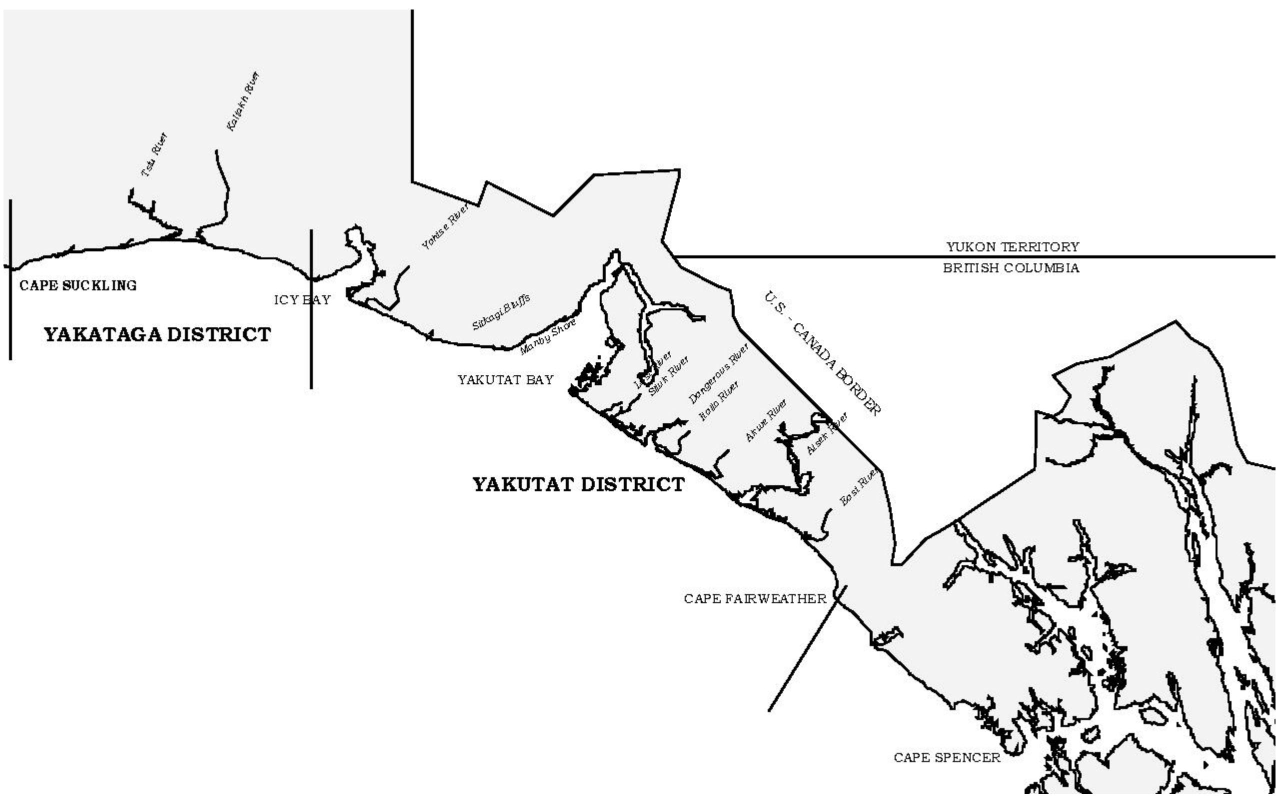

Figure 3-37. Yakutat management area (Conrad and Gray 2017).

2.5.3 UoC 3 – Prince William Sound (PWS)

The Prince William Sound salmon fishery was added to the 2013 Alaska salmon MSC certificate in 2015 via a "scope extension" assessment. The general features of the Alaska Salmon fishery are incorporated by reference to the Alaska re-certification report https://fisheries.msc.org/en/fisheries/alaska-Salmon/@@assessments (IMM 2013). The following PWS fishery description is adapted from Wiese et al. (2015). The PWS management area encompasses all coastal waters and inland drainages entering the north central Gulf of Alaska between Cape Suckling and Cape Fairfield (Figure 3-383-38). In addition to PWS, the management area includes the Bering and Copper Rivers, which were defined as a separate unit of certification in the statewide assessment (IMM 2013). The Salmon management area is divided into districts that correspond to the local geography and distribution of the five species of Salmon harvested by the commercial fishery. Nine districts are designated for the PWS UoC.

Gear for the Salmon fishery includes purse seine, drift gillnet, and set gillnet. Drift gillnet permits are the most numerous and are allowed in the Bering River, Copper River, Coghill, Unakwik, and Eshamy districts. Set gillnet gear is allowed only in the Eshamy District. Purse seine gear is allowed in the Eastern, Northern, Unakwik, Coghill, Northwestern, Southwestern, Montague, and Southeastern districts.

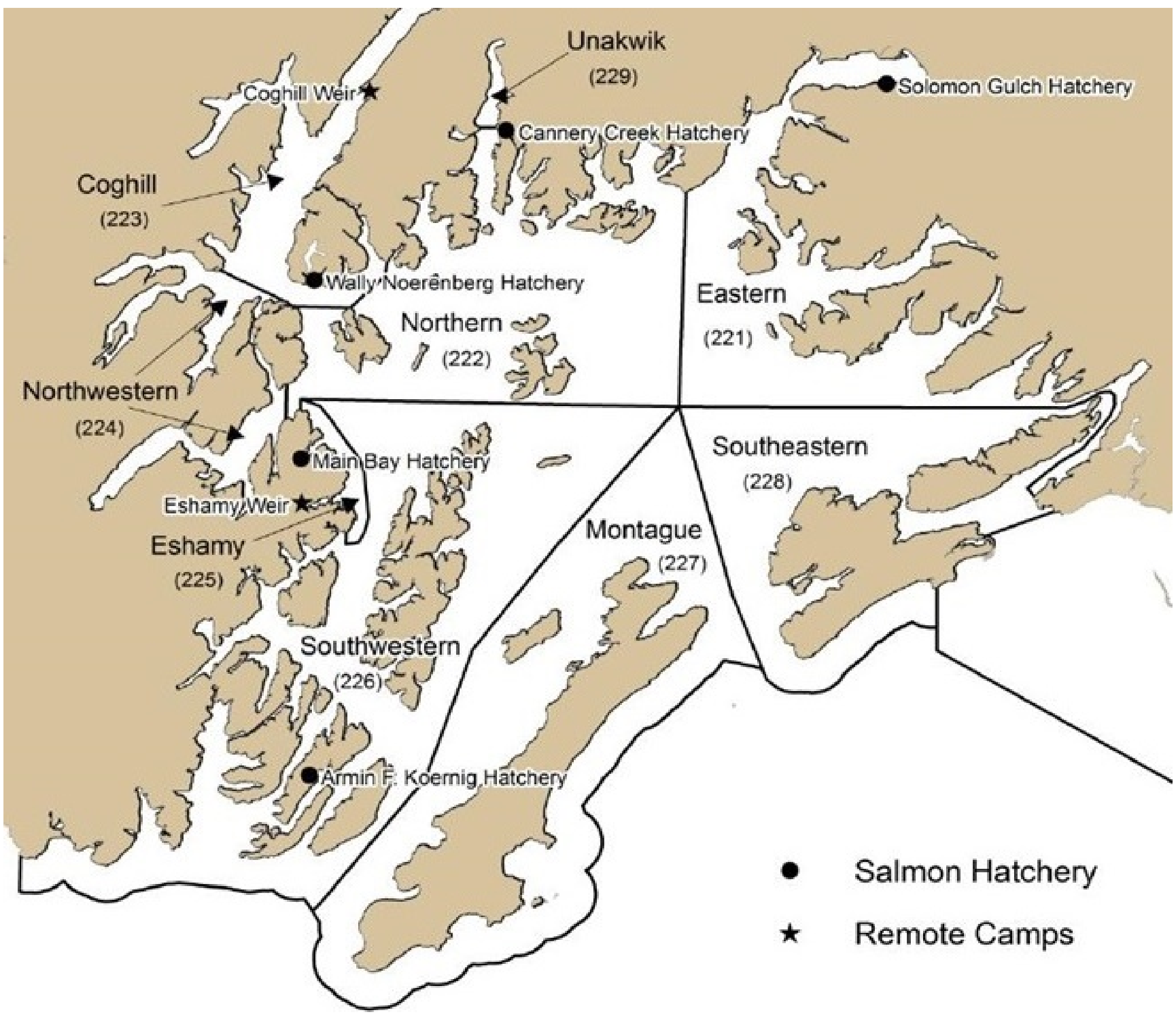

Figure 3-38.Prince William Sound Management Area showing commercial fishing districts and Salmon hatcheries.

The management objective for all districts is the achievement of spawning escapement goals for the major Salmon species and stock groupings while allowing for the orderly harvest of all fish surplus to spawning requirements. In addition, ADF&G follows regulatory plans to manage fisheries and allow private non-profit (PNP) hatcheries to achieve cost-recovery and broodstock objectives. Management is based on time and area openings based on in-season monitoring of abundance, spawning escapement and species/stock composition. Hatchery contribution of the run is assessed in-season based on otolith marks and fisheries are shaped to maximize hatchery harvest and protect natural escapement.

PWS Salmon harvests currently average about 47 million fish per year, although numbers vary considerably from year to year (Figure 3-39). Pink Salmon typically comprise 91% of the harvest followed by Chum Salmon (6%) and then Sockeye (2%). Chinook and Coho Salmon comprise just 1% of the harvest. Catches of most Chum Salmon have been incidental to harvest of Pink Salmon throughout PWS except in terminal areas for returns to hatcheries (Moffett et al. 2014).

Five hatcheries contribute to the area's fisheries. Four of these are operated by the regional aquaculture association, Prince William Sound Aquaculture Corporation (PWSAC). Cannery Creek Hatchery (CCH), located on the north shore of the sound, and Armin F. Koernig Hatchery (AFK) in the southwestern sound produce Pink Salmon; Wally Noerenberg Hatchery (WNH) in the northwestern sound produces Pink, Chum, and Coho Salmon; and Main Bay Hatchery (MBH) in the western sound produces Sockeye Salmon. Valdez Fisheries Development Association (VFDA) operates Solomon Gulch Hatchery (SGH) in Port Valdez and produces Pink and Coho Salmon, the latter for the sport fishery.

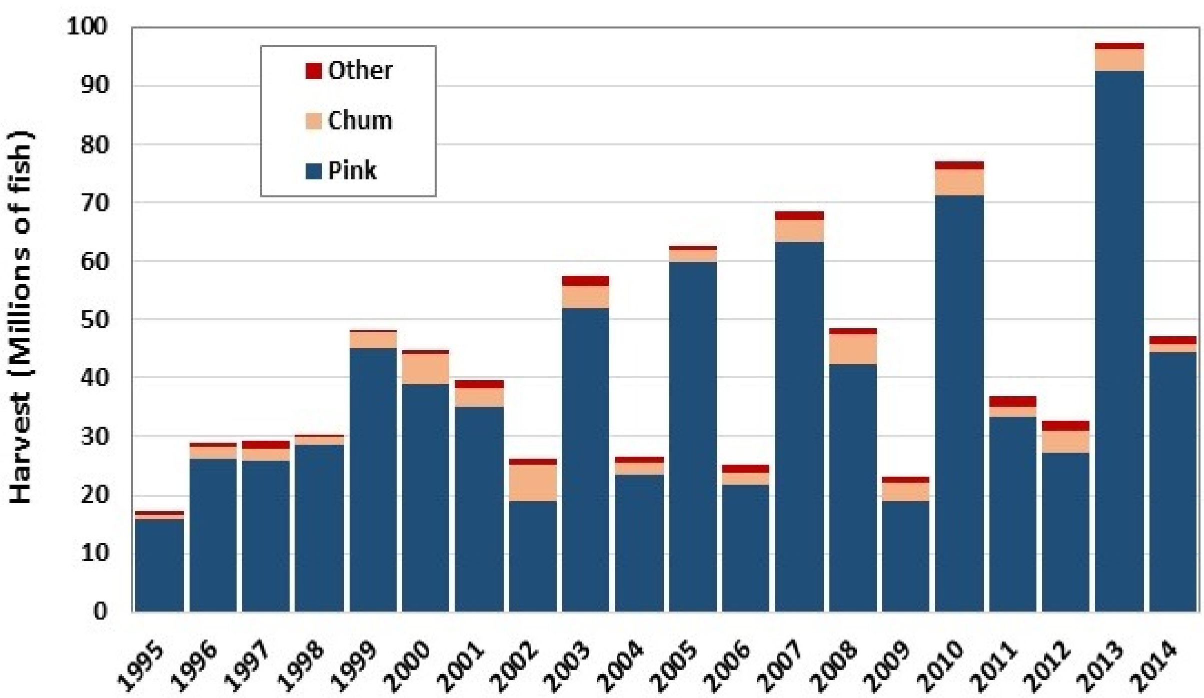

Figure 3-39.Commercial Salmon harvests in Prince William Sound, 1995-2014.

Pink Salmon

There are approximately 1,000 Pink Salmon spawning systems in the Prince William Sound Management Area (PWSMA) (Moffitt et al. 2014). Since 1960, ADF&G has conducted aerial surveys of selected Pink Salmon streams to index the spawning escapement in PWS. Between 1960 and 1989, an average of 266 streams were surveyed (range = 203–489). The 208 streams surveyed during 1989 represented approximately 20–25% of the anadromous streams in each district and 75–85% of the total spawning escapement. Beginning in 1990, additional streams were surveyed in some districts to make the proportion flown similar to other districts, and the survey total is now 214 streams. Hatchery Pink Salmon returns have been estimated using wild stock exploitation rates (1977–1986) or mark–recapture methods that employed either coded wire tags (1977-1986) or otolith thermal marks (1987–present).

Total run size of Pink Salmon to PWS typically averages about 40-50 million per year but has ranged from 20 to 70 million in recent years (Figure 3-40). Hatchery fish typically comprise about 80% of the total run and about 90% of the commercial harvest (Figure 3-41). About 700 million Pink Salmon fry have been released by PWS hatcheries annually since the late 1980s (Figure 3-42). Hatchery Pink Salmon are 100% otolith marked at all facilities.

Escapement goals have been established for both odd and even year returns in all 8 PWS management districts (Moffitt et al. 2014). Pink Salmon have consistently met or exceeded district-specific escapement goals and have averaged equal or higher, in the hatchery period relative to the pre-hatchery period (Figure 3-43, Figure 3-44). Presence of hatchery fish on wild spawning grounds is included in these observations.

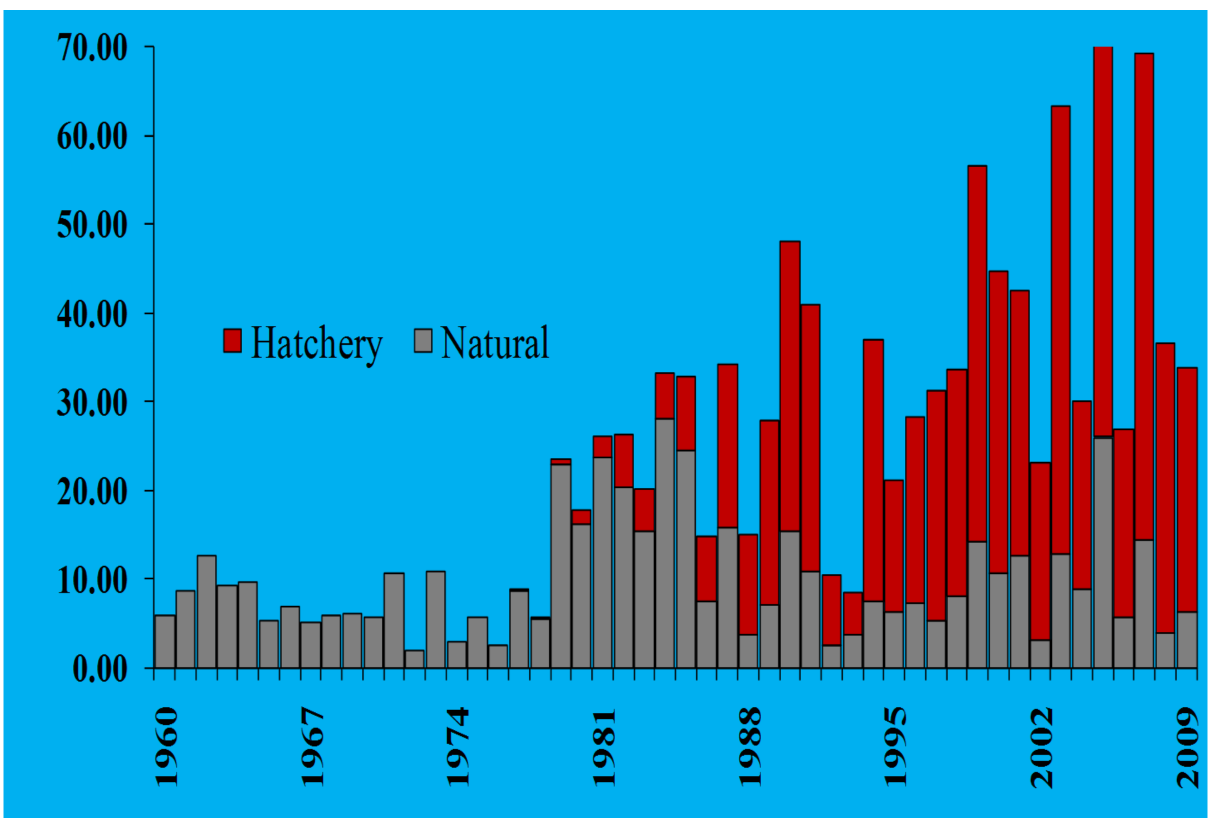

Figure 3-40. Estimated total annual run of natural and hatchery Pink Salmon to Prince William Sound, 1960-2009 (S. Moffett, ADFG, 8/16/16 Power Point presentation).

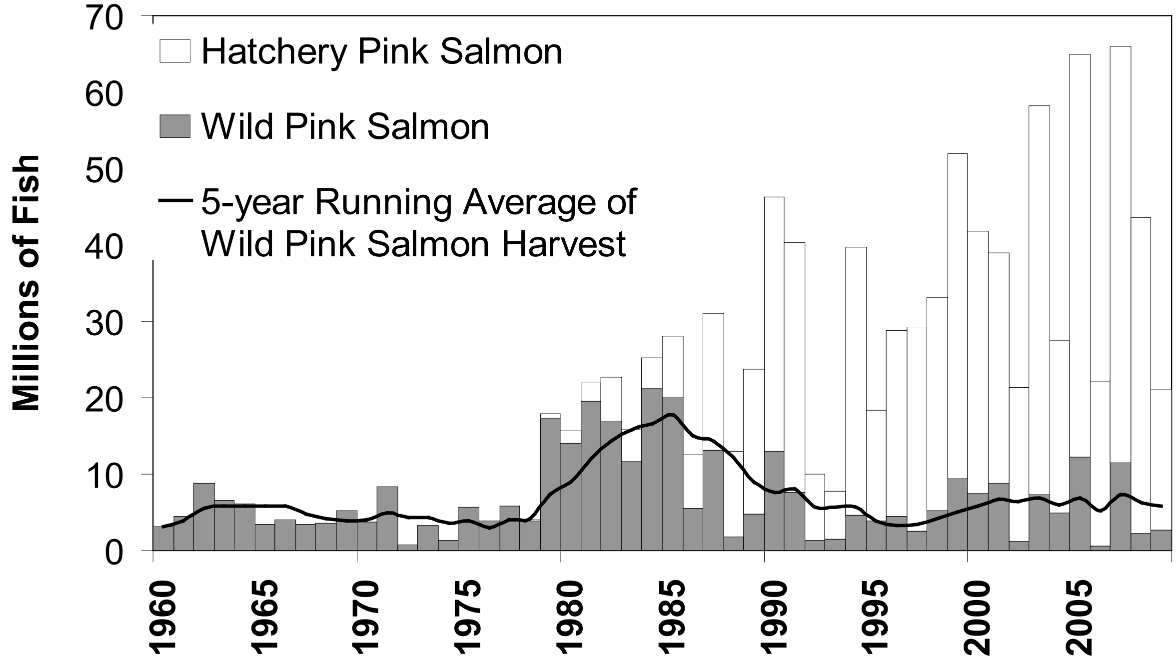

Figure 3-41.Annual average harvest of hatchery and wild Pink Salmon in Prince William Sound (B. Templin, ADFG, 8/16/16 Power Point presentation).

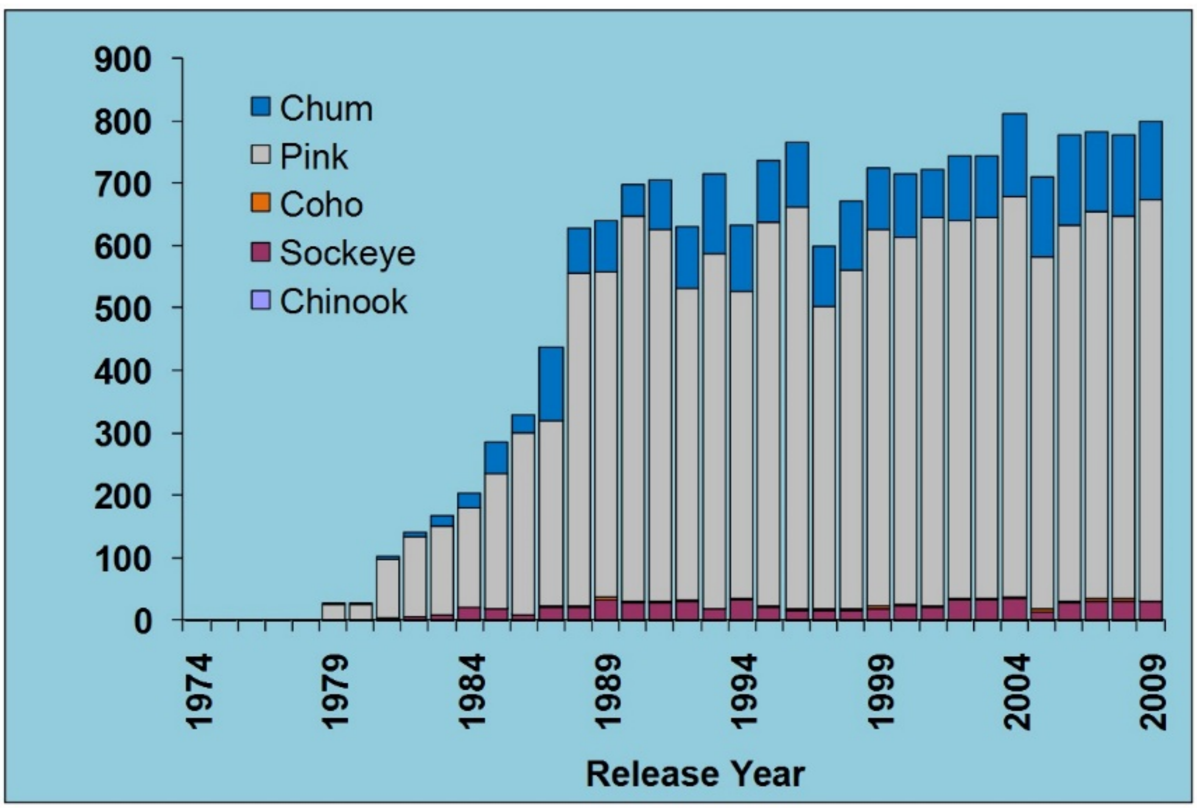

Figure 3-42.Hatchery releases of Salmon in Prince William Sound (includes Sockeye released from Gulkana hatchery in the Copper River watershed) (S. Moffett, ADFG, 8/16/16 Powerpoint presentation).

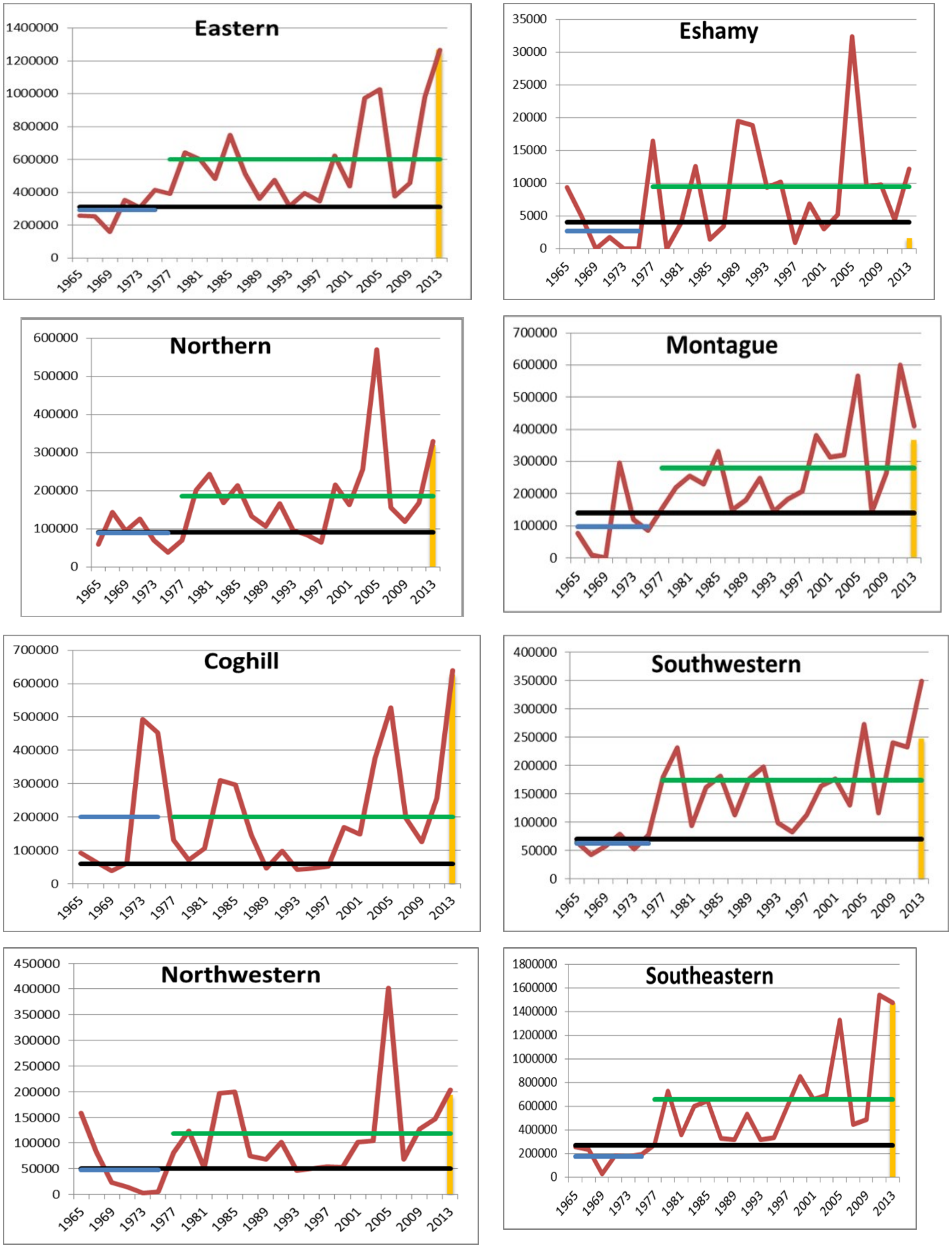

Figure 3-43.Odd-year Pink Salmon escapements by district in Prince William Sound. Red = Estimated Escapement. Black = 2011 Goal Lower Bound. Yellow = NOR in 2013. Blue = Pre-hatchery Period Average. Green = Hatchery Period Average. (Gaudet & Wertheimer, 8/16/16 Power Point presentation)

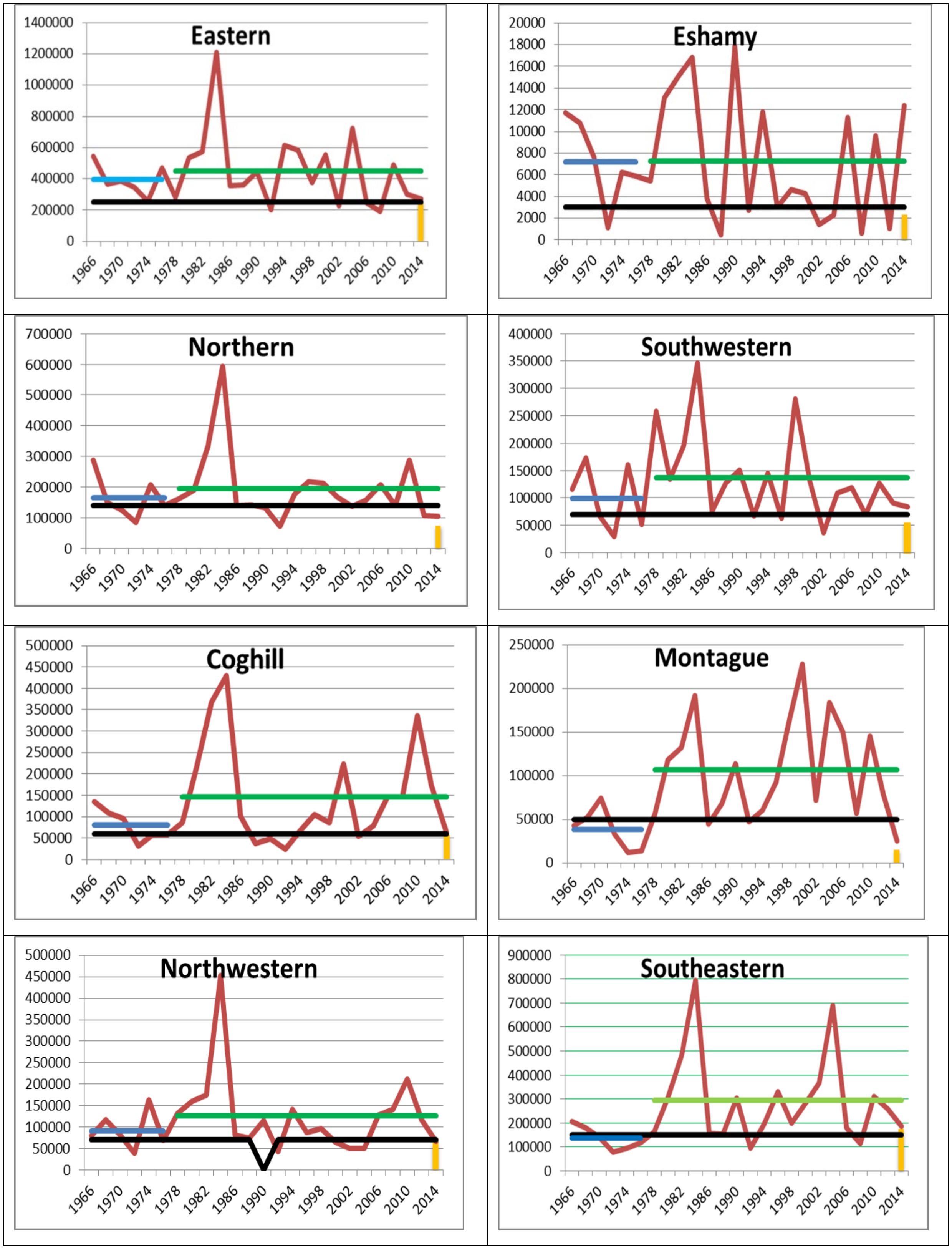

Figure 3-44. Even-year Pink Salmon escapements by district in Prince William Sound. Red = Estimated Escapement. Black = 2011 Goal Lower Bound Yellow = NOR in 2013. Blue = Pre-hatchery Period Average. Green = Hatchery Period Average. (Gaudet and Wertheimer, PSPA, 8/16/16 Power Point presentation)

The Alaska Hatchery Research Project (AHRP http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/research/pwssc_h-w_proposal_6-29-12.pdf) is quantifying the proportion of hatchery strays in stream escapements at the district and PWS levels. This study sampled proportions of hatchery and natural fish in the run at entrances to PWS and in the escapement in 32 Pink and Chum Salmon streams in PWS. Stream sampling was completed in 2013, 2014, and 2015 (Knudsen et al. 2015a, 2015b, 2016). This study is also examining the relative fitness of hatchery-origin and wild-origin spawners based on pedigree analysis of returning fish through several generations.

Hatchery-origin Pink Salmon comprised 55-86% of the total run of this species to PWS in 2013-2015 (Table 12). Estimated region-wide hatchery fraction of Pink Salmon in PWS spawning streams was 4.3% in 2013, 15% in 2014, and 10% in 2015 (Table 12). Most PWS Pink Salmon stream hatchery proportions were relatively low but were higher in localized areas, such as the Eshamy District and the Southwestern District (Table 13), probably due to migration into PWS predominantly from the southwest. Pink Salmon hatchery fractions also tended to be greater in districts with hatcheries.

Table 12. Estimated numbers and hatchery fraction of Pink Salmon entering Prince William Sound (Knudsen et al. 2015a, 2015b, 2016).

Year	Total Number	Hatchery fraction
2013	103 million	68%
2014	50 million	86%
2015	141 million	55%
Avg.;	98 million	70%

Table 13. Estimated PWS Pink Salmon district and district-wide hatchery fractions. Aerial survey fractions for each district were used to weight the contribution of each district to the overall aerial fraction estimate (Knudsen et al. 2015a, 2015b, 2016).

District	2013	2014	2015	Avg.
Eastern	0.013	0.045	0.021	0.026
Northern	0.045	0.273	0.173	0.164
Coghill	0.018	0.099	0.000	0.039
Northwestern	0.034	0.067	0.157	0.086
Eshamy	0.868	0.899	0.807	0.858
Southwestern	0.29	0.49	0.336	0.372
Montague	0.11	0.394	0.159	0.221
Southeastern	0.001	0.036	0.010	0.016
Overall	*0.044*	*0.148*	*0.095*	0.096

Table 14. Cumulative frequency of percentages of hatchery origin Pink Salmon spawners in Prince William Sound streams (Knudsen et al. 2015a, 2015b, 2016). For instance, the percentage of hatchery-origin spawners was 1% or fewer in 30% of 27 streams sampled in 2013.

	2013	2014	2015	Avg.
n	27	28	28	--
<1%	30%	10%	14%	19%

<5%	60%	40%	39%	44%
<10%	70%	50%	46%	57%
<20%	90%	60%	64%	71%

Chum Salmon

Chum Salmon are at a period of historical high abundance in PWS due to favourable marine conditions and a substantial hatchery enhancement program. Harvest currently averages about 3 million per year.

Chum Salmon spawn in the larger stream systems throughout PWS. Chum Salmon escapements are indexed based on expanded counts from aerial surveys that have been conducted since 1963 (Moffitt et al. 2014). Numerous streams within each district were flown multiple times each year to estimate escapement. Reliable estimates of hatchery contributions to commercial harvests of Chum Salmon are unavailable before 2003.

Escapement goals have been established for Chum Salmon in five PWS management districts (Moffitt et al. 2014). Chum Salmon escapements have more consistently met or exceeded current escapement goals, and have averaged equal or higher, in the hatchery period relative to the pre-hatchery period (Figure 3-46). Hatchery fish occurring on wild spawning grounds are included in these observations.

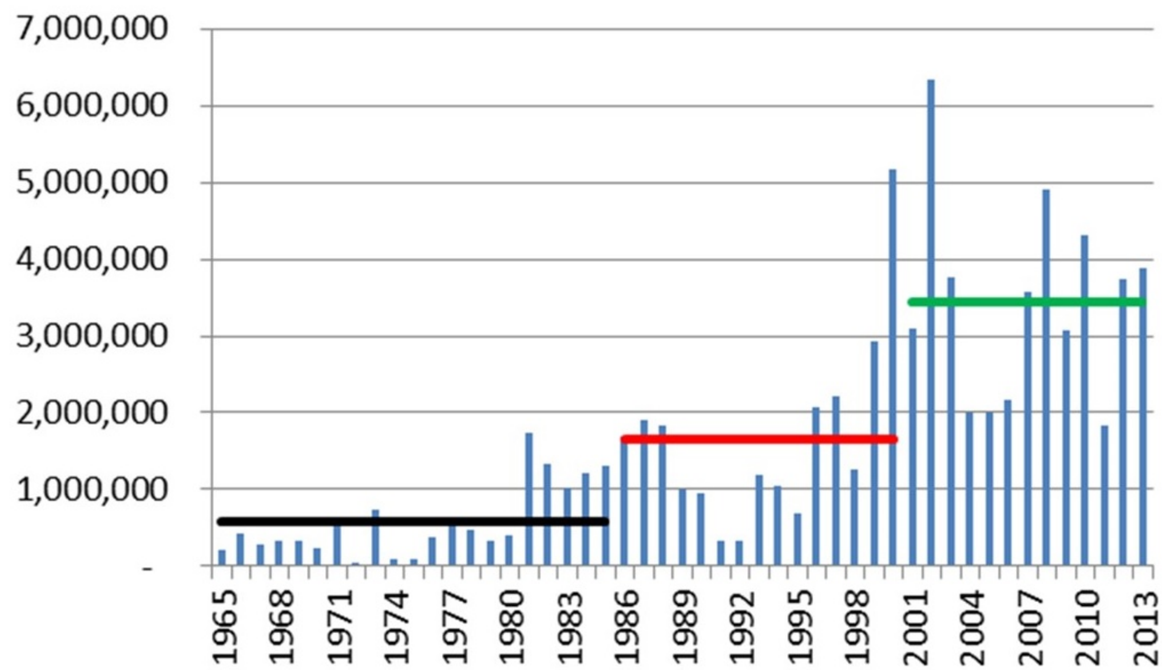

Figure 3-45.PWS commercial Chum Salmon harvests, 1965-2013 (A. Wertheimer, 8/16/16 Powerpoint presentation).

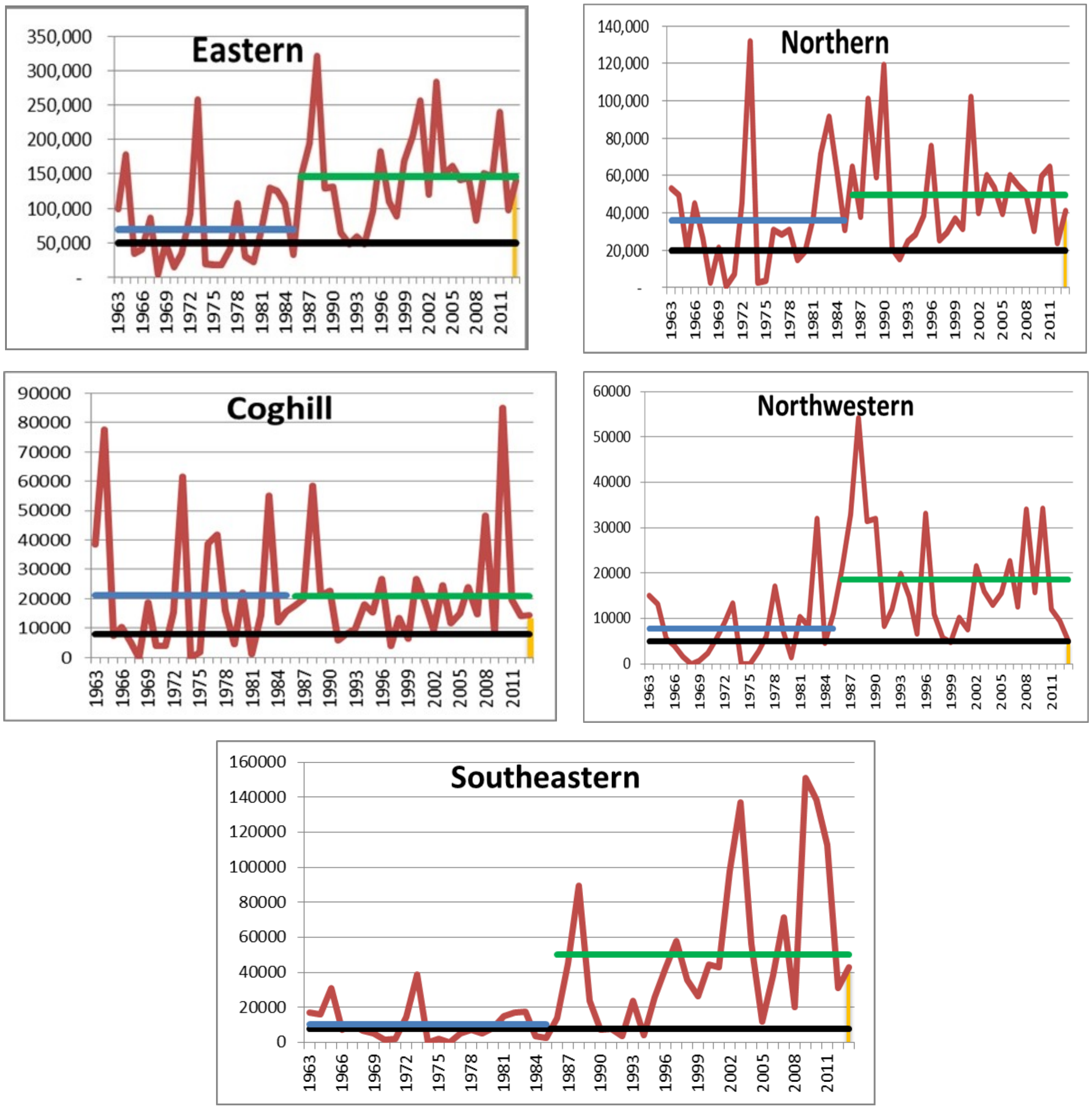

Figure 3-46.Chum Salmon escapements by district in Prince William Sound. Red = Estimated Escapement. Black = 2011 Goal Lower Bound Yellow = NOR in 2013. Blue = Pre-hatchery Period Average. Green = Hatchery Period Average.

About 140 million Chum Salmon fry are currently released by PWS hatcheries (Figure 3-42). The AHRP is quantifying the fraction of hatchery strays in stream escapements at the district and PWS levels. Hatchery-origin Chum Salmon comprised 51-73% of the total run of this this species to Prince William Sound in 2013-2015 (Table 15). Estimated region-wide hatchery fraction of Chum Salmon in PWS spawning streams was just 3% in each of the three years sampled (Table 16). Most PWS Chum Salmon stream hatchery proportions were relatively low but were higher in localized areas, such as the Montague District.

Table 15. Estimated numbers and hatchery fraction of Chum Salmon entering Prince William Sound (Knudsen et al. 2015a, 2015b, 2016).

Year	Total Number	Hatchery fraction
2013	4.1 million	73%
2014	2.4 million	51%
2015	3.6 million	69%
Avg.;	*3.4 million*	*64%*

Table 16. Estimated PWS Chum Salmon district and district-wide hatchery fractions. Aerial survey fractions for each district were used to weight the contribution of each district to the overall aerial fraction estimate (Knudsen et al. 2015a, 2015b, 2016).

District	2013	2014	2015	Avg.
Eastern	0.004	0.041	0.013	0.019
Northern	0.080	0.054	0.097	0.077
Coghill	0.049	0.000	0.008	0.019
Northwestern	0.052	0.015	0.038	0.035
Montague	0.783	0.803	0.846	0.811
Southeastern	0.022	<0.001	0.031	0.027
Overall	0.028	0.032	0.031	0.030

Table 17. Cumulative frequency of percentages of hatchery origin Chum Salmon spawners in Prince William Sound streams and aggregate values for the stock management unit (Knudsen et al. 2015a, 2015b, 2016).

	2013	2014	2015	Avg.
n	17	16	17	--
<1%	20%	40%	18%	26%
<5%	70%	70%	71%	70%
<10%	80%	90%	82%	84%
<20%	80%	90%	82%	86%

Sockeye Salmon

Sockeye Salmon escapements into Coghill Lake have been visually counted from 1960 to 1973 using a partial weir, and tower with a full river weir coming into use in 1974. Escapement of Sockeye Salmon into Eshamy Lake has been visually counted through a weir since 1931-2012 and with a video system beginning in 2012. Escapement goals have been established for Sockeye in Coghill and Eshamy lakes (Moffitt et al. 2014). Goals are consistently met or exceeded (Table 18).

Table 18. Escapement goals and escapements for Sockeye index populations in Prince William Sound (Munro and Volk 2015, 2017). Green = within goal. Blue = above goal. Yellow = below goal.

		Coghill Lake	Eshamy Lake[a]
Goal		20,000-60,000	13,000-28,000
Year	2006	23,479	42,473
	2007	70,001	17,196
	2008	29,298	18,495
	2009	23,186	24,025
	2010	24,312	16,291
	2011	102,359	24,129
	2012	73,978	--
	2013	17,231	4,500
	2014	21,836	7,500
	2015	13,684	4,400
	2016	8,708	5,816

[a] *Video replaced weir in 2013. Video provides a minimum estimate and this index is not a comparable to historical weir counts.*

Coho Salmon

Coho Salmon is largely a hatchery-based fishery, although relatively small numbers of wild stocks are included in catches based on long-term hatchery marking data (Wiese et al. 2015). The primary purpose of the fishery is to develop a stable sport fishery as well as cost recovery to the hatchery operators. Commercial catches of hatchery Coho Salmon are variable and sometimes large (Figure 3-47). Coho Salmon account for <1% of the PWS Salmon catches annually.

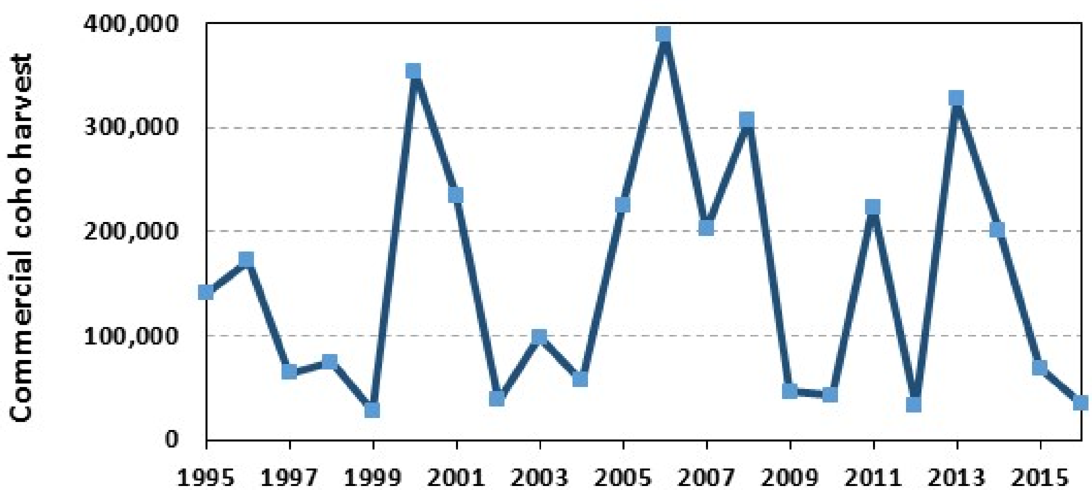

Figure 3-47.Commercial harvest of Coho salmon in Prince William Sound.

Chinook Salmon

There is no significant wild production of Chinook Salmon in PWS streams. Chinook Salmon are not released from PWS hatcheries. Chinook Salmon harvest is typically fewer than 1,000 fish per year and accounts for <0.1% of the total harvest of Salmon in the Sound.

2.5.4 UoC 4 – Copper/Bering Districts

Copper/Bering gill net fisheries target Sockeye, Chinook, and Coho salmon (Botz et al. 2012, Botz & Somerville 2011). Pink and Chum salmon are taken incidentally in the Copper/Bering Districts and are addressed in this assessment as IPI retained catch.

Sockeye and Chinook salmon are among the earliest seasonally-available commercial salmon and have established a high-value market. The 10 most recent annual harvests for the Copper/Bering Districts averaged 1.2 million Sockeye, 300,000 Coho, 32,000 Chinook, 20,000 Chum, and 9,000 Pink salmon (Botz et al. 2012).

Substantial runs of Sockeye, Coho, and Chinook salmon are produced by the Copper River, and there are escapement goals (SEG) for each (Fair et al. 2011). The much smaller Bering River produces Sockeye and Coho salmon, and there are also escapement goals (SEG) for each (Fair et al. 2011). Escapements of Sockeye, Coho, and Chinook salmon are monitored at multiple index sites for each species using enumeration tools that include sonar, aerial surveys, mark-recapture, and genetics (Botz et al. 2012, Botz & Somerville 2011). Recent research has identified significant stock structure within the Chinook salmon and Sockeye salmon runs and ADF&G uses these results to identify the components of mixed stock fisheries (Ackerman 2010, Ackerman et al. 2011, Templin et al. 2011a).

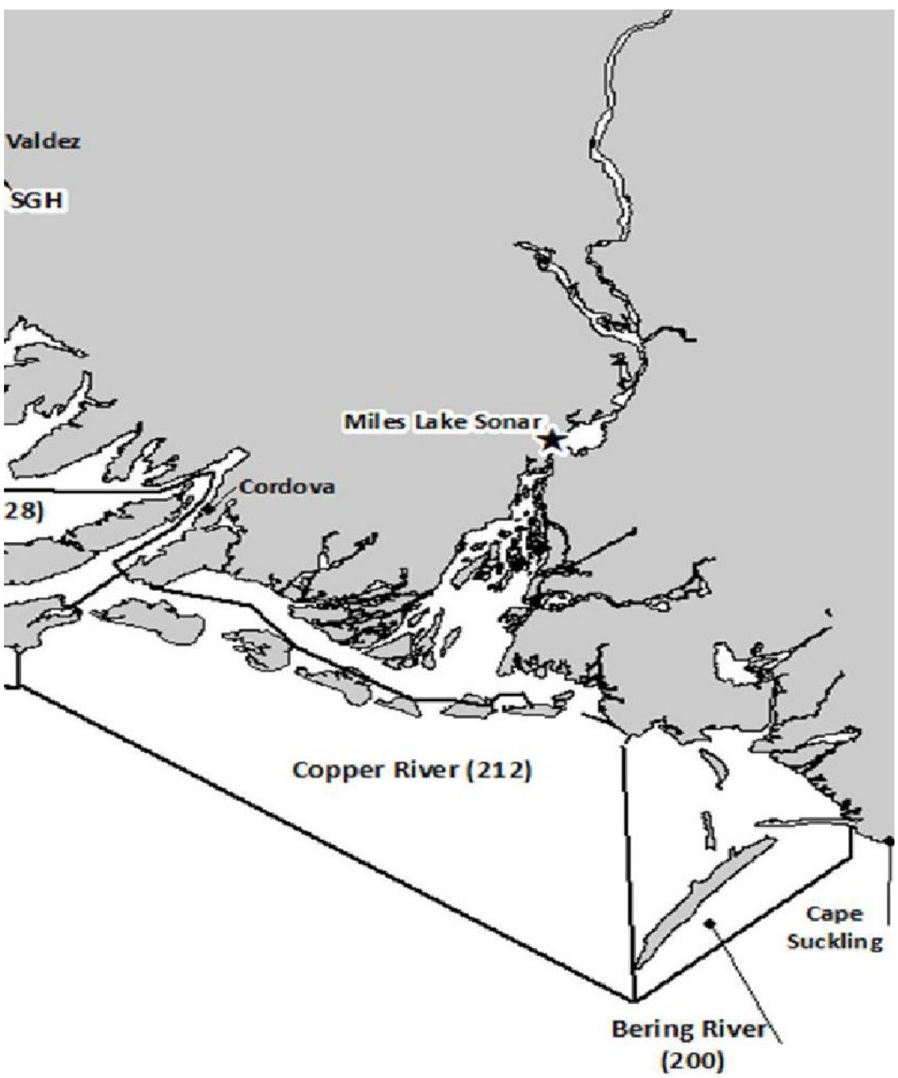

Figure 3-48.Copper/Bering Management Area showing commercial fishing districts.

Copper River fisheries occur in terminal areas at the mouth of the river and the district includes 6 subdistricts distributed inside and outside a series of barrier islands (Botz et al. 2012). Sockeye and Chinook salmon are also harvested in subsistence and personal use dip net and fish wheel fisheries upriver, and Chinook and Coho are also subject to significant sport fisheries in some tributaries; the numbers of fish harvested are closely documented (Botz et al. 2012).

The Gulkana Hatchery is the only commercial hatchery system in the Copper/Bering Districts UoC. It is a stream-side incubation facility that currently releases a combined total of approximately 20 million Sockeye fry per year into three lakes, and these fish dominate Sockeye catches during the latter part of the season. About 10% of hatchery fish are otolith marked for later identification and evaluation. This is an integrated hatchery project, with almost half of the broodstock used annually coming from local wild stocks. The Gulkana Hatchery has contributed an average of 201,000 Sockeye to the Commercial fish and another 36,000 to subsistence and personal use fisheries in 2006-2015 (Russell et al. 2017). This is about 14% of the average annual harvest

2.5.5 UoC 5 – Lower Cook Inlet

The Lower Cook Inlet (LCI) Management Area includes waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point. The freshwater drainages are coastal streams dominated by Pink salmon. There are five fishing districts with the Barren Islands District being the only fishing district where no salmon fishing occurs. The other four districts (Southern, Outer, Eastern, and Kamishak Bay) are separated into approximately 40 subdistricts and sections to facilitate management of discrete stocks of salmon.

All Pacific salmon species are harvested in LCI waters (Holowell et al. 2017), with Chum, Sockeye and Pink being the most valuable. Coho and Chinook harvests are very limited and local stocks are small and not targeted. Commercial salmon harvest currently averages about 1.5 million per year of which 80% is Pink Salmon (Figure 3-50). Fisheries enhancement has been important in LCI over the past 30 years and has contributed up to 90% of the harvest.

Purse seines and set gill nets are legal gear in LCI. Seine fishing effort was low with only a portion of permit holders generally making deliveries. The number of active set gillnet permits in 2010 was 21, slightly exceeding the recent 10-year average of 20.

Fish escapements are enumerated by a variety of methods, with multiple weirs (fish fences) providing real time counts of salmon for the major Sockeye salmon systems. Aerial counts are also conducted in Pink salmon and Chum salmon management. Fisheries management use in season harvest rates reported in real time from the industry and the escapement data. Fisheries are relatively terminal and fishing on enhanced stocks is very terminal with hatchery cost recovery areas often dominating the harvests.

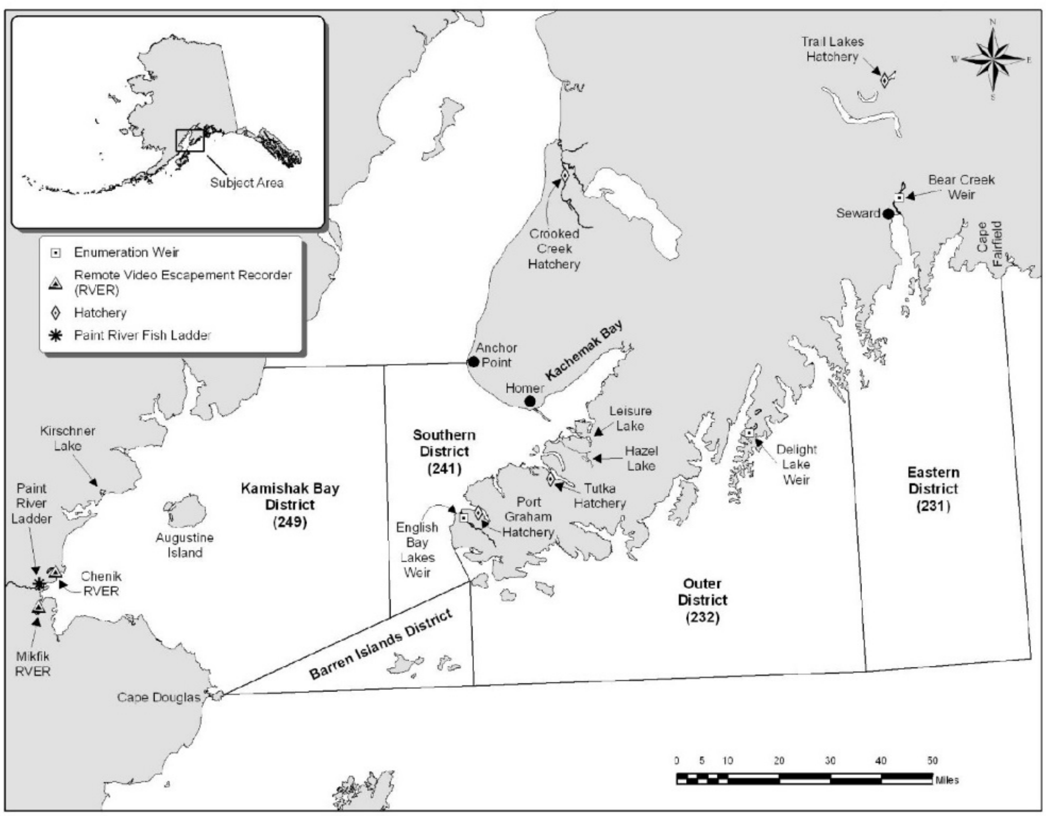

Figure 3-49.Lower Cook Inlet management area showing commercial fishing districts, salmon hatcheries, weir and fish ladder locations, and remote video salmon monitoring sites.

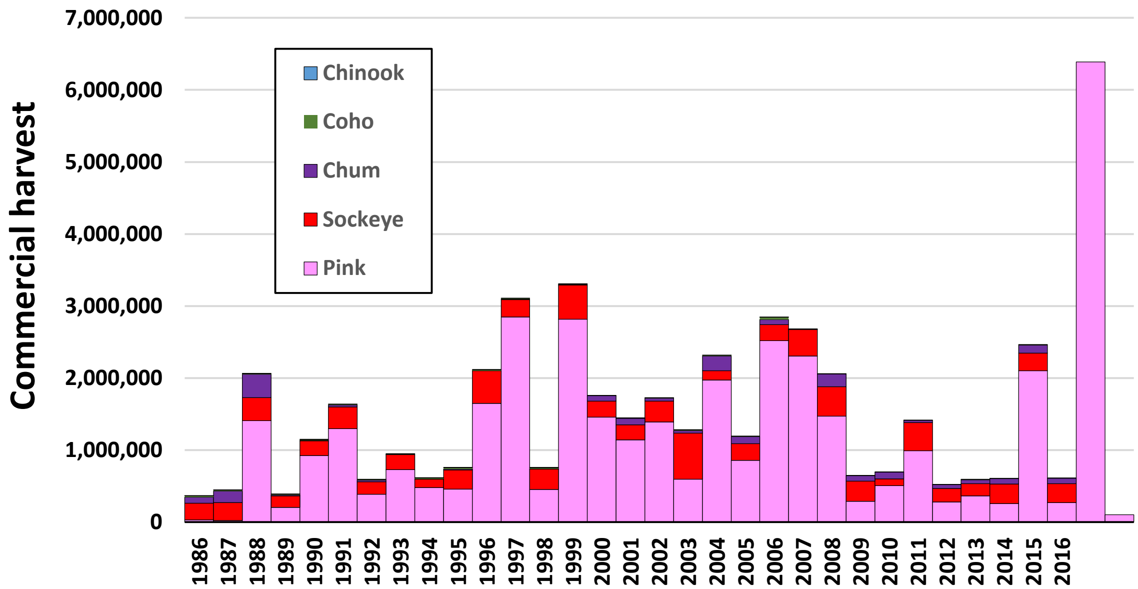

Figure 3-50.Total commercial salmon harvest by species from all gear types, Lower Cook Inlet area, including cost recovery for all Cook Inlet Area hatcheries, 1986–2016.

There are 12 Chum and 17 Pink salmon systems with escapement goals in LCI. The LCI management area has six lake systems with significant naturally occurring Sockeye salmon runs and 3 Chinook salmon systems. There are no escapement goals for Coho and the 3 Chinook runs reflect sport fish management and are considered to be incidental harvests to the commercial fisheries in LCI. The escapement goals were recently reviewed (Otis *et al*. 2010) with adjustment to many of the systems that reflect improved data analysis.

Hatcheries

No Pink salmon returned to Tutka Hatchery or to Port Graham Hatchery where operations were suspended after 2004 and 2007 respectively. Hatchery production contributed to Sockeye salmon catches of LCI Sockeye salmon harvest attributed to the Cook Inlet Aquaculture Association (CIAA) lake stocking, fertilization, and/or remote release projects at Leisure and Hazel Lakes, Tutka Bay Lagoon, Kirschner Lake and Bear Lake. Trail Lakes Hatchery Sockeye Salmon Management Plan enacted by the BOF dictated that all CIAA Special Harvest Areas in LCI be managed primarily to achieve CIAA's corporate cost recovery and brood stock goals.

The Trail Lakes facility primarily produces Sockeye salmon, with minor production of Coho and Chinook salmon. Most of the production from this facility benefits LCI fishermen. Review of the hatchery operations of LCI including the Trail hatchery were completed in 2012 and reports indicated minor administrative issues but operations generally complied with all of ADF&G regulations (Stopha 2012a). Review of the hatchery at Port Graham (Stopha 2012b) indicated poor hatchery practices and problems in compliance with genetic policies. Operations have been terminated with Pink salmon releases ended and Sockeye salmon program taken over by the Trail Lakes hatchery. The hatcheries at Tutka lagoon and at Eklutna (located in UCI), despite being inactive for the past several years, have received good marks for previous operations (Stopha 2013, Stopha & Musslewhite 2012).

The hatchery programs at Port Graham and Tutka were not active for a variety of reasons, primarily financial. Major reductions recently occurred in stocking salmon for commercial harvests from much of CIAA's operations. Some of the stocking activities in LCI are directed at intensively used sport fisheries

(CIRPT 2007) although multiple small Sockeye salmon systems are the primary enhancement target in LCI. These have terminal fisheries and typically weir counts to enumerate escapements to facilitate terminal harvest management, which recently has been cost recovery and brood stock collection.

More recently, significant Pink Salmon production has been resumed at Tutka and Port Graham Hatcheries by CIAA.

2.5.6 UoC 6 – Upper Cook Inlet

The Upper Cook Inlet (UCI) commercial fisheries management area is that portion of Cook Inlet north of the latitude of the Anchor Point Light and is divided into the Central and Northern districts. The Central District is 75 miles long and 32 miles in width. The Northern District is 50 miles long and 20 miles in width. All five species of Pacific salmon are commercially harvested. Set gillnets are the only gear permitted in the Northern District, while both set and drift gillnets are used in the Central District. The use of seine gear is restricted to the Chinitna Bay Sub-district, where they have been employed sporadically.

Commercial salmon harvest currently averages about 3.4 million per year of which 80% is Sockeye (Figure 3-52). Fish escapements are enumerated by a variety of methods, with multiple weirs (fish fences) providing real time counts of salmon for the major Sockeye salmon systems and some Pink, Coho, Chum and Chinook escapements. Formal reviews of escapement goals in the UCI were conducted at regular intervals (Hasbrouck & Edmundson 2007; Fair et al 2009, 2010; Erickson et al. 2017). New sonar technology has at least contributed to changes in escapement goals and more accurate enumeration.

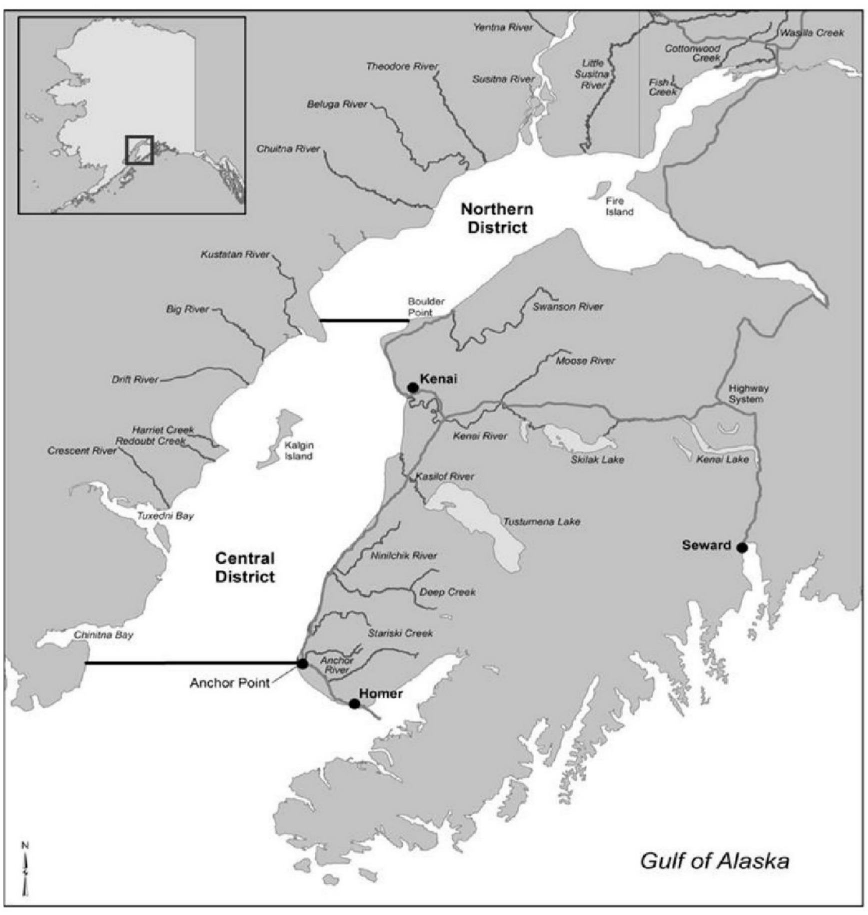

Figure 3-51.Upper Cook Inlet commercial fishing districts.

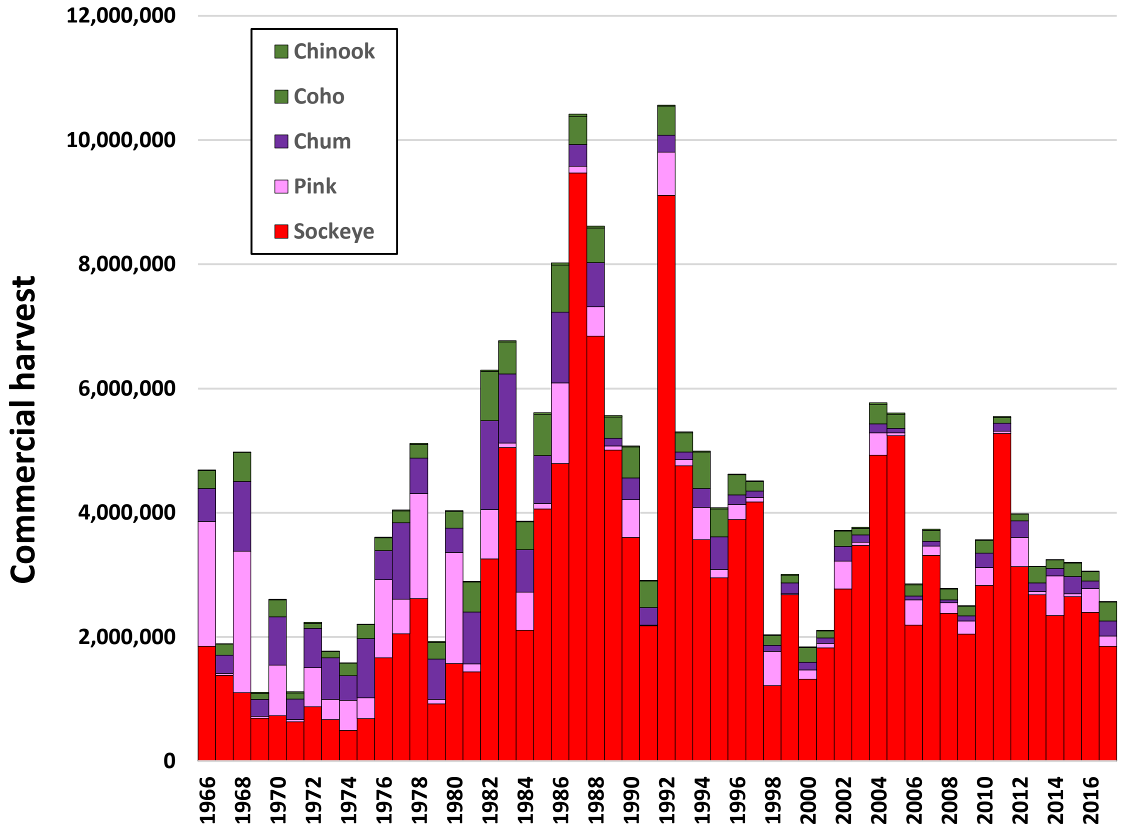

Figure 3-52.Harvest of salmon in Upper Cook Inlet commercial fisheries.

<u>Sockeye</u>

In 2017, the total Sockeye salmon harvest from commercial, sport, personal use, subsistence, and educational fisheries of 2.5 million fish was approximately 31% less than the 1996–2016 average annual harvest of 3.7 million fish. The commercial fishery harvested 1.8 million Sockeye.

Currently, there are 7 Sockeye salmon systems with escapement and/or inriver goals that are monitored in UCI (Shields and Frothingham 2018). Management of the UCI Sockeye salmon fishery integrates information from a variety of programs, which together provide an inseason model of the actual annual run. These programs include: offshore test fishing (OTF); passage and escapement enumeration by sonar, weir, remote camera, and various mark–recapture studies (Shields and Dupuis 2015); comparative analyses of historical commercial harvest and effort levels; genetic stock identification (GSI); and age composition studies. Beginning in 2005, a comprehensive sampling program was initiated to estimate the stock composition of Sockeye salmon harvested in UCI commercial fisheries using improved GSI analyses. GSI data describing the UCI Sockeye salmon catch allocation are available for the years 2005–2016 (Barclay 2017).

Susitna River Sockeye salmon were first designated as a stock of yield concern in 2008. As a result of this classification, an action plan was developed by ADF&G and BOF to identify restrictive management measures in those fisheries harvesting Susitna River Sockeye salmon stocks. These restrictions have undoubtedly reduced the harvest of Susitna Sockeye salmon, but even with a reduction in harvest, (Shields and Frothingham 2018) report that Susitna Sockeye salmon as a whole merit continued concern.

Coho

The 2017 UCI commercial Coho salmon harvest of 304,000 fish was approximately 81% greater than the recent 10-year (2007–2016) average annual harvest of approximately 167,000 fish, but only 5% greater than the 1966–2016 average annual harvest of 289,000 Coho salmon. The largest harvest of UCI Coho salmon occurs in the UCI drift fishery, where 191,000 were taken in 2017. There are a small number of Coho escapement goals.

Commercial Coho salmon harvests in UCI during the 1980s and early 1990s were much higher than the long-term average. This can be attributed to good Coho salmon production, but also due to additional fishing time on strong Sockeye salmon runs to UCI. Recent Coho salmon harvest data, however, may or may not be a true indication of run strength, largely due to regulatory changes that were made to reduce commercial harvest of Coho salmon.

Chinook

Chinook salmon harvests are concentrated in 2 different fisheries in UCI: set gillnet fisheries in the Northern District and in the Upper Subdistrict of the Central District. The 2017 UCI harvest of 7,660 Chinook salmon was the 9th smallest since 1966 (52 years) and was approximately 19% less than the previous 10-year (2007–2016) average annual harvest of 9,427 fish. The recent pattern of below-average Chinook salmon harvests is the result of lower abundance of Chinook salmon in UCI, but also related to restrictions placed upon commercial fisheries for the conservation of this species.

In the UCI, stocks of Chinook salmon with 21 formal escapement goals are closely monitored based on aerial surveys, weir counts or hydroacoustic assessments. Because of the broad based regional decline in marine survival, escapements have fallen short over the past five years. Most of the harvests from these systems are targeted for sport fisheries. Several Chinook systems have been declared stocks of concern by the BOF and have action plans established to help them recover (Munro & Volk 2012).

Pink Salmon

Pink salmon runs in UCI are even-year dominant, with odd-year average annual harvests typically about 15% of even-year harvests. The 2017 UCI commercial Pink salmon harvest of 168,000 fish was 124% more than the average annual harvest of 75,000 fish from the previous 10 years of odd-year harvests and was also the second largest odd-year harvest since 1977. There are no formal Pink escapement goals. The only data collected on Pink salmon stocks are from commercial fisheries harvests, recreational fishing surveys, and some information collected at projects designed to enumerate other species.However, exploitation rates of Pink Salmon are relatively low due to run timing primarily after the bulk of the commercial fishery. Based on a marine tagging project in 2002, harvest rate of Pink salmon by the UCI commercial fishery was estimated to range between 1% and 12%, with a point estimate of 2%, indicating Pink salmon were harvested at very low rates in UCI.

Chum Salmon

A total of 244,000 Chum salmon were harvested by UCI commercial fishermen in 2017, which was 63% greater than the previous 10-year average annual harvest of 149,000 fish There is a single Chum system with an escapement goal. An evaluation of UCI Chum salmon stocks is made difficult because of a lack of information other than commercial harvest data and very limited escapement data (Shields and Frothingham 2018). However, exploitation rates of Chum Salmon are relatively low due to run timing primarily after the bulk of the commercial fishery. Although ADF&G lacks long-term quantitative Chum salmon escapement information, escapements to streams throughout UCI have benefited by management actions or regulatory changes aimed principally at other species.

Hatcheries

Salmon enhancement through hatchery stocking has been a part of UCI salmon production since the early 1970s. Currently, there is a single private hatchery that is fully operational in UCI, the Trail Lakes facility operated by Cook Inlet Aquaculture Association (CIAA). The only lake in UCI currently stocked with Sockeye salmon is Hidden Lake, which is located on the Kenai Peninsula. Production from this enhancement program contributes to the UCI commercial, personal use, educational, and recreational fisheries. Review of the hatchery operations of UCI including the Trail hatchery was completed in 2012 and reports indicated minor administrative issues but operations generally complied with all of ADF&G regulations (Stopha 2012a). Upper Cook Inlet's long term regional plan indicates no likely major expansions of hatchery operations in the foreseeable future with major reductions recently occurring on stocking. Much of the stocking activity in UCI is directed at intensively used sport fisheries (CIRPT 2007).

2.5.7 UoC 7 – Bristol Bay

The Bristol Bay salmon fishery takes large numbers of Sockeye salmon in each of five fishing districts: Ugashik District, Egegik District, Naknek –Kvichak District (Naknek, Alagnak, and Kvichak rivers), Nushagak District (Nushagak, Wood and Igushik rivers), and Togiak District. All species of salmon may be harvested from June 1 through September 30. Fishing periods (windows) are established through emergency order designed to (1) ensure that adequate numbers of salmon escape to spawn and (2) harvest the surplus of fish in excess of escapement needs. Gear types include drift gillnet and set gillnet. There are no enhanced stocks in Bristol Bay.

In addition to Sockeye salmon, other directed fisheries include Nushagak River Chinook, Coho, and even-year Pink salmon and Togiak River Coho salmon. Large numbers of Nushagak River Chum salmon are taken incidentally; incidental catch of other species is exceeding low.

Escapement goals are used to manage the fisheries; goals for directed fisheries are based on brood tables and stock-recruitment relationships. Brood tables originate from harvest, escapement, and age composition data; data series starting in the 1950s are available for most drainages. During the season fisheries are scheduled using: 1) preseason forecasts, 2) abundance and genetic stock composition data from the in season test fishery at Port Moller (Sockeye), 3) in season (daily) monitoring of catch and escapement, 4) and regular monitoring of age, sex, and size. Daily escapements are monitored primarily by tower, but sonar and aerial surveys are also used.

Until early 2013, Kvichak River Sockeye salmon was a SOC (yield concern) because of a series of poor-production years, especially 1996-2004. Recent years have shown increased production, seen as both catch and harvest. Returns per spawner increased from an average of 0.8, during the 1990s, to an average of 3.4 during the most recent 5 brood years. ADF&G recommended removing Kvichak River Sockeye salmon from stock of concern status in 2012 and this recommendedation was approved by the BOF (L. Fair, personal communication). No stocks of concern are in the Bristol Bay Management Area.

The fishery has a long history of management and research, including long-term projects and data sets produced by University of Washington's Alaska Salmon Program and ADF&G. The primary documents used to assess fisheries management in Bristol Bay include reports of stock composition in the harvest (Dann *et al.* 2009; Smith 2010), the annual management report (Jones *et al.* 2012), and published accounts of management strategy (Fair 2003; Baker *et al.*, 2009).

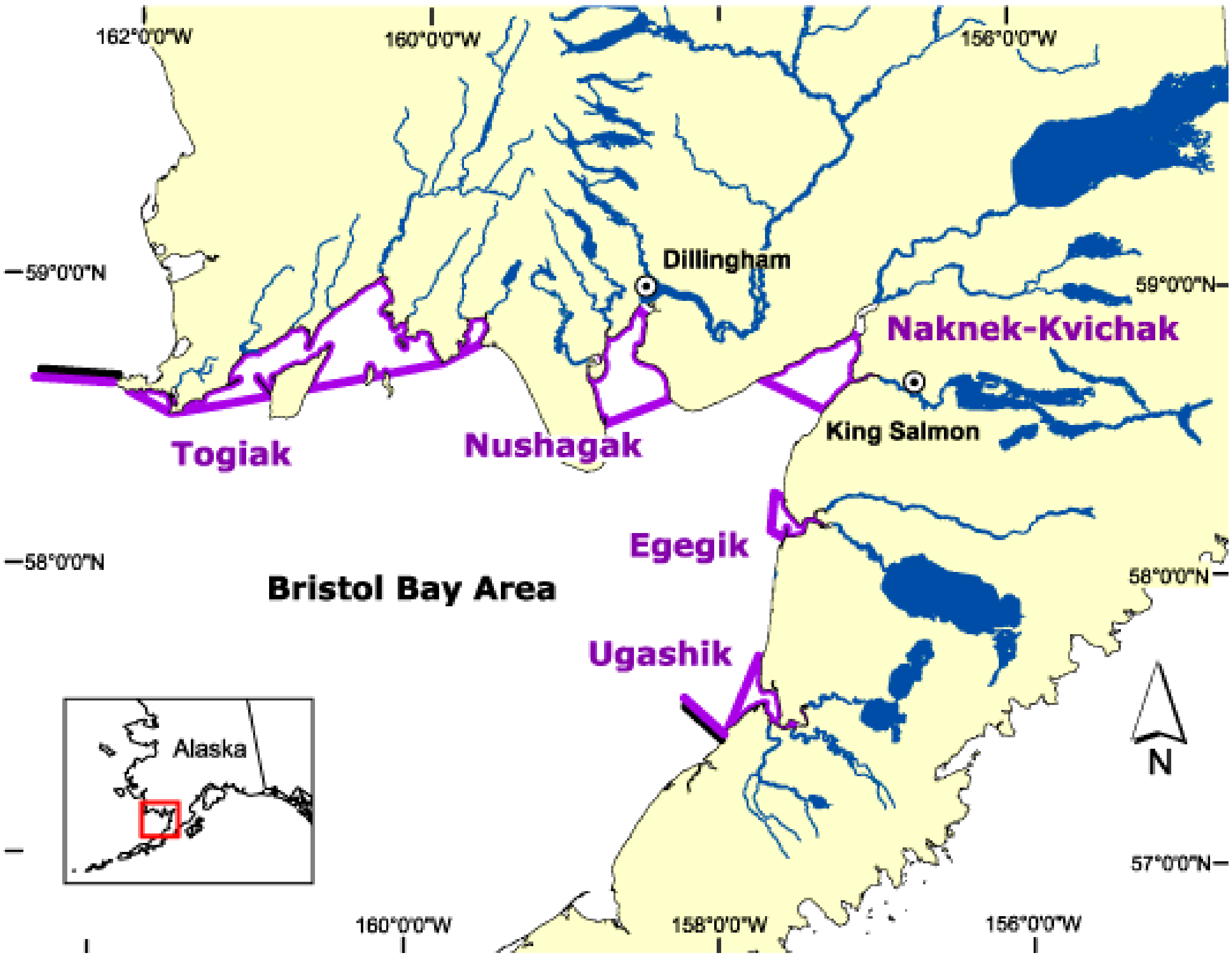

Figure 3-53. Bristol Bay fishery management area.

2.5.8 UoC 8 – Yukon River

Source: http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercialbyarea.interior

Figure 3-54.The Arctic-Yukon-Kuskokwim Region (NB. There is no commercial harvest of salmon in the Northern Management Area, and so this is not a Unit of Certification).

The Yukon Management Area (YMA) is part of the Arctic-Yukon-Kuskokwim Region (AYK) and includes the Alaska portion of the Yukon River plus some nearby marine waters along the Bering Sea coast (Estensen et al. 2012). The Yukon is the largest river in Alaska, originating in British Columbia and the Yukon Territory and flowing over 2,300 miles to the Bering Sea.

Commercial salmon fishing occurs throughout the 1,200 miles of the Alaska mainstem portion of the river, as well as the lower 225 miles of the Tanana and lower 12 miles of the Anvik rivers (Estensen et al. 2012). Essentially all salmon harvested in the YMA are of Yukon River origin. The YMA is divided into 7 fishing Districts that progress from the coastal zone upstream to the US-Canada border. The vast majority of harvest occurs in Districts 1 and 2 of the lower river (average ~500 of the 520 deliveries during the summer season). Drift gillnets are the predominant gear type used in the lower Yukon River. Set gillnets are more common in the coastal district, and fish wheels account for most of the commercial harvest in the middle river districts. (N.B. “upper Yukon” is generally used to refer to the Canadian portion of the river). A salmon roe fishery is conducted in Districts 4-6 of the middle Yukon River, in which fishermen use beach seines and fish wheels to catch salmon which are then stripped of roe. Only the roe is sold. Carcasses are retained for subsistence use (sometimes referred to as "commercial-related harvest"). The gear used in the roe fishery allows live release of male fish.

The Yukon River produces Chinook, Chum, Coho, Pink, and Sockeye salmon (Estensen et al. 2012). Chinook spawning populations occur throughout the drainage. A distinctive characteristic of the Yukon River Chinook salmon run is that it occurs in pulses, typically 3 or 4, with the earliest pulse containing a higher proportion of upper river (Canada bound) spawning stocks. Later pulses have progressively lower proportion of upper river stocks, and this information is used to manage the fisheries. Total Chinook run estimates were relatively stable at around 300,000 fish from 1982 to 1997, but have since declined sharply to an average of around 200,000 fish, with most recent years among the lowest (ADF&G 2012b).

Chum salmon occur as two genetically distinct runs, a summer run that spawn primarily in tributaries in the lower 700 miles of the drainage and in the Tanana River, and a fall run that spawns in the middle and upper portions of the drainage. The summer run is more abundant, averaging over 1.6 million fish annually compared to 800,000 fall Chum. Annual abundance is variable for both Chum runs, but in recent years has been above average.

Coho salmon have a discontinuous distribution throughout the Alaska portion of the drainage, spawning primarily in tributaries of the lower 700 miles and the Tanana River. Annual abundance ranges from about 62,000 to 270,000 (based on Pilot Station sonar that excludes lower river harvest). In recent years Coho abundance has been near average (+/- about 30%) with no clear trend.

Pink salmon spawning is mostly in tributaries downstream of river mile 336 with abundance higher in even years. Total run abundance is unknown, but can be substantial in some lower Yukon River tributaries. Sockeye are uncommon in the Yukon River and have a scattering of recorded occurrences to river mile 763.

The commercial fisheries of the YMA target Chinook, summer Chum, fall Chum, and Coho salmon (Estensen et al. 2012). The selectivity of fishing gear generally precludes harvest of Pink salmon, which are small and typically pass through the gillnets. Commercial fishing unfolds as a series of waves that progress upstream through the various fishing districts as pulses of fish travel along their migration route. The first wave, the summer season, traditionally starts in June and targets Chinook salmon with unrestricted gillnet mesh size (mostly >8-inch) so fishermen can target large Chinook salmon and exclude smaller salmon. As the Chinook run wanes in late June or early July, management shifts to summer Chum with gillnet mesh size restricted to 6-inch or smaller mesh. By mid-July, fall Chum and then Coho begin to enter the lower river and become the focus of management. In more recent years, low Chinook salmon abundance has prohibited any directed Chinook salmon fishery, but restricted mesh openings (6-inch or smaller) are allowed by late June or early July to target summer Chum when abundance warrants. However, managers continue to close areas where late entering Chinook tend to be more abundant (e.g. Middle Mouth and North Mouth). The last commercial fishery targeting Chinook salmon occurred in 2007. Time, area, and gear restrictions have allowed commercial harvest opportunity for summer Chum after the vast majority of Chinook have cleared the respective district. Commercial sale of incidentally-caught Chinook was prohibited in 2009, 2011, and 2012. Chinook captured in the commercial Chum fishery were retained for subsistence use. Chinook salmon are currently the only stock of concern (yield) in the YMA, and have been since 2000.

Subsistence fishing is highly important to people throughout the YMA (avg. all salmon 200,441 fish, 2000-2009), especially for Chum salmon (avg. 118,711 fish, 2000-2009) which accounts for about half the average annual statewide subsistence Chum harvest (ADF&G 2010, Estensen et al. 2012). Chinook are an important species for subsistence harvest (avg. = 47,101 fish, 2000-2009), but repeated years of low Chinook abundance has led to progressively more stringent restrictions in the form of multi-day closures and gillnets being limited to 6-inch or smaller mesh. In 2010, out of concern for the selective harvest on large Chinook salmon, the BOF restricted subsistence users to gillnets of 7.5 inch or smaller mesh size, which ADF&G studies found to result in age compositions more closely resembling that of entering fish (Howard and Evenson 2012). Still, managers have continued to use time, area, and gear restrictions to minimize the subsistence harvest of Chinook salmon while targeting Chum salmon. Annual subsistence Chinook harvests have been below the lower end of the “Amounts Necessary for Subsistence” (ANS; 45,500-66,704 fish) since 2008 (ADF&G 2012a), indicating that subsistence fishermen have not harvested enough Chinook salmon to meet their needs. The failure to meet ANS is in part because of the low Chinook abundance and the various management actions, but also because of informed choice among some members of the public to reduce their Chinook catch in order to bolster escapement.

Subsistence fishing was limited to rural Alaska residents in 1986, so the BOF established a “Personal Use” fishery for non-rural state residents (Estensen et al. 2012). Details of the fishery have changed repeatedly through various legal challenges. Currently there exists in the YMA a “non-subsistence area” in the vicinity of Fairbanks where limited Personal Use harvest is allowed though a permit system.

ADF&G is the lead fishery management agency. The Federal Subsistence Board (via United States Fish and Wildlife Service – USFWS) has authority to close fishing for non-subsistence uses on applicable waters if necessary to ensure a priority for federally qualified rural subsistence users, but most management decisions are done cooperatively. Although differences exist, state and federal regulations are generally the same. In some cases, State regulations can be superseded by a Federal Special Action.

The YMA salmon fisheries are managed to achieve spawning escapement goals in a number of tributaries and at the US/Canada border (Estensen et al. 2012). There are 16 goals in the YMA, 7 for Chinook, 2 for summer Chum, 6 for fall Chum, and 1 for Coho. In addition, there are 3 goals for Canadian stocks, 1 for Chinook and 2 for fall Chum. These goals are based on weirs, counting towers, peak aerial counts, and sonar projects. Eight of the YMA goals are BEGs and 8 are SEGs. Between 2007 and 2011, escapement goals were achieved 67% of the time for Chinook, 80% for summer Chum, 87% for fall Chum, and 100% of the time for Coho (Munro & Volk 2012). No changes are being recommended for escapement goals in 2013. Inseason, managers use a series of gillnet test fisheries and main stem sonar projects to monitor timing and abundance of each of the targeted species. Managers compare CPUE in the test fisheries and counts in the mainstem sonar with historical estimates as a means to determine whether there is sufficient abundance to open commercial fisheries while also meeting escapement goals. For example, Coho and fall Chum salmon enter the river together, and if Coho abundance appears weak based on preseason forecast, test fisheries, Pilot Station sonar, and tributary index counts (several without formal goals), then frequency of commercial fishing periods is reduced as required in the management plan (F. Bue, former ADF&G Yukon manager, personal communication with D. Molyneaux; ADF&G 2010). Commercial fishing for Coho typically stops well before the end of the migration period and the overall harvest rate on Coho is relatively low.

The Yukon River Salmon Agreement between the United States and Canada factors in strongly with the management of Chinook and fall Chum salmon (Estensen et al. 2012). Canadian waters are responsible for approximately 50% of the production of Yukon River Chinook salmon and a large fraction of the fall Chum salmon. The agreement has undergone many adjustments in response to the changing dynamics of the fishery. In 2010 U.S./Canada panel agreed to one year Canadian interim management escapement goal (IMEG) ranges of 42,500 to 55,000 Chinook salmon and 70,000 to 104,000 fall Chum salmon based on the Eagle sonar project near the Canadian border. In addition, Canada is receiving a share of any harvestable surpluses in the Canadian run component, referred to as the Total Allowable Catch (TAC), which is annually determined based on projected run abundance with inseason adjustments. In January 2013, the BOF made it a priority to protect the first wave of Chinook (Canada-bound) passing through the Yukon from both commercial and subsistence fishing.

The Canadian portion of the Yukon River also supports aboriginal, commercial, sport, and domestic salmon fisheries that target Chinook and fall Chum salmon. A hydroelectric dam equipped with fish ladder is located on the mainstem Yukon River at Whitehorse (river mile 1,980) and there is a small-scale on-site Chinook salmon hatchery for mitigation (Evenson 2009). The Canadian commercial fishery is not part of this MSC assessment.

2.5.9 UoC 9 – Kuskokwim

Kuskokwim Management Area (KMA) is part of the Arctic-Yukon-Kuskokwim Region (AYK) and includes the Kuskokwim River and Kuskokwim Bay drainages of the Bering Sea coast. The KMA includes three active commercial fishing districts, each managed as an independent terminal fishery. District 1 is in the lower Kuskokwim River and extends from the mouth upstream to river mile 126. Districts 4 and 5 occur in the marine waters south of the Kuskokwim River and the fisheries harvest salmon returning primarily to the Kanektok and Goodnews Rivers, respectively. Commercial fishing in all three districts occurs with gillnets, primarily drift gillnets, and fishermen can move between districts. Currently fishers are restricted to using gillnets with 6 inch or smaller mesh size, although in District 1 ADF&G has regulatory authority to allow the use of gillnets of up to 8 inch mesh to target Chinook salmon. The option to use 8 inch mesh has not yet been implemented since it went into regulation in 2007. Harvests of Pink salmon are less than 2% of the total, as most are too small to be taken in the gillnets. Subsistence fishing is highly important to people throughout the KMA, especially for Chinook salmon and ranks as the largest Chinook subsistence fishery in the Alaska. Most subsistence harvest occurs with gillnets, and mesh size is unrestricted. ADF&G managers attempt to ensure that commercial fishing activities do not adversely impact subsistence fishing. Although ADF&G takes the lead in fishery management, the Federal Subsistence Board (via USFWS) has authority to close fishing for non-subsistence uses on applicable waters if necessary to ensure a priority for federally qualified rural subsistence users.

The District 1 commercial fishery (lower Kuskokwim River) focuses on Chum and Coho salmon (Brazil et al. 2011). Directed commercial fishing on Chinook salmon has not occurred since 1986, although Chinook are incidentally captured (and sold) in the commercial Chum fishery. There is a trend of commercial fishing becoming more concentrated in the lower half of District 1, downstream of Bethel (W1-B) because of processor preference. In-season management is highly dependent on an ADF&G operated drift gillnet test fishery near Bethel to evaluate run strength and run timing, and serves as the primary basis for decisions when to allow commercial fishing. Escapement is currently monitored via 8 tributary weirs, plus aerial surveys are flown on up to a dozen other streams to index Chinook salmon escapement. Spawning escapement data are typically available late fishing season because it takes weeks for fish to reach the spawning areas where they are enumerated. A good statistical relationship has been developed between the test fishery and Chinook escapement at weirs (Schaberg 2012). The test fishery is also used to approximate relative abundance and timing of the other species. Low Chinook abundance in recent years has prompted time, area, and gear restrictions to the subsistence fishery, and delayed start of the commercial Chum fishery.

The District 4 and 5 commercial fisheries target Chinook, Sockeye, and Coho salmon, with the directed fisheries roughly corresponding to the months of June, July, and August respectively. Chum are caught (and sold) incidentally. In-season management typically follows a fishing schedule that allows for 2 twelve hour periods per week in June and 3 per week in July and August, with one or more fishing periods removed if abundance is assessed as low. In District 4 in-season abundance is determined by fishery performance and through input from subsistence and sports fishermen, the latter are used particularly for Chinook. More recently a weir has been operated intermittently from late June through August on the Kanektok River to monitor Chinook, Sockeye and Chum escapements and this information factors into District 4 in-season management when available. Coho salmon escapement is not monitored in District 4. In District 5, a weir is also operated in the lower Middle Fork Goodnews River that provides timely in-season abundance information for Chinook, Sockeye, Chum, and Coho. Chinook and Sockeye escapements are also monitored with peak abundance aerial surveys of the Kanektok and Goodnews rivers.

Overall, ADF&G manages KMA commercial fisheries to achieve spawning escapement goals in a number of tributaries. Overall, there are 14 goals for Chinook, four for Chum and Sockeye, and three for Coho (Munro & Volk 2012). The goals are based on weirs, peak aerial counts (live and dead), and until recently one tributary sonar project. Most goals are classified as SEGs. Escapement goals (lower end) have been achieved during each of the five most recent years for Chum, Coho, and Sockeye (except one Sockeye stock in one year).

ADF&G recently reconstructed the drainage-wide abundance of Chinook salmon in the Kuskokwim River since 1976 and used these modelled data to develop a basin-wide escapement goal of 65,000 to 120,000 Chinook salmon using a Ricker approach coupled with a Bayesian state-spaced model (Bue et al. 2012, Schaberg et al. 2012). The new goal was reviewed and approved by external experts, including Dr. R Hilborn, University of Washington; evidence indicated the previous goals were too high. Under the new drainage-wide goal, historical escapements would have achieved or exceeded in all but two years (1986 and 2010). The basin-wide goal was used to modify three tributary goals based on the average contribution of the tributaries to the total run, the result being a reduction and narrowing of escapement goal ranges. Chinook goals are to be eliminated in two other tributary because of their relatively low contribution to the run.

Concern was raised that escapements below the mid-point of the revised goal would significantly reduce catchability of Chinook by subsistence fishermen upstream of the W1-B commercial fishery because the basin-wide goal results in abundance levels below historical levels (e.g., average historical escapement was 150,000 Chinook). However, a management plan was developed and approved by the BOF in January 2013 for implementation of the new goal.

2.5.10 UoC 10 – Kotzebue

The Kotzebue District is part of the AYK management area and it includes all waters from Cape Prince of Wales to Point Hope, i.e., north of Norton Sound. The Kotzebue District is divided into three subdistricts and all are open to commercial fishing (Menard 2012b, Menard *et al.* 2012). This region supports the northern most commercial fishery in Alaska. Most fishing occurs in Subdistrict 1, which is subdivided into six statistical areas to help managers determine catch location. Chum salmon is the most abundant salmon, though other salmon species occur in small numbers. Commercial harvests are dependent on Chum abundance and the presence of a buyer. Commercial harvests averaged 228,000 Chum salmon during 2008-2012, supporting up to 89 fishermen (Menard & Kent 2012). Small numbers of other salmonid species, including Dolly Varden char and sheefish, are captured for personal use and documented on fish tickets. Primary fishery management objectives are to provide adequate Chum salmon escapement through the commercial fishery to ensure a sustained run and to provide for the subsistence priority. A test fishery conducted on the Kobuk River provides the only in-season escapement index (600 fish is the index threshold). If commercial catches indicate a weak run, and are in agreement with test fish catches in the Kobuk River, the department reduces fishing time in late July to two short duration periods per week or less. If commercial catches indicate sufficient run strength the department allows commercial fishing to continue based on market conditions and escapement indicators. Age, sex and length composition (ASL) are taken from commercial catch samples. Aerial survey data are utilized to: (1) evaluate initial run strength while salmon are traveling to the spawning grounds, and (2) document peak salmon abundance on the spawning grounds as an index to total escapement. One of the primary fishery management strategies is to provide for escapement within sustainable escapement goal ranges (SEG) for each river system (five goals). These ranges were developed in 2007 and are based on an analysis of historical harvest and escapement information of specific index areas within major drainages. In recent years, the goals have been met or surveys have not been conducted largely due to weather issues and water clarity (Menard 2012b, Munro & Volk 2012). Chum abundance in recent years has rebounded from low levels in the 1990s and 2000s.

There are no stocks of concern in Kotzebue and currently there is no hatchery production.

2.5.11 UoC 11 – Norton Sound

The Norton Sound unit of certification includes the Norton Sound District and the Port Clarence District, an expansive area (>500 miles of coastline) that is located in northwestern Alaska, including the City of Nome (Menard *et al.* 2012, Menard 2012a). Norton Sound is part of the AYK management area. The Norton Sound district is divided into 6 subdistricts. All commercial salmon fishing in the district is by set gillnets in marine waters; however, fishing effort is usually concentrated near river mouths. Commercial fishing typically begins in June and targets Chinook salmon if abundance is sufficient to meet escapement and subsistence needs. Emphasis switches to Chum salmon in July and the Coho salmon fishery begins the fourth week of July and closes in September. Pink salmon are much more abundant in even numbered years (late July and early August), and can support commercial fisheries when a buyer is present. Commercial fishing is not allowed when fish buyers are not present, as has frequently occurred since the mid-1990s, especially for Pink salmon. Commercial fishery managers use estimates of run strength based on pre-season forecasts, in-season test fishing, escapement counting projects (e.g., three counting towers and six weirs), aerial surveys, and commercial fishing indices as a means to issue emergency orders to open the fishery. Gillnet mesh size varies with the targeted species, e.g., <4.5 inch for Pink, <6 inches for Coho. The use of smaller mesh sizes have been used to conserve larger, older Chinook salmon (2012a). Several of the subdistricts are managed intensively for subsistence use, and management uses a variety of tools to provide for escapement needs. Little or no commercial fishing has occurred in subdistricts 1 and 4 (Nome and Norton Bay) since the early 1980s. Relatively little commercial fishing occurs in Port Clarence District, which has been closed to commercial fishing in recent years (Menard 2012a).

Norton Sound/Port Clarence has escapement goals for all species of salmon (Brannian et al. 2006, Volk et al. 2009, Munro & Volk 2012): Chinook (5 goals), Chum (12 goals), Coho (3 goals), Sockeye (2 goals), and Pink salmon (5 goals). Fisheries are managed to achieve escapement goals (Menard 2012a). Low abundances of Chinook salmon have led to reduced commercial openings for Chum salmon in the Unalakleet and Shaktoolik subdistricts. Methods to develop goals vary with the type and quality of data: percentile method, theoretical spawner-recruit analysis (SRA), SRA, proportion of aggregate goal, risk analysis, and empirical observation. In recent years, Chinook spawner escapements have fluctuated around the goals but often did not meet the lower goal in each of the five survey areas except Unalakleet River/Old Woman River where the goal was consistently met. In response to low Chinook run size (due primarily to environmental issues), directed commercial fisheries on Chinook salmon have been prohibited (Menard 2012a). Incidental commercial harvests of Chinook salmon have been greatly reduced, averaging only 70 Chinook per year, 2006-2010 (Menard 2012a).

Presently, stocks of concern (yield) in the Norton Sound district have been identified for Chinook in subdistricts 5 & 6 (Shaktoolik, Unalakleet), and Chum in subdistricts 1, 2, 3 (Nome, Golovin, Elim) because these stocks have been failing to produce expected levels of harvest. Action plans to improve harvests of these stocks have been developed (Kent et al. 2009, Menard and Bergstrom 2009a,b). The plans include a discussion on factors of decline (e.g., gold mining and road construction), management actions to improve the runs, and research activities. Although hatcheries are not part of the action plans, Norton Sound residents near Nome have expressed interest in developing hatcheries for Chum salmon. However, the cost of heating water in order to rear eggs and fry in a hatchery may be cost prohibitive.

Presently, there are no commercial-scale hatchery programs in the Norton Sound area. However, pilot-scale projects exist for Chum, Coho, and Chinook salmon. On average, approximately 88,000 Chum eggs and 49,000 Coho eggs per year were stocked into Norton Sound streams during 2007-2011 by the Norton Sound Economic Development Corporation (NESDC-http://mtalab.ADF&G.alaska.gov/CWT/Reports/hatcheryrelease.asp). Approximately, 488 Chinook eggs were recently stocked into the Unalakleet watershed (L. Wilson, ADF&G, pers. comm.). All salmon are thermally marked (C. Lean, NSEDC, pers. comm.). These hatchery egg programs are not identified as part of the action plans developed by ADF&G to recover Chum and Chinook populations, but the goal is to help rebuild wild salmon runs, especially in tributaries where few or no wild salmon currently exist (http://www.nsedc.com/reestablishment.html). Very few adult salmon have returned from this limited stocking (C. Lean, NSEDC, personal communication). Additionally, Salmon Lake, which discharges to Port Clarence, has been periodically fertilized in an attempt to enhance Sockeye salmon growth and production (http://www.ADF&G.alaska.gov/FedAidPDFs/FDS12-28.pdf).

2.5.12 UoC 12 – Kodiak

Figure 3-55.The Westward Management Region (Source: http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercialbyarea.southwest).

The Kodiak salmon fishery is located on the Kodiak Island archipelago and the southeastern border of the Alaska Peninsula extending from Cape Douglas just south of Cook Inlet, and along the peninsula to the southwest where it adjoins the Chignik Management Area. All five species of Pacific salmon are targeted by a mixture of primarily purse seine and set gill net fisheries with a small number of beach seine permits.

Major hatcheries operate at Pillar Creek near Kodiak and at Kitoi Bay, with some production of all five species but major efforts are focused on Pink, Chum and Sockeye salmon. Major enhancement activities in the past beyond the fish hatcheries have included lake fertilization of Sockeye salmon lakes, and large run developments of Sockeye salmon at Frazer Lake and Spiridon Lake. Frazer Lake is essentially a natural run with the fishway being the only factor. Spiridon Lake uses a smolt bypass but is annually stocked with fry originating from the Pillar Creek hatchery (PCH) with Saltery Lake as a brood stock. PCH Sockeye salmon egg-take goals have ranged from 300,000 to 3.4 million early-run Sockeye (Afognak Lake) eggs and from about 500,000 to 9.1 million late-run Sockeye (Upper Station, Little Kitoi Lake, Saltery Lake) eggs. There are multiple other smaller Sockeye salmon systems that are maintained by a combination of fishways and stocking (KRPT 2011).

Kodiak's long term regional plan indicates substantial expansion of fisheries enhancement from hatcheries (KRPT 2011). The regional planning team stated the following in the 2010-2030 salmon plan: "Examination of supplemental harvest goals for the period 2010-2030 exposes a significant need to increase supplemental production. Significant expansion and new projects are required to meet these goals. While it may be possible that existing supplemental salmon production facilities in the KMA could make some increases to current production, any such expansion would likely still be insufficient to meet future harvest goals for supplemental Chum salmon or even-year Pink salmon. One or more new hatchery facilities is a logical alternative. Additional research programs to determine potential effects of new salmon hatchery projects will likely be required (e.g., coded wire tagging or thermal otolith marking of new salmon production). Hatchery investigation and site selection has been identified as a high priority project for all districts."

Because the long term plan is to increase supplemental production to equal or exceed natural production in the KMA (KRPT 2011), ADF&G has suggested that investigations of hatchery fish straying would be desirable for hatchery releases in the KMA. Musslewhite (2011a; 2011b) evaluated Kodiak's hatchery management plans and permits, an assessment of each hatchery program's consistency with statewide policies, and recommendations to address any deficiencies. These reports included a fisheries management component and the report recognized the need to mark hatchery releases as a means to evaluate fisheries management assumptions, although they acknowledged that the local staff had not requested a marking program.

Previous investigations have been conducted on the Spiridon Lake Sockeye salmon stocking program using scale pattern analysis of age 1.2 Spiridon Lake adult returns that indicated a low risk to current management of wild salmon stocks (Nelson & Swanton 1996). A scale pattern analysis was conducted in recent years as well by visually examination of scales collected from the fishery, with similar components identifying Spiridon Lake Sockeye in Kodiak fisheries. This study indicated similar proportions, but there was no indication of blind calibrations using samples from the escapement to determine classification accuracy (Foster 2010).

For Chinook salmon in the Kodiak Management Area (KMA) there are 6 stocks with escapement goals for the Karluk and Ayakulik River. For Sockeye salmon there are 49 stocks with 14 escapement goals at Malina Creek, Afognak (Litnik) River, Little River, Uganik Lake, Karluk River Early Run, Karluk River Late Run, Ayakulik River Early Run, Ayakulik River Late Run, Upper Station River Early Run. Upper Station River Late Run, Frazer Lake, Saltery Lake, Pasagshak River, and Buskin

Lake. For Coho there are 204 stocks with 4 goals at Pasagshak River, Buskin River, Olds River, and American River. For Chum salmon there are 174 Stocks with 2 Goals, the Mainland District and the

Kodiak Archipelago Aggregate. For Pink salmon there are 404 Stocks with 3 Goals, the Mainland District, Kodiak Archipelago (odd year) and Kodiak Archipelago (even year).

Fish escapements are enumerated by a variety of methods, with multiple weirs (fish fences) providing real time counts of salmon for the major Sockeye salmon systems and some Pink, Coho and Chinook escapements. Multiple overflight of Pink, Chum and some Coho systems are used to obtain real time escapement data used for inseason management of the commercial fishery.

2.5.13 UoC 13 – Chignik

The Chignik Management Area (CMA) is in the Westward Management Region and located on the south side of the Alaska Peninsula, approximately 250 miles southwest of Kodiak. The Chignik salmon fishery focuses on catches of Sockeye salmon, largely while fishing in Chignik Lagoon and Chignik Bay. Fishing can also occur in districts along the south side of the Alaska Peninsula when areas are opened by the manager. Harvests of other salmon species are largely incidental to Sockeye salmon, but they do contribute significantly to the overall value of the fishery. Directed fishing for Pink and Chum salmon may occur in the Eastern, Western, and Perryville districts. Catch of Chinook and Coho is largely incidental to the Sockeye fishery. Coho returning to the Chignik lake system can support modest harvests when fishermen fish into late September, although effort is often low. Purse seine is the only commercial gear.

Escapements are monitored hourly by a large weir in Chignik River and by aerial surveys (~weekly) along the peninsula (up to 49 streams for Pink and Chum salmon). The weir has been used to monitor escapements of Sockeye, Chinook, and to a lesser extent Coho salmon since 1922. Aerial surveys are also used to monitor abundance and distribution of Sockeye spawning in tributaries upstream of the counting weir. Escapement goals are used to manage the fisheries. Escapement goals are largely based on stock-recruitment relationships with consideration of Sockeye habitat conditions, including lake euphotic volume and zooplankton biomass (Nemeth et al. 2010). Yield analysis and risk analysis are used for Pink and Chum salmon goal determinations. Due to late season run timing and limited directed effort, escapement goals for Coho salmon have not been established in the CMA (Anderson & Nichols 2012). Escapement goals are reviewed every three years; detailed area management reports are produced annually.

The fisheries are managed using: 1) preseason forecasts and preseason management plans, 2) in-season test fisheries, 3) in-season catch per effort by district, 4) daily monitoring of catch and escapement (Sockeye), 5) weekly aerial surveys of streams along the coast (Pink and Chum), and 6) and monitoring of age, sex, and size (primarily Sockeye). Chignik Sockeye are intercepted in both Kodiak and South Peninsula management areas, which are managed based on written management plans (Anderson & Nichols 2012). Until 2004, the early and late Chignik Sockeye runs were quantified in-season using scale pattern analysis, which has given way to an assumed fixed 50% date of stock composition (July 4). For example, the 2011 fishery was managed based on this date, so that through July 4, fishing periods were based on achieving interim early-run escapement objectives, and beginning July 5, fishing periods were based on achieving interim late-run escapement objectives. The fishery has a long history of management and research, including efforts by the University of Washington. Although fishermen support the Chignik Regional Aquaculture Association (CRAA), this organization supports research to improve management of wild salmon, including natural changes to Black Lake; there are no enhanced salmon in Chignik.

2.5.14 UoC 14 – Alaska Peninsula

The Peninsula/Aleutian Islands UoC is in the Westward Management Region and has three components. The first is located on the southern portion of the south side of the Alaska Peninsula adjacent to the southern boundary of the Chignik management area and is called the South Unimak and Shumagin Islands June commercial salmon fishery which targets Sockeye salmon. The Aleutian Islands and Atka-Amlia Islands management area component extends southwest from Unimak Island and encompasses all of the Aleutian Islands to the Russian border and the Pribilof Islands. The Northern portion of the Peninsula/Aleutian Islands UoC extends along the northern side of the Alaska Peninsula from Cape Sarichef on Unimak Island to Cape Menshikof near Port Heiden where it joins the Bristol Bay District of the Central Management Area. The Peninsula fishery focuses on catches of Sockeye salmon, composed of interceptions of Sockeye salmon bound primarily for Bristol Bay and local stocks primarily along the north side of the Alaska Peninsula. Significant catches of Coho, Pink and Chum are also caught but are largely incidental to Sockeye salmon although there are some targeted fisheries, although they do contribute significantly to the overall value of the fishery. Purse seines, drift gill nets, and beach seines are the only commercial gear allowed with significant restrictions on gear types are employed to accomplish various conservation and allocation objectives established by the BOF.

Interception fisheries are based on quotas established preseason, dependent upon run forecasts for the primary stocks being intercepted. Chum salmon from various stocks are also intercepted with some captured from Japanese aquaculture releases (Murphy 1993). Escapements are monitored hourly by weirs and by aerial surveys (~weekly) along the Peninsula (streams for Pink and Chum salmon. Aerial surveys are also used to monitor abundance and distribution of Sockeye and Coho spawning in tributaries upstream of the counting weir. Escapement goals are used to manage the fisheries where the primary stocks are local. Escapement goals are largely based on stock-recruitment relationships with consideration of Sockeye habitat conditions, including lake euphotic volume and zooplankton biomass (Wittiveen et al. 2009). Escapement goals are reviewed every three years; detailed area management reports are produced annually. The fisheries are managed using 1) preseason forecasts and preseason management plans, 2) inseason test fisheries, 3) inseason catch per effort by district, 4) daily monitoring of catch and escapement (Sockeye), 5) weekly aerial surveys of streams along the coast (Pink and Chum), and 6) and monitoring of age, sex, and size (primarily Sockeye and Chum).

There is one stock of concern in the Peninsula/Aleutian Islands UoC. Swanson Lagoon Sockeye salmon was designated as a stock of management concern in 2012 (Regnart & Swanson 2012; Munro & Volk 2013). ADF&G has difficulty assessing escapements because of algal blooms; fisheries that may impact the stock have been closed. The stock's decline is related to natural causes where a berm was formed at the mouth preventing escapements from entering the system.

There is one escapement goal for Chinook, 13 for Sockeye, three for Coho, two for Pink (different for odd and even years) and six for Chum salmon. Escapement goals were reviewed in 2012 (Sagalkin & Erickson 2012) with minor recommendations for changes, specifically to drop goals where survey information is unreliable and little fishing effort is occurring.

There are no significant hatchery contributions or enhanced fisheries to the Alaska Peninsula Salmon Fishery. Previous MSC conditions have focused on determining composition of harvests in the districts where potential significant interceptions have occurred of unidentified stocks in targeted fisheries. The Western Alaska Salmon Stock Identification Program (WASSIP) reports have been very extensive and have used genetic information to address harvest composition. A series of report have been made available in 2012 that provided the information on target stock composition (e.g. Eggers *et al* 2012).

(See http://www.adfg.alaska.gov/index.cfm?adfg=wassip.reports) for an extensive list of reports on Chum and Sockeye salmon catch and escapement composition throughout western Alaska.

2.6 Principle 2—Ecosystem Background

2.6.1 Overview of the Alaska Ecosystem

The following overview of the Alaska ecosystem is extracted from the document 'Our wealth maintained: a strategy for conserving Alaska's diverse wildlife and fish resources' (ADF&G 2006) as adapted by IMM (2013).

Alaska has more than 40% of the surface water resources of the entire USA. Approximately three quarters of all freshwater resources in Alaska are stored as glacial ice covering about 5% of the state. Alaska has more than 3 million lakes greater than 5 acres, over 12,000 rivers, thousands of streams, and an estimated 100,000 glaciers. Alpine glaciers, lakes, groundwater, glacial and clear water rivers, streams, springs and ice fields connect the uplands to Alaska's estuarine ecosystem.

Alaska's largest rivers include the Yukon, Kuskokwim, Nushagak, Susitna, Copper, Taku and Stikine. The state's longest river is the Yukon whose headwaters are in the Yukon territory of Canada. The Yukon flows for 1,280 miles through Alaska and drains a 204,000-square mile area. Alaska's rivers support many aquatic species including six species of Pacific salmon, other anadromous and resident fish. The Taku and Stikine rivers originate in the Yukon Territory of Canada. The rivers also serve as migratory corridors to the many smaller tributaries that support spawning, rearing, and overwintering habitats. These same tributaries provide protective vegetative cover, a significant source of detritus, and terrestrial wildlife riparian migration corridors.

Alaska's freshwater ecosystems range from the temperate coastal rain forest of the Southeast region with a maritime climate and dense riparian vegetation, to the boreal forest of Interior Alaska, with continental climate and modest riparian vegetation, to the Arctic tundra of the North Slope, with sparse riparian vegetation. In terms of elevation, freshwater habitats are found from the highest alpine glacier and cirque lakes down to sea level, and flowing waters effectively connect the mountains to the sea. Aquatic habitats are complex and range from small, ephemeral streams to large, braided glacial systems that flow across entire regions of the state.

Moving into the marine environment, Alaska's convoluted shoreline is more than double the shoreline for the entire Lower 48 states at 44,000 miles. This extensive shoreline creates an impressive abundance and diversity of intertidal and nearshore habitats, comprising rocky reefs, mud and sand beaches and eelgrass beds. Alaska also has over 5 million acres of islands and sea cliffs, spreading along its coastline, from the Alaskan Panhandle in the southeast, around the Gulf of Alaska, across the Aleutian Islands, and north through the Bering Sea to above the Arctic Circle. Alaska's marine waters and associated habitats are primarily pristine and undeveloped.

2.6.2 Primary and Secondary Species

The highly directed nature of salmon fishing (i.e. harvesting often occurs in near terminal areas, fishing is focused around peak run times, the gear is fished off the bottom, and gear must be attended) means that capture of non-salmonids in the fishery is minimized. Nevertheless, with the exception of the troll fishery in the Southeast region of Alaska, non-salmonids may not be retained in the Alaska salmon fishery except for personal use. Personal use fish may not be sold but must be reported on fish tickets. This strategy helps to minimize unwanted catches.

At the request of the 2001 MSC review of Alaska salmon fisheries, ADF&G collected non-salmonid catch data in test fisheries in the majority of the management areas during 2002-2004 (Table 19). Since the last full assessment in 2012, no new data has been collected. We therefore restate the original data from 2002 -2004. Test fisheries are regularly used as a tool by ADF&G to help determine when fishing may be appropriate early in the season before many fish have reached terminal areas where estimates of abundance can be made. No birds or marine mammals were taken by the test fishery program, but harbor seals were encountered when they attempted to steal fish from the nets (Chaffee 2005, Chaffee *et al*. 2007). Salmon dominated the catches in each area, almost always making up more than 99% of the catch. Where captured, the bycatch was reported to be made up of sheefish (*Stenodus leucichthys*), starry flounder (*Platichthys stellatus*), Dolly Varden (*Salvelinus malma malma*), sculpin spp. or cisco (*Coregonus* spp.).

Table 19. Salmon test fisheries monitored for bycatch between 2002 and 2004.

Region	Location	Gear Type	2002	2003	2004	By-catch
Southeast	Hawk Inlet N. Chatham Strait	Purse Seine	X	X	X	0.06% - 0.3% (mainly Dolly Varden)
UCI		Drift Gillnet			X	0%
Bristol Bay	Kvichak River	Drift Gillnet			X	0%
	Egegik River	Drift Gillnet			X	Minimal
	Ugashik River	Drift Gillnet			X	Minimal
Kuskokwim	Bethel	Drift Gillnet		X	X	<1%
	Aniak River	Beach Seine		X	X	No %, but live releases
	Kalskag & Aniak	Fish wheel & Gillnet		X	X	No %, but live releases
	Holitna River	Drift Gillnet		X	X	No %, but live releases
	Birch Tree	Fish wheel & Gillnet		X	X	No %, but live releases
Yukon	Lower Yukon	Set + drift gillnet		X	X	Minimal (mainly sheefish, whitefish, cisco)
	Pilot Station	Drift gillnet		X	X	Minimal (mainly sheefish, whitefish, cisco)
	Mountain Village	Drift gillnet		X	X	Minimal (only ciscos)
	Kaltag	Drift gillnet		X	X	Very low
	Russian Mission	Fish wheel		X	X	No %, but live releases
	Tanana tagging	Fish wheel		X	X	No %, but live releases
	Kantishna tagging	Fish wheel		X	X	No %, but live releases
	Nenana recovery	Fish wheel		X	X	No %, but live releases
	Kantishna recovery	Fish wheel		X	X	No %, but live releases
	Tolklat recovery	Fish wheel		X	X	No %, but live releases
Norton Sound	Unalakleet River	Set Gillnet		X	X	<1% (Dolly Varden, starry flounder)
Kotzebue	Kobuk River	Drift Gillnet		X	X	No % (Sheefish and Dolly Varden)
Kodiak	Alitak Bay	Set gillnet	X	X	X	<1% (cod, pollock, sculpin spp. starry flounder)
Peninsula / Aleutians	Shumagin Is. Immature Salmon	Purse Seine	X	X	X	<0.08% (pollock, flatfish spp.)
	Bear River	Drift gillnet	X	X	X	<7% (starry flounder, yellowfin sole, sculpin spp.)

In some cases, personal use and subsistence fisheries occur in about the same time and place with similar gear to that used in the commercial fishery. When this happens, additional data is available to perhaps shed light on the levels of non-salmonid catches that may occur in concurrent commercial fisheries. IMM (2013) provided data for the subsistence and personal use fisheries that occurred in the Copper/Bering, Lower Cook Inlet and Upper Cook Inlet Units of Certification for 2010 and 2012. The assessment team inquired about the availability for similar data since 2012, but no new data was available. The available data (Table 20) shows very low levels of non-salmonid catches, confirming the findings of test fishery data from other sites.

Table 20. Catch of salmon and other species in selected personal use and subsistence fisheries.

UoC	4: Copper/Bering		5: LCI		6: UCI	
Fishery	Upper Copper River subsistence and personal use		Southern District personal use / subsistence set gillnet		Upper Cook Inlet personal use fishery	
Source	Botz *et al*. (2012)		Hollowell *et al*. (2012)		Dunker (2010)	
Catch	Salmon	Other bycatch	Salmon	Other bycatch	Salmon	Flounder
2001	225496	548	1858	0	-	-
2002	144958	342	1878	0	-	-
2003	135244	307	1324	0	-	-
2004	172100	563	1805	0	-	-
2005	190521	487	1207	0	-	-
2006	189330	547	1577	0	-	-
2007	198790	716	2229	0	363852	2799
2008	132100	482	2639	0	335924	3310
2009	141531	340	1034	1	470657	5080
2010	211837	534	1306	0	-	-
2011	-	-	1197	3	-	-
Mean	174191	487	1641	0	390144	3730
Mean Bycatch	0.3%		0.0%		1.0%	

We conclude that the bycatch of marine and freshwater species seen in test fisheries and in subsistence and personal use fisheries is negligible and therefore not necessary to consider in scoring for most units of assessment. However, in the troll fishery in the SEAK UoA, groundfish may be retained and sold. IMM (2013) reported that:

- Overall, groundfish accounted for between 0.02 and 0.04 percent of the catch of salmon and groundfish for the years 2005 -2010.
- Lingcod (*Ophiodon elongatus*) made up 57.4% of the reported groundfish harvest.
- Black rockfish (*Sebastes melanops*) made up 25.5% of the groundfish catch.
- All other species made up less than 5% of the groundfish catch.
- The catches comprised only 0.2% of the salmon catch and at this level were deemed negligible.

For the years 2012 – 2016, Lingcod and Black rockfish once again were the two most common species landed by weight, followed by Pacific halibut, dusky rockfish and Silvergray rockfish (Table 21).

Table 21. Harvest of non-salmon in the SEAK troll fishery 2012 – 2016 in numbers of fish. (Rockfish are listed alphabetically).

Species (common Name)	2012	2013	2014	2015	2016
halibut, Pacific	10,769	8,156	9,987	9,945	9,661
Lingcod	25,298	13,531	10,663	16,949	23,773
rockfish, Black	20,271	8,077	8,591	8,285	13,778
rockfish, bocaccio					211
rockfish, Canary	996	512	531	770	1,616
rockfish, Copper	13				
rockfish, Dusky	4,533	2,238	2,913	4,537	11,809
rockfish, Quillback	565	349	258	367	618
rockfish, redbanded	10				10

rockfish, Redstripe		72	33	32	63
rockfish, Silvergray	3,891	2,192	1,848	2,707	4,787
rockfish, Widow				104	
rockfish, Yelloweye (red snapper)	1,441	832	783	2,104	3,689
rockfish, Yellowtail	2,296	1,453	2,785	2,514	2,956
trout, steelhead		-	211		209
Total	**70,083**	**37,412**	**38,603**	**48,314**	**73,170**
Percent of Total SEAK Salmon Catch	**0.04%**	**>0.01%**	**0.02%**	**0.02%**	**0.05%**

State Management of Lingcod includes establishment of Guideline Harvest Levels (GHL) by area, setting open and closed season, establishes specific closed areas, the ability to establish by-catch limits, and an allocation guideline by gear type and area (ADFG 2015). For 2018, the GHL is set at 859,000 pounds and the troll fishery share is 55,690 pounds or 6.5 %. In two inside waters of Southeast the troll fishery allocation was eliminated to provide for a robust sport fishery, but little troll effort occurs in these areas. We treat Lingcod as a Minor Primary Species

There were seven rockfish species harvested that are members of the demersal rockfish management assemblage, they are:

- Canary rockfish (S. pinniger),
- Copper rockfish (S. caurinus),
- Quillback rockfish (S, maliger),
- Redband rockfish (S. proriger).
- Rosethorn rockfish (S. helvomaculatus),
- Tiger rockfish (S. nigrocinctus),
- Yelloweye rockfish (S. ruberrimur).

There were four rockfish species harvested in the slope management assemblage, they are:

- Black rockfish (S. melanops)
- Bocaccio (S. paucispinis).
- Redstripe (S. proriger)
- Silvergray rockfish (S. brevispinis)

There were four rockfish species harvested in the pelagic shelf management assemblage, they are:

- Dusky rockfish (S. variabilis)
- Widow rockfish (S. entomelas)
- Yellowtail rockfish (S. flavidus)

The catch of rockfish is managed by both the North Pacific Fishery Management Council (NPFMC) and the State of Alaska. In general, the state quota is based upon the Federal guideline harvest level (ADFG 2015). State regulations also provide for apportioning the guideline harvest level between areas, establishing closed areas, trip limits and accounting for by-catch mortality in the allowable harvest.

Within the Demersal Shelf Rockfish complex (DSR), the troll fishery's largest catch was for Yelloweye rockfish followed by Canary rockfish. NOAA assessments show that Yelloweye rockfish account for a large portion of the biomass. Because of their longevity NOAA recommended that fishing mortality for the demersal shelf complex be set to 0.02. The estimated biomass for 2018 of Yelloweye rockfish in the Southeast Outside Subdistrict of the Gulf of Alaska is 11,508 tons and this represents an increase over the previous year. NOAA has recommended a TAC for all DSR of 250 tons of which 230 tons would be Yelloweye (Olson et al. 2017). In addition to NOAA's work, ADFG conducts an annual stock assessment for the demersal shelf complex using a habitat- based stock assessment. The density of Yelloweye rockfish, the primary target of the DSR complex, is estimated from a survey using an un-manned submersible, and rockfish habitat is estimated using sonar and fishing data. These data show that the the troll fishery catch represents a minor portion of the ABC of the complex.

Within the slope assemblage Black and Silvergray account for almost all the catch. Management of Black rockfish was delegated to the state of Alaska in 2008. Management includes establishment of Guideline Harvest Levels (by area), allowable gear, closed areas, allocations among user groups, requirements for full retention, by-catch allowances, logbooks when participating in the directed fishery, and requires deducting by-catch mortality from the GHL. For 2018 the GHL in the Southeast was set at 325,000 pounds (ADFG 2018 b). The only data available for stock assessment is catch and logbooks. However, because the directed fisheries are small and effort has been declining in recent year, there is no conservation concern. http://www.adfg.alaska.gov/index.cfm?adfg=blackrockfish.main

Within the Pelagic Shelf Assemblage, Dusky rockfish represent most of the catch. NOAA recommended the Allowable Biological Catch (ABC) of Dusky Rockfish in the Gulf of Alaska for 2018 as 3,975 tons. At this level the estimated exploitation rate will be 20%. Within Southeast and Yakutat, the ABC is 77 tons. The stock is not subject to overfishing, is not currently overfished nor is it approaching a condition of being overfished (Fenske et al. 2017). The troll fishery catch represents a minor portion of the ABC.

We classify the catches of rockfish caught in the troll fishery of Southeast Alaska and Yakutat as Minor Secondary Species. We classified rockfish as a secondary species because management is based more on the complex (e.g. DSR, Slope, Pelagic) than on individual species. The catch of steelhead is negligible and not scored.

Pacific halibut are managed jointly by the International Pacific Halibut Commission (IPHC) and the NPFMC. The IPHC sets the annual guideline harvest level (GHL) and the NPFMC sets the implementing regulations. The 2016 assessment results indicate that the Pacific halibut stock declined for much of the decade prior to 2010, but has been relatively stable or increasing since then. Recruitment and size-at-age were the primary factors causing the decline during that period (IPHC 2016). The GHL for the Southeast Alaska Area in 2017 was set at 5,250,000 pounds. The troll fishery takes a very small portion of the GHL. The Pacific halibut fishery is certified as sustainable by MSC. Halibut are classified as a minor primary species.

Non-local and Non-target Inseperable or Practicably Inseperable (IPI) catches by UoA

In this section we review the salmon catches by species in each UoA for potential inclusion of IPI species. Accoring to MSC FCR v2.0 Section SC6, salmon catches within a UoA may be considered IPI under two conditions; a) they are not targeted by management or, b) they spawn outside the UoA. At the beginning of each discussion for a UoA, we provide a graphic table with a summary of our findings.

Southeast UoA

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Southeast	Local P1, Some Non-Local IPI	Local P1, Some Non-Local IPI	Local P1, Some Non-Local IPI	P1	P1

In the Southern portion of the Southeast Region, the commercial fishery harvests stocks of Pink, Chum, Sockeye, and Coho salmon of British Columbia, Canada (BC) origin. The catches of BC origin fish are governed under terms of the Pacific Salmon Treaty (Treaty). Treaty based conservation and harvest sharing agreements were renewed in 2009.

The Northern Boundary area fisheries include the Alaska District 104 purse seine and Alaska District 101 drift gillnet fishery. Treaty agreements are "abundance based" where the allowable harvest is a percentage of the Annual Allowable Harvest (AAH). The AAH is the total return of applicable stocks minus the lesser of: 1) the actual escapement, or 2) the escapement goal. Catches over, or under, the AAH each year are summed over the period of the agreement to allow for annual variation.

In Alaska's District 104 purse seine fishery, the allowable catch is 2.45% of the AAH of Sockeye Salmon returning to the Nass and Skeena rivers prior to Alaska's Statistical Week 31, which signals the beginning of directed Pink Salmon management. Since 2012 the actual catches have varied around the agreed limits (Table 22) (PSC-NBTC 2017).

Table 22. The Annual Allowable Harvest (AAH) of Sockeye Salmon returning to the Nass and Skeena rivers and the District 104 share of these fish in the purse seine fishery, 2012-2016.

Year	Total Annual Allowable Harvest	District 104 Share	Actual Percent Caught
2012	1,637,173	9,589	<1%
2013	339,015	4,228	3%
2014	2,724,535	74,005	3%
2015	1,915,042	21,433	1%
2016	894,130	65,039	7%

In Alaska's District 101 drift gillnet fishery the allowable catch is 13.8 percent of the AAH of Sockeye Salmon returning to the Nass River. Since 2012 the actual catches have generally been below the agreed limits (Table 23) (NBTC 2017). Sockeye Salmon caught in Alaska of BC origin are certified sustainable by MSC (Acoura Marine 2017).

Table 23. The Annual Allowable Harvest (AAH) of Sockeye Salmon returning to the Nass River and the District 101 share of these fish in the gill net fishery, 2012-2016.

Year	Total Allowable Harvest	District 101 Catch	Actual Percent Caught
2012	276,818	38,983	14.1%
2013	301,428	35,471	11.8%
2014	349,685	29,022	8.3%
2015	668,749	14,867	2.2%
2016	238,311	14,388	6.0%

The Treaty does not establish harvest sharing arrangements for BC origin Pink Salmon caught in Alaska. English et al. (2012) estimated exploitation rates of 9%, 9% and 8% for Pink Salmon originating from British Columbia's Area 3, 4, and 5, caught in Southeast Alaska for the years 2006-2010. However, no estimate of the actual catch was provided. Pink Salmon caught in Alaska of BC origin are certified sustainable by MSC (Acoura Marine 2017).

The only provision in the Pacific Salmon Treaty for Chum Salmon in the Northern Boundary Area is that neither Party shall conduct net fisheries in the Portland Canal, described as Alaskan Section 1A and Canadian sub-areas 3-15 and 3-16, nor conduct directed Chum fisheries in Alaskan Section 1B north and east of Akeku Point or in Canadian sub-areas 3-11 and 3-13 unless agreed otherwise by the Parties.

Chum Salmon that spawn in BC are harvested in Southeast Alaska. Estimates of the average exploitation rates in Alaska were made by assuming exploitation rates similar to that of Sockeye Salmon from the Nass and Skeena Rivers, adjusted for run timing (English et al. 2012). Estimates of harvest rates for BC north coast statistical areas 3 (including Portland Canal), 4 and 5 for the period 2006 - 2010 were 24%, 10% and 10% respectively. English et al. (2017) provided no direct estimates of the harvest of Canadian origin Chum Salmon in Alaska. Chum Salmon caught in Alaska of British Columbia origin are certified sustainable by MSC (Acoura Marine 2017).

The Treaty does not establish specific harvest sharing arrangements for Canadian origin Coho Salmon caught in Alaska. However, the treaty does require that neither Party may redirect its fisheries in a manner that would be designed to intentionally increase interceptions of the other Party fish. English et al. (2012) estimated exploitation rates in Alaska fisheries of 4%, 4%, 37%, 14%, 5%, 14%, 8%, 8%, 3%, and 3% for fish originating from BC areas 2E, 2W, 3, 4, 5, 6, 7, 8, 9, and 10, respectively, during 2006-2010. However, no estimates of numbers harvested, were provided. Even lacking direct estimates of the harvest of BC Coho Salmon, we believe the catch to very small based on the modest numbers caught and escaping to spawn in these areas (PSC-JNBTC 2017) in relation to the catches in Southeast and conclude that the catch of BC origin Coho Salmon is less than 2%. We classified these B.C. origin Coho as Non-Local IPI.

The Pacific Salmon Treaty includes very complex conservation and harvest sharing arrangements for Sockeye, Chinook and Coho salmon returning to the Transboundary Taku and Stikine rivers that originate in Canada's Yukon Territory and harvested , in part, in the Southeast UofA. In general, the treaty requires the Party's to manage their fisheries to achieve escapement goals, share available surplus production in specific ways, and participate in joint enhancement programs. The reader is referred to treaty language in Annex IV http://www.psc.org/publications/pacific-salmon-treaty/ for a complete description of each party's obligations. Salmon runs to in Transboundary Rivers are actively managed with programs to provide in-season estimates of catch and escapement and share this information as it becomes available. Overall the Treaty's provisions to meet escapement goals and share the harvest have been met (PSC-JTTC, 2017 and Munro and Volk, 2017).

The Joint Transboundary Technical Committee provides estimates of the catch, by species of transboundary river stocks in the Southeast fisheries Table 24 (PSC-JTTC 2017). The average weight of Coho Salmon in the Southeast fisheries for these years was 6.89 pounds per fish and the average weight of Sockeye Salmon was 5.94 pounds per fish. We estimate that that the total weight of Sockeye and Coho Salmon caught of transboundary river origin for the years 2011 – 2015 was 3,663,883 lbs. This catch represents 0.2% of the overall catch. We treat the Transbounday River Origin Chinook, Coho and Sockeye salmon as non-local IPI.

Table 24. Estimated catch of Transboundary Taku and Stikine rivers salmon in Southeast Alaska, 2011 - 2015 (PSC -JTTC, 2017). There are no direct estimates of the catch of Stikine River origin Coho Salmon in Southeast fisheries; we used the long-term average harvest by Canadian fisheries as a surrogate. Catch of Pink and Chum salmon are extremely small.

System	Year	Chinook	Sockeye	Coho	TOTAL
Stikine	2011	2,145	78,857	4,399	8 7,412
Stikine	2012	2,370	28,700	4,399	37,481
Stikine	2013	1,566	29,136	4,399	37,114
Stikine	2014	1,622	23,881	4,399	31,916
Stikine	2015	1,499	31,958	4,399	39,871
Taku	2011	1,139	71,805	9,393	84,348
Taku	2012	1,380	50,736	11,554	65,682
Taku	2013	632	100,144	25,300	128,089
Taku	2014	1,223	33,226	31,149	67,612
Taku	2015	784	41,999	9,558	54,356
Total		14,360	490,442	108,949	546,469

The Treaty provides for an abundance-based conservation and harvest sharing arrangement for Chinook Salmon caught in Southeast Alaska for all gear types (and includes troll caught fish in the Yakutat UoA). Crane et al. (2000) made estimates of the contribution of various stocks and stock groups based on analysis of genetic data (GSI) for the 1999 troll fishery (Table 25). The Pacific Salmon Commission's (PSC) Joint Chinook Salmon Technical Committee also made estimates (PSC-JCTC 2017a) of the contribution that various stock groups make to the fishery using coded micro-wire tag data (CWT) for the years 1985 – 2009 (Table 26). The PSC-JCTC also made estimates of the average annual percent of the run, for each stock, that was harvested in Southeast for these same years (Table 27). The fraction of the annual run caught in Southeast for the major wild stocks are; 0.7% for the north and central coast stocks of BC, 20.6% for the stocks of upper Georgia Strait, 17.4% for the stocks from the west coast of Vancouver Island, 20.9% for the stocks from the Washington coast, 13.2% for the Oregon coastal stocks, 15.5% for the mid-Columbia River bright stocks, 13.7 % for the upper Columbia river fall bright stocks and 14.6% for the upper Columbia summer stocks. Among the majority of stocks that are harvested in Southeast that have escapement goals reviewed and accepted by the PSC_JCTC (Table 27) only three have not met their escapement goal in year, over the last two years. While escapement goals for the north and central coast of BC have not been reviewed and accepted by the Joint Technical Committee, the annual escapements to rivers in these areas have been stable but variable (PSC-JCTC 2017b).

While some differences are evident in the contribution of specific stocks and regions (Table 25), an average of the estimates is that 95% of the Chinook Salmon caught in the Southeast fisheries spawn outside the UoA. We have computed that for the years 2012 – 2016 the total catch was 1,413,245 Chinook Salmon weighing 19,684,787 pounds (whole weight) originated from outside the UoA. This represents 1.7% of the total salmon catch for these years. We note that the available data shows that the Southeast UoA is being managed to meet the conservation and harvest sharing obligations of the Treaty and that the primary contributing stocks are healthy (PSC – JCTC 2017b).

Table 25. Comparison of estimates for the contribution of various Chinook Salmon stock groups to the Southeast fishery. The column marked GSI is based on the genetic analysis collected

from the 1999 troll fishery (Crane et al. 2000). The column marked CWT is based on coded micro-wire tag data for the years 1985 - 2009 (PSC-JCTC 2017a).

Region	Stock Group	GSI	CWT
Oregon	Mid and North Oregon Coastal	12.6%	14.7%
Columbia R.	Upper Columbia Summer & Snake River Fall	13.7%	23.8%
Washington	Washington Coastal	7.4%	2.8%
	Puget Sound	2.7%	6.7%
	Subtotal	10.1%	9.5%
British Columbia	Lower Fraser	2.0%	
	Thompson River	14.6%	
	Mid and Upper Fraser	5.4%	
	Strait of Georgia	6.0%	5.1%
	West Vancouver Island	17.2%	18.9%
	Central BC Coastal	6.3%	
	Skeena River	1.4%	
	Fraser River		6.0%
	North & Central Coast		16.8%
	Subtotal	52.9%	46.8%
Alaska	Southern Southeast Alaska	4.8%	4.0%
	Susitna River	1.2%	
	Subtotal	6.0%	4.0%
Other Minor		4.7%	1.2%

Table 26. The average percent of a Chinook Salmon stock's annual catch that occurs in the fisheries of Southeast Alaska, and the average percent of that stock that is caught in the fisheries of Southeast Alaska. Averages are based on the PSC's Chinook Salmon Joint Technical Committee's code-wire tag based model for the years 1985 -2009 (PSC-JCTC, 2017a).

Region	CWT Based Modeled Stock	Average Percent of Stocks Catch	Average Percent of Stocks Total Run	Associated Escapement Indicator Stocks
British Columbia	North - Central B.C.	22.30%	10.70%	Yukon, Nass, Skeena Area, Area 6 & 8, River and Smith Inlets
	W. Coast Vancouver Is. Hatchery	48.80%	17.30%	Not Applicable
	Fraser River Early Run Stocks	30.30%	7.40%	Upper & Middle Fraser, Thomson R.
	Fraser Late	0.40%	0.20%	Harrison
	Upper Georgia Strait	35.10%	20.60%	Upper Georgia Strait Stocks
	W. Coast Vancouver Is. Wild	49.80%	17.40%	Wild Stocks on WCVI
	Lower Georgia Strait	4.10%	2.20%	Wild Stocks in l. Gorgia Strait
	Lower Georgia Strait Hatchery	3.80%	2.00%	Not Applicable
Washington	Coastal Hatchery	18.70%	10.40%	Not Applicable
	Coastal Wild	20.90%	11.10%	Grays Harbor, Quillayute, Hoh, &

				Queets Fall Runs
	Puget Sound Fingerling Hatchery	0.50%	0.30%	Not Applicable
	Skagit River Summer and Fall	3.90%	1.10%	Skagit River Summer and Fall Runs
	Stillaguamish River Summer and Fall	18.10%	6.30%	Stillaguamish River
	Puget Sound Yearling Hatchery	0.50%	0.40%	Not Applicable
	Puget Sound Natural	0.60%	0.30%	Green Lake
	Nooksack River Fall Hatchery	0.20%	0.10%	Not Applicable
	Snohomish River Summer/Fall	3.70%	1.00%	Snohomish River
Oregon	Oregon Coastal North Migrating	35.70%	16.20%	Oregon Coastal Rivers
Columbia River	Upriver Bright	27.60%	13.70%	Upriver Bright stock
	Mid-Columbia Bright	33.60%	13.50%	Not Represented in Model
	Upriver Summer	34.00%	14.60%	Upriver Summer
	Willamette River Hatchery	11.90%	5.20%	Not Applicable
	Fall Cowlitz Hatchery	5.70%	2.20%	Not Applicable
	Spring Cowlitz Hatchery	1.60%	0.80%	Not Applicable

Table 27. Summary of escapement goals and escapements for 2015 and 2016, for Chinook Salmon stocks that have goals which have been reviewed and accepted by the PSC Joint Chinook Salmon Technical Committee. (PSC-JCTC, 2017b). Actual escapements shown in bold are below goal.

Region	Stock Group	Stock	Escapement Goal	2015	2016
British Columbia	Fraser River	Harrison	75,100–98,500	101,516	**41,327**
	Lower Georgia Strait	Cowichan	6,500	**5,984**	7,787
Washington	Washington Coast	Quillayute Fall	3,000	3,440	3,654
	Washington Coast	Queets Spr/Sum	700	**532**	704
	Washington Coast	Queets Fall4	2,500	5,313	2,915
	Washington Coast	Hoh Spr/Sum4	900	1,080	1,241
	Washington Coast	Hoh Fall4	1,200	1,795	2,831
	Washington Coast	Grays Harbor Fall	13,326	22,200	**11,685**
Columbia River	Mid Col. Summer	Summer	12,143	88,691	79,253
	Up river Bright	Upriver Bright	40,000	385,774	189,358
	Mid Col. Falls	Deschutes Fall	4,532	17,074	11,628
	Lewis	Lewis	5,700	23,631	8,957
Oregon	Oregon Coast	Nehalem	6,989	12,678	10,074
	Oregon Coast	Siletz	2,944	6,397	8,479
	Oregon Coast	Siuslaw	12,925	35,087	30,135

We note that IMM (2013) concluded that overall the catch of non-local salmon of all species in Southeast was about 1.2% of the total harvest and as such qualified for an exemption from the IPI requirements. However, such exemption does not exist in the current version of the salmon certification requirements. We treat the catch of Canadian , Washington and Oregon Chinook Salmon as non-local IPI.

Yakutat UoA.

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Yakutat	Local P1, Some Non-Local IPI	Local P1, Some Non-Local IPI	Local P1, Some Non-Local IPI	P1	Non-target IPI

Sockeye, Chinook and Coho salmon caught in set net fisheries in the Yakutat UoA may originate from the Transboundary Alsek River, Chinook Salmon caught in troll gear may originate from British Columbia, Oregon, Washington or the Columbia River. Chum Salmon are not targeted in the UoA. Chinook Salmon caught in the troll fishery were discussed in the Southeast UoA, however, some Chinook Salmon are caught in the Alsek River set gill net fishery.

The Alsek is a Transboundary river and management is governed by terms of the Pacific Salmon Treaty. There is a recommended escapement range for Sockeye Salmon returing to one tributary of the Alsek and a weir has been mainteained on that tributary since 1976. In general, target escapements have been met and fisheries allowed on both sides of the boarder. Over the long term the escapements of Chinook Salmon have fluctuated around their goal, but in recent years the run has experienced a decline in productivity consistent with other Chinook stocks in Alaska. Fisheries in Both Alaska and Canada have been reduced during years of low returns (PSC - JTTC 2017). The available escapement data for Coho Salmon is limited in the Alsek because the weir on the Klukshu River is normally removed long before the run is over. Available Coho Salmon escapement data do not show a pattern of decline and are higher than catches by both Alaskan and Canadian fisheries (PSC – JTTC 2017). The catch of Chinook and Coho salmon in the Alsek set gillnet fishery for the period 2012 -2016 was 2,428 and 1,222 fish respectively (Zeiser and Hoffman 2017). Based on an average weight of 13.6 pounds for Chinook and 7.2 pounds for Coho, the total harvest was 33,021 lbs. and 8,798 lbs. The total harvest in Yakutat over this time period was 11,725,508 lbs. The catch of Chinook Salmon and Coho salmon in the Alsek set net fishery comprised less than 0.3 and 0.1 percent respectively. We treat these catches as Non-local IPI.

The East River is the only consistent producer of Chum Salmon in the Yakutat area; however, Chum Salmon are not targeted because transportation costs are high and prices are low. Chum Salmon are also occasionally caught in Yakutat Bay. The total catch of Chum Salmon for the period 2012 -2016 was 42,767 lbs. and this represents 0.4% of the total catch. We treat these catches as non-target IPI.

Copper - Bering Unit of Assessment

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Copper - Bering	P1	P1	P1	Non Target IPI	Non Target IPI

In the previous assessment (IMM 2013) Pink and Chum salmon represented 2.1 % of the overall catch and were classified as IPI species. There is no escapement data for Pink and Chum in the Copper-Bering Uof A. The proximity of the Copper-Bering Fishery to an eastern entrance into Prince Willima Sound leads to a hypotheisis that some of the fish may be of Prince William Sound origin. But no data exists to test this hypothesis.

Prince William Sound Unit of Assessment

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Prince William Sound	P1	Non-Target IPI	Non-target IPI	P1	P1

In the PWS Scope Extension (MRAG 2017) Chinook and Coho salmon were classified as IPI species but were exempted from the IPI requirements. In recent years there have been significant hatchery releases of Coho Salmon (1.4 – 2.9 million) and small releases of Chinook Salmon (0.2 – 0.35 million). For the period 2012 – 2016 the commercial catch of both Chinook and Coho Salmon accounted for only 0.45% of the total catch. We treat these catches as Minor Primary Species.

Lower Cook Inlet Unit of Assessment

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Lower Cook Inlet	P1	Non-Target IPI	Non-target IPI	P1	P1

In the previous assessment (IMM 2013) Chinook and Coho salmon made up less than 0.1% of the total catch and were exempted from the IPI requirements. Historically, there were essentially no catches of either species in Lower Cook Inlet (Byerly et al. 1999). In recent years, there have been modest hatchery releases of Chinook Salmon (0.53 – 0.89 million) and modest releases of Coho Salmon (0.67 - 0.95 million). These releases primarily benefit recreational fisheries. For the period 2012 - 2016 Chinook and Coho salmon made up 0.4 of the total catch. We treat these catches as Minor Primary Species.

Upper Cook Inlet Unit of Assessment

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Upper Cook Inlet	P1	P1	P1	P1	P1

There are no IPI species in Upper Cook Inlet.

Bristol Bay Unit of Assessment

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Bristol Bay	P1	P1	P1	P1	P1

In the previous assessment Coho Salmon were considered IPI species (IMM 2013) but were exempted from the IPI requirements because the catch averaged only 0.2% of the total harvest. However, a review of Bristol Bay Annual Management reports (for example Elison et al. 2015) shows that directed fishing is allowed in the Nushagak District when escapement data warrants, as such we treat Coho Salmon under P1.

Yukon River Unit of Assessment

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Yukon River	No Catch	P1	P1	No Catch	P1

In the previous assessment, Sockeye and Pink Salmon we classified an IPI species (IMM 2003), but because catches were <0.1%, they were exempt from the IPI requirements. For the period 2012 -2016 there was no reported catch of either species in the Yukon.

Kuskokwim UoA

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Kuskokwim	P1	P1	P1	P1	P1

In the previous assessment Pink Salmon were classified as an IPI species, but exempted from IPI requirements because catches averaged 0.155 (IMM 2013). For the period 2012 - 2016 there was no reported catch of Pink, Chinook, Sockeye or Chum Salmon.

Kotzebue UoA

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Kotzebue	No Catch	No Catch	No Catch	No Catch	P1

In the previous assessment, the catches of Sockeye, Chinook, Coho and Pink salmon were classified as IPI species but exempted for the IPI requirements because catches were 0.1 % of the catch. For the period 2012 -2016 the only reported catch was for Chum Salmon.

Norton Sound UoA

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Norton Sound	Non -Target IPI	No Catch	P1	P1	P1

In the previous assessment there were no IPI species identified in Norton Sound (IMM 2013). During the period 2012 - 2016 significant catches occurred for Pink, Chum, and Coho Salmon and these species are therefore treated under P1. There was no reported catch of Chinook Salmon. The catch of Sockeye Salmon was 0.5% of the total harvest. We treat these as Minor Primary Species.

Kodiak UoA

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Kodiak	P1	P1	P1	P1	P1

In the previous assessment, there were no IPI species identified in the Kodiak Area. During the last several years there have been extensive regulations in place to avoid the harvest of Chinook Salmon for conservation reasons. As such during this period Chinook Salmon can be classified as non-target IPI species. The catch of Chinook Salmon for the period 2012 -2016 was 0.1% of the total harvest. We treat these catches as Minor Primary Species.

Chignik UoA

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Chignik	P1	P1	Non target IPI	P1	P1

There were no IPI Species in Chignik in the last assessment (IMM 2013). Coho are identified as an IPI species in the Chignik Area during this reassessment period.

Alaska Peninsula and Aleutian Is UoA

Unit of Assessment	Sockeye	Chinook	Coho	Pink	Chum
Alaska Peninsula and Aleutians	P1	P1	P1	P1	P1

There were no IPI Species in Alaska Peninsula or Aleutians Area (IMM 2013) or in this reassessment period.

2.6.3 ETP Species

In addition to presenting information for each ESA listed species in Alaska that may be impacted by the state's salmon fisheries, we also present information on marine mammals and migratory birds, because they are protected by the Marine Mammal Protection Act (MMPA) and the Migratory Birds Act (MBA).

Summary of Previous Findings and New Information

By-catch of birds and marine mammals was the subject of a Condition of Certification during the first MSC certification in 2000. The condition required collection of by-catch data in test fisheries as a means to identify whether by-catch was a significant conservation issue. IMM (2013) reported on the results of work conducted to comply with the requirement as reported by ADFG (Chaffee et al. 2007), no by-catch of birds or marine mammals was observed in ADF&G test fisheries in Southeast Alaska, Upper Cook Inlet, Bristol Bay, Kuskokwim, Yukon, Norton Sound, North Alaskan Peninsula, Shumagin Islands, and Kodiak during 2002, 2003, and/or 2004.

In our 2017 Scope Extension Assessment of Prince William Sound (MRAG Americas 2017) we reported the following new information on the Kittlitz's murrelets which is listed as a Bird of Concern by the US Fish and Wildlife Service (USFWS 2008). Blejwas & Wright (2012) examined spatial and temporal overlap of Kittlitz's murrelets with gillnets in Prince William Sound, Cook Inlet, Kodiak, and Yakutat and concluded that most Kittlitz's murrelets were found in areas where there was no fishing. In areas of overlap, they concluded “the total number of birds exposed to gillnets in any of the overlap areas is small.”

The only other new information since the 2013 assessment is by Manley (2015) who reported on observer coverage of the incidental take of marine mammals and birds in the Southeast District 6 and 8 Drift Gillnet fishery during 2012 and 2013. In 2012 and 2013 he sampled about 6% of the fishing effort. In 2012 he recorded 12 dead and one released alive common murres. All of these encounters were in one sub-district (6A). There was also one injured Dall's porpoise encountered. There were no encounters with birds or marine mammals in sub-districts 7A, 8A or 8B. In 2013 he recorded 92 birds and six marine mammal encounters. Species encountered and the number (live & dead) included Common Murre (2,74) Marbled Murrelet (0,6) Rhinoceros Auklet (0, 8) Cassin's Auklet (0,1) Red Throated Loon (0,1), Harbor Porpoise (4,0), Sea Otter (1,0) and Humpback Whale (1,0). Of these species, The Marbled Murrelet and Red Throated Loon are on the USFWS Birds of Concern List (USFWS 2008), while the Sea Otter and Humpback Whale are listed under the ESA.

Marine Mammal Act

The National Marine Fishery Service must classify each commercial fishery into one of three categories under the Marine Mammal Protection Act (MMPA) each year based upon the level of incidental mortality and serious injury that occurs in each fishery. The classification of a fishery determines whether participants in that fishery are subject to certain provisions of the MMPA, such as registration, observer coverage, and most importantly, for our purposes, a take reduction plan (TRP).

The fishery classification criteria consist of a two-tiered, stock-specific approach that first addresses the total impact of all fisheries on each marine mammal stock and then addresses the impact of individual fisheries on each stock. This approach is based on consideration of the rate, in numbers of animals per year, of incidental mortalities and serious injuries of marine mammals due to commercial fishing operations relative to the potential biological removal (PBR) level for each marine mammal stock. The MMPA (16 U.S.C. 1362(20)) defines the PBR level as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

Tier 1 considers the cumulative fishery mortality and serious injury for a particular stock. If the total annual mortality and serious injury of a marine mammal stock, across all fisheries, is less than or equal to 10 percent of the PBR level of the stock, all fisheries interacting with the stock will be placed in Category III (unless those fisheries interact with other stock(s) in which total annual mortality and serious injury is greater than 10 percent of PBR). Otherwise, these fisheries are subject to the next Tier (Tier II) for determination of classification.

Tier 2 considers fishery specific mortality and serious injury for a particular stock. Category I: annual mortality and serious injury of a stock in a given fishery is greater than or equal to 50 percent of the PBR level (i.e., frequent incidental mortality and serious injury of marine mammals).

Category II: Annual mortality and serious injury of a stock in a given fishery is greater than 1 percent and less than 50 percent of the PBR level (i.e. occasional incidental mortality and serious injury of marine mammals).

Category III: Annual mortality and serious injury of a stock in a given fishery is less than or equal to 1 percent of the PBR level (i.e., a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

Because fisheries are classified on a per-stock basis, a fishery may qualify as one category for one marine mammal stock and another category for a different marine mammal stock. A fishery is typically classified at its highest level of classification (e.g. a fishery qualifying for Category III for one marine mammal stock and for Category II for another marine mammal stock will be listed under Category II.

One of the ways NMFS determine what category a fishery belongs in is through the Alaska Marine Mammal Observer Program (AMMOP). The primary goal of the program is to provide reliable observation data on the number and condition of incidental injury and mortality to marine mammals occurring in commercial fisheries, seabird by-catch information is also collected and is considered an important secondary benefit of the program https://alaskafisheries.noaa.gov/pr/ammop. There has been observer coverage in the fisheries of the Alaska Peninsula and Kodiak (Manly 2007), Cook Inlet (Manly 2006), Prince William Sound (Wynne et al. 1990 and 1991), Yakutat (Manly 2009) and Southeast (Manly 2014) to estimate impacts on marine mammals.

Under the 2017 letter of determination (Federal Register / Vol. 82, No. 8 / Thursday, January 12, 2017) NMFS classified the following fisheries as Category III: troll, beach seine, Cook inlet, Kodiak and Southeast seine, Prince William Sound gill net and all set net fisheries in the Artic -Yukon -Kuskokwim region. The remaining commercial salmon fisheries were classified as Category II. There are no salmon fisheries in Alaska that are operating under a Take Reduction Plan.

ESA listed Species

The Steller's eider (Polysticta stelleri) is listed as threatened. They nest in the Arctic tundra during the spring/early summer. After breeding, they move to near shore marine waters to molt and winter. They dive underwater to feed on invertebrates such as amphipods, aquatic insects, and clams. Critical Habitat includes marine waters of southwest Alaska. Reasons for initial population decline and range contraction are unknown. Ingestion of lead shot, shooting, and changes in predation patterns may have contributed to the decline, and may currently be limiting population growth. The Salmon fisheries of Alaska are not implicated in the decline or as hindrance to recovery. https://www.fws.gov/alaska/fisheries/endangered/species/stellers_eider.htm

Spectacled eiders (Somateria fischeri) are listed as Threatened. They spend most of the year on marine water where they feed primarily on clams. They nest on coastal tundra near shallow ponds or lakes, usually within 10 feet of the water. After breeding, they move offshore to molt. After molting, eiders from all breeding populations migrate to the central Bering Sea south of St. Lawrence Island, where they remain in large flocks until March or April. Critical habitat was designated for molting in Norton Sound and Ledyard Bay; for nesting on the Yukon-Kuskokwim Delta; and for wintering south of St. Lawrence Island. Reasons for initial population decline and range contraction are unknown. Ingestion of lead shot, predation, and harvest may currently be limiting population growth. Research continues to better understand the life history and needs of these birds. The salmon fisheries of Alaska are not implicated in the decline or as hindrance to recovery. https://www.fws.gov/alaska/fisheries/endangered/species/spectacled_eider.htm

The short-tailed albatross (Phoebastria albatrus) is the largest seabird in the North Pacific with a wingspan up to 8 feet. Their diet includes squid, flying fish, eggs, and other items that are available at or near the surface of the ocean. There is no designated Critical Habitat. After breeding, the birds are found throughout the Bering Sea and Gulf of Alaska, along the Aleutian Islands, southeast Alaska. Just over 100 years ago, harvest of the birds by feather collectors nearly exterminated this species. Volcanic activity on Torishima Island is a threat to nesting birds and their offspring. Because they feed at the surface of ocean, albatross is vulnerable to hooking mortality by longlines during commercial fishing operations. If birds are hooked or snagged, they can be pulled underwater and drown. The Salmon fisheries of Alaska are not implicated in the decline or as hindrance to recovery.

https://www.fws.gov/alaska/fisheries/endangered/species/short_tailed_albatross.htm

Sea otters (Enhydra lutris Kenyon) are listed as Threatened. They eat a variety of invertebrates like clams, crabs, sea urchins, and snails. Critical habitat includes all of the Aleutian Islands, Bristol Bay, the Kodiak Archipelago, the Alaska Peninsula, and western Cook Inlet. The essential elements of critical habitat are shallow, rocky areas; nearshore waters; kelp forests. Commercial harvest drastically reduced historical populations to a few hundred animals at the beginning of the 20th century. Cause of the recent decline in the southwestern population is not known with certainty, but increased predation by killer whales is likely important. Human-caused threats include oil spills, pollutants, disturbance from recreational and industrial activities, and entanglement in fishing nets. Since 1998 observer programs have documented marine mammal interactions in six commercial salmon fisheries operating in coastal waters including Prince William Sound set net and gillnet gillnet, South Alaska Peninsula driftnet, Cook kInlet set net and drift net and Kodiak setnet. Four of the observed salmon fisheries occur outside the range (to the east) of the southwest Alaska DPS. In PWS, sea otters swam within 10 m of 2.0-6.3% of observed set and drift gillnets but few became entalgled (< 0.25% in 9428 observed sets. The otters that did become entangled were either able to free themselves or were extrictated byy the attending fishermen. Non of the observed entanglements resulted in sea otter injury or death (USFWS 2013). The NMFS has listed the Kodiak set net, Alaska Peninsula set net and Cook Inlet set net fisheries in Category II and listed the Prince William Sound drift gill net in Category III. Sea otters are not identified as a source of mortality in any other Alaska salmon fishery. https://www.fws.gov/alaska/fisheries/endangered/species/southwest_sea_otter.htm

Steller sea lions (Eumetopias jubatus) are comprised of two populations: the western Distinct Population Segment (DPS) that occurs primarily west of Cape Suckling (144° W. Longitude) and the eastern DPS that occurs primarily east of Cape Suckling. The eastern DPS was previously listed as a threatened species under the Endangered Species Act but has since recovered to the point that it is no longer considered threatened. The western DPS has been listed as an endangered species since 1997. That population is gradually increasing, although its numbers continue to decline sharply in the western and central Aleutian Islands for unknown reasons. Entanglement with lost/discarded fishing gear is noted as an incidental take that the Recovery Plan, and is identified as a factor for continued monitoring. The Bristol Bay drift gill net, Kodiak set net, Cook Inlet set and drift gill net, Alaska Peninsula and Prince William Sound drift gill net fisheries are classified into Category II by NMFS for the Western DPS. The Prince William Sound set gill net and the Southeast/Yakutat troll fishery were placed into Category III for the Western DPS by NMFS.

Bowhead whales (Balaena mysticetusare) listed as Endangered. Over 10,000 bowhead whales migrate annually through the Bering, Chukchi and Beaufort seas in a population that is growing at a rate of 3.4% per year. No Alaska Salmon fishery is identified as causing mortality of Bowhead whales. https://alaskafisheries.noaa.gov/sites/default/files/bowheadbrochure07.pdf

The Fin Whale (Balaenoptera physalusis) listed as Endangered. There are about 2,700 fin whales in the North Atlantic and Gulf of Mexico and about 3,200 in the waters off of California, Oregon, and Washington (the eastern Pacific Ocean). The estimate for the entire North Pacific is between 14,000 and

18,000. The number of fin whales in the southern hemisphere is around 82,000. For management purposes, fin whales in U.S. are divided into four stocks; 1) Hawaii, 2) California/Oregon/Washington, 3) Alaska (Northeast Pacific) and Western North Atlantic. No Alaska Salmon fishery is identified as causing mortality of Fin whales. https://www.fisheries.noaa.gov/species/fin-whale

North Pacific Right Whale (Eubalaena japonica) as listed as Endangered. The current population size in the North Pacific is likely fewer than 1,000 animals. To date, the largest number of eastern North Pacific right whale individuals identified in the Bering Sea is 23 based on genetic sampling. This appears to include at least 2 calves. Based on the current population size, the continued anthropogenic threats and other factors the North Pacific right whale faces a high risk of extinction throughout its range into the foreseeable future. The life history characteristics and habitat requirements of this species make it extremely vulnerable to environmental variation and demographic stochasticity at such low numbers. No Alaska Salmon fishery is identified as causing mortality of North Pacific Right Whales. https://alaskafisheries.noaa.gov/sites/default/files/statusreview1206.pdf

Sei whales (Balaenoptera borealisoccur) are listed as Endangered. They are found in subtropical, temperate, and subpolar waters around the world. There are around 8,600 Sei whales in the North Pacific. This is only little more than 20 percent of the original population estimate of 42,000 for this area. Sei whales have an unpredictable distribution; many whales may be found in one area for a period and then not return for years or decades. This behavior is unusual for large whales. One of the main threats to Sei whales is getting caught in fishing gear, they can become entangled in traps, pots, and gillnets. Once entangled, whales may swim for long distances with gear attached, resulting in fatigue, compromised feeding ability, or severe injury. No Alaska Salmon fishery is identified as causing mortality of Si whales. https://www.fisheries.noaa.gov/species/sei-whale

The sperm whale (Physeter microcephalus) is listed as endangered. They inhabit all oceans of the world and are typically found where the water depth is 600 m or more, and are uncommon in waters less than 300 m deep. No Alaska Salmon fishery is identified as causing mortality of Sperm whales. http://www.nmfs.noaa.gov/pr/species/mammals/whales/sperm-whale.html

The Beringia and Okhotsk distinct population segments (DPS) of Bearded seals (Erignathus barbatus) are listed as Threatened. The Beringia DPS bearded seals occur in U.S. waters off Alaska's coast. No Alaska Salmon fishery is identified as causing mortality of Bearded seals. https://alaskafisheries.noaa.gov/pr/ice-seals

Fish from four ESA-listed Chinook ESU's are harvested through Federally-issued incidental take permits in the Southeast and Yakutat UoA. The four ESU's are the Puget Sound, Upper Willamette, Lower Columbia River and Snake River Fall Runs. In all cases, factors other than fishing are considered to be the major limiting factors for Chinook populations in these four ESA-listed ESUs, and average catches of Chinook in the Southeast and Yakuat UoA's comprise a maximum of 13.7% of the total run from any of these stocks, and in most cases comprise much less. We note that in almost all cases, exploitation rates on Chinook Salmon Stocks caught in the Alaska fishery have been decreasing and escapement goals have been met (PSC-JCTC 2017b).

2.6.4 Habitat

Salmon ecosystems encompass freshwater, nearshore marine waters and the high seas. Habitats throughout Alaska are virtually pristine, although nearshore marine waters in Prince William Sound (PWS) and Kodiak were impacted by the Exon Valdez oil spill in 1989. Littoral and freshwater habitats in PWS were also disrupted through uplifting by the 1964 Alaska earthquake. Salmon fishing gear typically has little contact with the bottom substrate or causes relatively little damage when gear hits soft bottom habitats. The extent of gear loss or gear discard in Alaska Salmon fisheries is very small given the nature of the gear, and the expense involved in its loss as well as lost fishing time associated with making repairs.

IMM (2013) reported that the largest possible single ecosystem concern for Alaska salmon fisheries is the large-scale release of Pink and Chum Salmon from hatcheries in Kodiak, PWS, and Southeast Alaska. Possible related concerns include overharvest of wild stocks in pursuit of the more productive enhanced populations, genetic impacts on long term productivity of wild stocks by hatchery strays, and rearing competition with wild salmon in both nearshore and offshore habitats. . Since that time, it has been shown that mass marking and in-season estimation of the hatchery component in the catch has prevented overharvest of wild stocks in the Southeast and Prince William Sound UoA's. To address the concern of genetic impacts on wild stocks the state has undertaken an extensive research program in PWS and Southeast and completion of that research is an ongoing condition of certification. http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesResearch.main. In the Kodiak UoA, a plan is in place to address concerns regarding knowing the relative contribution of hatchery and wild stocks in the catch and escapement.

The question of whether large scale enhancement of Pacific Salmon that has occurred across the Pacific Rim since the mid 1980's has resulted in significant impacts on the marine ecosystem remains uncertain. Since the mid 1980's, hatchery releases of Pacific Salmon in the North Pacific have been about 5,000 million fish annually and catches have averaged about 425 million each year. http://www.npafc.org/new/science_statistics.html . There is some evidence that high salmon abundances in the ocean might adversely affect wild salmon through competition (Peterman 1991). Ocean growth of Pink Salmon is inversely correlated to their own abundance, and survival of Chum, Chinook, and Sockeye salmon appears to be reduced in years of high Pink Salmon abundance (Ruggerone et al. (2003), Ruggerone and Goetz (2004), Ruggerone and Nielsen (2004), Ruggerone et al. (2005); Ruggerone et al. (2010); Ruggerone and Connors (2015). There has been a long-term decline seen in size at age, among some stocks that even precedes the large increase in hatchery production (Ricker 1981).

The North Pacific Anadromous Fish Commission has developed a Science Plan for 2016-2020 that would be integrated with a proposal for the International Year of the Salmon that recognizes the many challenges and uncertainties associated with environmental variability such as climate change. The plan promotes new international cooperative research to provides better scientific information on the ecological mechanisms regulating production of anadromous populations and climate impacts in North Pacific marine ecosystems (SSC 2016).

2.7 Management System

The units of assessment comprise all regulatory areas within the State of Alaska (single jurisdiction). There are some stocks, classified as IPI, which could be considered as shared or straddling (with Canada). The management of these stocks is explained in the regional overview sections under section 3.3.

2.7.1 Legal & Customary Framework

There are many places where the management of Alaska's salmon fisheries have been documented. The Commercial Salmon Fishery in Alaska (Clark, J.H. et al. 2006) provides a recent review of Alaska's management of salmon. Excerpts from the paper are quoted below to give the reader of this report a general idea of Alaska salmon management. For a greater appreciation, the reader can find the full paper at http://www.ADF&G.state.ak.us/pubs/afrb/afrbabst.php#vol12_1.

"Authority for the management of the subsistence and commercial salmon fisheries of Alaska was primarily vested with the ADF&G, Division of Commercial Fisheries at statehood. The Alaska constitution provided policy guidance. The Alaska legislature created the Department of Fish and Game as well as the Division of Commercial Fisheries at statehood with a mandated fishery management mission. The Alaska legislature has passed laws since statehood providing further authority and guidance. The Alaska Board of Fish and Game and later the Alaska BOF has promulgated a diverse set of regulations and plans for management of Alaska's subsistence and commercial salmon fisheries that provide guidance for day to day management by area biologists of the Division of Commercial Fisheries. Since statehood, some major changes in authority for management of the Alaska salmon fishery have occurred.

Article VIII of the Alaska Constitution is dedicated to natural resources. Sections pertinent to the management of salmon include: "Section 1. It is the policy of the State to encourage the settlement of its land and the development of its resources by making them available for maximum benefit of its people. Section 2. The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of its people. Section 3. Wherever occurring in the natural state, fish, wildlife, and waters are reserved to the people for common use. Section 4. 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 uses. Section 15. No exclusive right or special privilege offishery shall be created or authorized in the natural waters of the State." Section 15 of the Alaska constitution was included due to the special privileges granted to the salmon canning industry by the federal fishery management program prior to statehood, particularly the ownership and use of fish traps. Fish traps were quickly prohibited by regulation, but language in section 15 prevented the BOF and Game from implementing regulations to limit total fishing effort. In 1972, the Constitution was amended to facilitate a limited entry program for the Alaska commercial salmon fishery. Section 15 now reads: "No exclusive right or special privilege offishery shall be created or authorized in the natural waters of the State. This section does not restrict the power of the State to limit entry into any fishery for purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the State.

In 1973, the Alaska legislature passed a bill creating the first comprehensive limited entry program in the United States. The limited entry program implemented for commercial salmon fisheries in Alaska stabilized the number offishermen and therefore the amount of gear used in each of the State's salmon fisheries. It improved management effectiveness and the ability of the fishery managers to regulate the fishery such that harvestable surpluses could be taken while still meeting escapement objectives in an orderly and predictable fishery. Limited entry also succeeded in maintaining a high proportion of Alaska resident participation in the state's salmon fisheries. The Alaska legislature created the ADF&G with the commissioner as the principle executive and charged the commissioner to: "manage, protect, maintain, improve, and extend the fish, game, and aquatic plant resources of the State in the interest of the economy and general well-being of the State." At statehood, Alaska made two very significant departures from the prior federal fishery management regime.

At statehood, Alaskans keenly understood the value of a decentralized salmon management program after dealing for decades with the centralized federal salmon management regime. First, in an important organizational change, ADF&G offices were opened in numerous towns and villages across Alaska and staffed with area management biologists. Second, these area management biologists were provided with fishery management authority so they could ably address the rapidly changing in-season fishery management needs of the salmon fisheries in Alaska. Area biologists in the Division of Commercial Fisheries were charged with managing subsistence and commercial salmon fisheries while area biologists in Sport Fish Division were charged with managing sport fisheries for salmon. Prior to statehood, federal managers had been given limited authority to make field announcements, however, less than 25 such announcements were made per year across the State of Alaska by federal managers in the 1950's. In contrast, under State of Alaska management, in 2004, 745 emergency orders were issued by Division of Commercial Fisheries staff to manage salmon fisheries.

2.7.2 Management Structure

<u>Alaska Board of Fisheries</u>

Regulations for prosecution of the commercial salmon fisheries in Alaska were promulgated by the Alaska Board of Fish and Game from statehood until 1975 when that Board was split and the Alaska BOF was formed. The BOF is defined as: "for purposes of the conservation and development of the fishery resources of the State, there is created the BOF composed of seven members appointed by the governor, subject to confirmation by a majority of the members of the legislature in joint session. The governor shall appoint each member on the basis of interest in public affairs, good judgment, knowledge, and ability in the field of action of the board, and with a view to providing diversity of interest and points of view in the membership. The appointed members shall be residents of the State and shall be appointed without regard to political affiliation or geographic location of residence." The authority of the BOF is defined in AS 16.05.251. In part those authorities include: establishing fishing seasons, setting fishing quotas, setting bag limits, establishing harvest levels along with sex and size limitations on these harvests, establishing means and methods employed in the pursuit, capture and transport of fish, and regulating commercial, sport, subsistence, and personal use fisheries. The BOF has sole authority to allocate fishery resources among commercial, sport, personal use, and subsistence users.

The BOA conducts public meeting for each fishery area In a rotating three-year cycle and also considers out-of-cycle issues in annual statewide work sessions. The board generally holds meetings from October through March. The Board of Fisheries meets four to six times per year in communities around the state to consider proposed changes to fisheries regulations. Regulatory proposals and testimony are invited from the public and other stakeholders. The board uses biological and socioeconomic information provided by the Alaska Department of Fish and Game, public comment received from people inside and outside of the state, and guidance from the Alaska Department of Public Safety and Alaska Department of Law when creating regulations that are sound and enforceable. Related technical information is provided by ADF&G and every proposal is considered in an open public meeting which typically extends for multiple days depending on the region. Proceedings and decisions are documented extensively and publicized on the internet.

Alaska Department of Fish & Game

The Alaska Department of Fish and Game manages approximately 750 active fisheries, 26 game management units, and 32 special areas. Our operating budget is approximately $200 million annually. he Alaska Department of Fish and Game maintains active and comprehensive management and research programs to ensure fish and wildlife populations are "utilized, developed, and maintained on the sustained yield principle," in accordance with Alaska's Constitution. Management and research of fish and wildlife is carried out by five divisions in the department: Commercial Fisheries, Sport Fish, Subsistence, Habitat, and Wildlife Conservation. We also partner with Alaska tribes; state, federal, and municipal agencies; and other organizations to conduct research, monitoring, permitting, and access for resource use and development.

The Division of Commercial Fisheries manages commercial, subsistence, and personal use fisheries within the jurisdiction of the State of Alaska. Some commercial fisheries occurring in the Exclusive Economic Zone—those waters extending seaward from state waters to the U.S. 200 mile limit—and subject to federal jurisdiction, are also managed by the division under authority delegated to it by the North Pacific Fisheries Management Council. The division also permits and oversees the state's non-profit salmon hatchery and the aquatic shellfish farming programs and operates three scientific laboratories: a fish genetics laboratory, a fish pathology laboratory, and a laboratory for reading coded wire tags, otoliths, and determining the age of fish.

Commercial Fisheries is the largest division within the Alaska Department of Fish and Game; employing 278 fulltime, and 382 seasonal, staff; and allocated an annual budget of $69 million by the Alaska Legislature. The division is organized into a statewide unit and four regional units. The division statewide staff is split between Juneau and Anchorage, while regional offices are located in Douglas, Anchorage, and Kodiak. Permanent area offices are situated in Ketchikan, Petersburg, Wrangell, Sitka, Haines, Cordova, Soldotna, Homer, Fairbanks, Dutch Harbor, King Salmon, Dillingham, and Nome. Seasonal offices are maintained in Craig, Yakutat, Sand Point, Chignik, Cold Bay, Port Moller, Unalakleet, and Emmonak. The division also hires seasonal technicians for its many seasonal field camps.

The division's core fishery management and research staff is composed of highly trained professionals with college degrees in the biological sciences and other related scientific and technical disciplines. Many have earned master's degrees and PhDs in their respective fields. These research scientists and fishery managers are supported and assisted by other staff, specializing in accounting, personnel management, procurement, data management and analysis, writing, editing, publishing, and public information; many seasonal technicians are stationed at remote field camps. The division also operates several large research vessels requiring experienced captains and crews. Frequently, these positions are filled by individuals who have previously run fishing vessels and other work boats in Alaskan waters.

Since fishery resources are migratory, cross jurisdictional boundaries, and are subject to the fisheries of multiple states and countries, staff from the Division of Commercial Fisheries are involved in the research and policy making activities of the Pacific Salmon Commission, the Joint Canadian/US Yukon River Panel, the North Pacific Fisheries Management Council, and several other interstate and international fisheries research and policy making bodies.

Since statehood, emergency order authority has been vested in area management biologists giving the department's field staff authority to make regulatory announcements that carry the force of law and can be implemented immediately. AS 16.05.060, Emergency Orders, states: "(a) This chapter does not limit the power of the commissioner or an authorized designee, when circumstances require, to summarily open or close seasons or areas or to change weekly closed periods on fish or game by means of emergency orders" and "(c) An emergency order has the force and effect of law after announcement by the commissioner or an authorized designee...". Sustained yield management of commercial salmon fisheries requires precise timing of fishery openings and closures and adjustments in gear, often with short notice to allow the harvest of surplus fish and simultaneously assuring adequate escapement of spawning fish.

Advisory Committees

The Alaska fisheries and game regulatory process is among the most open regulatory processes in Alaska if not the nation. Alaska's fish and game users are encouraged to participate through appointments to the Boards of Fisheries or Game, service on one of 84 advisory committees across the state, submitting proposals for regulatory change, providing written and oral comments, and working with the boards at scheduled meetings. Advisory committees are the local groups authorized by state law to provide recommendations to the boards on fishing and wildlife issues. Meetings are always open to the public and are generally attended by department staff and members of the public who can offer background information on agenda topics. Advisory Committees are intended to provide a local forum on fish and wildlife issues, and are critical policy bodies to the boards.

North Pacific Fishery Management Council

US states are responsible for management of fishery resources in freshwater and marine waters within 3 miles of the coast. In Alaska, management of salmon fisheries in Federal waters of marine waters, 3-200 miles offshore of the Alaska coastline has also been delegated to the State by the North Pacific Fishery Management Council of the National Marine Fisheries Service. This delegation ensures that marine and freshwater management action is implemented consist with the requirement of long-term sustainability as specified in the guiding Federal Magnuson Stevens Act.

Federal Subsistence Management Program

A formal and well-defined process exists to consider the views, customs, and interests of indigenous peoples who depend on fishing for their food or livelihood – this involves the Alaska BOF, a Federal Subsistence Board, and a series of Regional Advisory Councils. The BOF process provides a formal and well-defined process to consider the impact of the fishery on coastal communities that are closely tied to the fishery. This process regularly seeks and considers input from stakeholders in an effort to understand and address socioeconomic issues related to the fishery.

The Federal Subsistence Management Program is a multi-agency effort to provide the opportunity for a subsistence way of life by rural Alaskans on federal public lands and waters while maintaining healthy populations of fish and wildlife (http://alaska.fws.gov/asm/about.cfml). The Alaska National Interest Lands Conservation Act (ANILCA), passed by Congress in 1980, mandates that rural residents of Alaska be given a priority for subsistence uses of fish and wildlife. In 1989, the Alaska Supreme Court ruled that ANILCA's rural priority violated the Alaska Constitution. As a result, the Federal government manages subsistence uses on Federal public lands and waters in Alaska- covering about 230 million acres or 60 percent of the land within the state. To help carry out the responsibility for subsistence management, the Secretaries of the Interior and Agriculture established the Federal Subsistence Management Program. The program provides for public participation through the Federal Subsistence Board and 10 Regional Advisory Councils. Regulations implementing the Federal Subsistence Management Program on Federal public lands within the State of Alaska can be found in the Code of Federal Regulations, Part

100, Section 1-23, available here: http://alaska.fws.gov/asm/pdf/50cfr100.pdf.
Fishery Objectives & Measures

2.7.3 Management Objectives & Measures

Sustainable use natural resources is explicitly directed in the Alaska state constitution's Section 4: "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 uses." Management objectives are defined by policies and plans adopted into Alaska Administrative Code which provides binding procedures directing actions by Division of Commercial Fisheries.

Sustainable Salmon Fishery Policy

Management objectives were formalized in 2000 with adoption of a Policy for the Management of Sustainable Salmon Fisheries into state regulation (5 AAC 39.222). Referred to as Alaska's Sustainable Salmon Fisheries Policy, the regulation states that: "while, in the aggregate, Alaska's salmon fisheries are healthy and sustainable largely because of abundant pristine habitat and the application of sound, precautionary, conservative management practices, there is a needfor a comprehensive policy for the regulation and management of sustainable salmon fisheries." The goal of the policy is to "ensure conservation of salmon and salmon's required marine and aquatic habitats, protection of customary and traditional uses and other uses, and the sustained economic health of Alaska's fishing communities." The landmark policy updates and strengthens long-standing principles of Alaska's salmon management program. Most importantly, it direct ADF&G and the Alaska BOF to follow a systematic process for evaluating the health of salmon stocks throughout the state by requiring ADF&G to provide the Board, in concert with its regulatory cycle, with reports on the status of salmon stocks and fisheries under consideration for regulatory changes.

The policy also defines a new process for identifying stocks of concern (stocks which have not met escapement goals or yield expectations), and requires ADF&G and the Alaska BOF to develop Action Plans to rebuild these stocks through the use of management measures, improved research, and restoring and protecting habitat. Three levels of concern are identified: (1) a yield concern is the least severe and results from an inability to maintain expected harvest levels over a 4- to 5-year period, (2) a management concern relates to the inability to maintain escapements within escapement goal ranges over a 4- to 5-year period despite the use of management measures, and (3) a conservation concern is the most severe and relates to the inability over a 4- to 5-year period to maintain escapements above a minimum threshold below which the stock's ability to sustain itself is jeopardized.

Escapement Goals

To comply with the new policy, ADF&G has expended considerable effort since 2000 to update salmon stock status information and review and update the scientific basis of salmon escapement goals – producing an extensive series of published reports in the process. There are currently over 270 escapement goals established for salmon stocks or stock aggregates throughout the state of Alaska. The goals are classified either as BEGs, which are scientifically-based and represent the escapement estimated to provide the greatest potential for maximum sustainable yield, or as SEGs, which represent an escapement level that is known to provide for sustained yield over a 5- to 10-year period. Relative to the criteria of Alaska's Sustainable Salmon Fisheries Policy, as of early 2013 only 5 salmon stocks in Alaska are classified as stocks of management concern and 6 are identified as stocks of yield concern which are meeting escapement objectives but producing low levels of harvest. The BOF and ADF&G have developed action plans to address rebuilding of each these stocks.

Fishery Management Plans

Regulations enacted by the BOF for management of the Alaska salmon commercial fishery are extensive, taking up a substantial portion of the over 1,000 page booklet entitled "Alaska Fish and Game Laws and Regulations Annotated issued annually. These diverse and detailed fishery regulations provide much of the basis for management of the Alaska commercial salmon fishery. These regulations provide guidance but these regulations are supplemented by hundreds of emergency orders developed and announced by ADF&G area management biologists that are directly responsible for management of specific salmon fisheries across the State of Alaska.

Enhancement

Enhancement programs are guided by comprehensive salmon plans for each region. Plans are developed by the regional management teams, which are composed of six members: three from ADF&G and three appointed by the regional aquaculture association Board of Directors (5 AAC 40.310). The Comprehensive Phase III plan for PWS states: "the proportion of hatchery salmon straying into wild stock streams must remain below 2% of the wild-stock escapement over the long-term; the growth rates ofjuvenile salmon during the early marine period must be density independent over the long term; and wildstock escapement goals must be achieved over the long-term."

Objectives consistent with MSC principles Numerous Alaska mandates, policies and regulation for hatchery operations were specifically developed to minimize potential adverse effects to wild stocks (Stopha 2018). These regulations require fishery managers to consider the interactions of wild and hatchery salmon stocks when reviewing hatchery management plans and permits. Production objectives and requirements are specified for private non-profit hatchery operations through a comprehensive permitting and planning process.

The policy for the management of sustainable salmon fisheries [5AAC 39.222], states that "wild salmon stocks and fisheries on those stocks should be protected from adverse impacts from artificial propagation and enhancement efforts", and "plans and proposals for development or expansion of salmon fisheries and enhancement programs should effectively document resource assessments, potential impacts, and other information needed to assure sustainable management of wild salmon stocks" The policy also advocates for a precautionary approach when there are uncertainties in the effects on sustainable fisheries and populations.

The ADF&G Genetic Policy (Davis et al. 1985) sets out restrictions and guidelines for stock transport, protection of wild stocks, and maintenance of genetic variance banning importation of salmonids from outside the state (except US/Canada transboundary rivers); restricting transportation of stocks between the major geographic areas in the state; requiring the use of local broodstock; maintaining genetic diversity by use of large populations of broodstock collected across the entire run and without regard to any physical trait such as size; and limiting the number of hatchery stocks derived from a single donor stock.

The Alaska Fish Health and Disease Control Policy (5 AAC 41.080) is designed to protect fish health and prevent spread of infectious disease in fish and shellfish. The policy is used by ADF&G fish pathologists to review hatchery plans and permits.

Activities of private nonprofit hatcheries are monitored by ADFG as a condition of permitting. Hatchery Permits are required for the construction and/or operation of a private nonprofit (PNP) salmon hatchery in Alaska. Hatchery permits specify the species and number of salmon than can be incubated at the hatchery, as well as the number released, release sites, broodstock sources, and other conditions of operation. Once they are issued, hatchery permits do not expire, but they may be revoked. Hatchery permits are non-transferable, so if a hatchery is sold or leased, the new operator must apply for a new permit. Hatchery permits may only be issued to private nonprofit corporations. Hatchery operators are required to submit annual reports of egg takes, releases, and adult returns. Annual reports from each hatchery must be submitted by December 15th. The disposal of salmon carcasses used for broodstock must be documented in carcass disposal logs, which are due no later than the end of the calendar year.Comprehensive evaluations of individual hatchery programs have been completed by ADF&G within the last few years for consistency with statewide policies and prescribed management practices.

Hatchery programs have recently undergone a detailed program by program review. These review assessed consistency with statewide policies and prescribed management practices. Some projects were not properly permitted in earlier years, and recommendations for clarification of outstanding issues were addressed by the reviews including updates of basic management plans with descriptions of current permit conditions and operations.

2.7.4 Enforcement

The primary responsibility for enforcing fish and wildlife-related statutes and regulations in Alaska lies with the Alaska Department of Public Safety, through its Division of Alaska Wildlife Troopers. Biologists and other staff of ADF&G participate in enforcement activities and assist the Wildlife Troopers as needed. Additionally, fishermen continually watch activities on the water and would likely report illegal fishing activity given that this would impact their livelihood.

2.7.5 International Management

Pacific Salmon Treaty

Coastal and freshwater salmon fisheries such as occur in Alaska sometimes harvest salmon that spawn in other jurisdictions. Significant interceptions of Alaskan, southern U.S. and Canadian spawned salmon occur in coastal fisheries of Southeast Alaska, Canada, and Washington. Alaskan fisheries also intercept significant numbers of salmon that originate in Canadian waters of the Yukon River. A long series of negotiations between the U.S. and Canada concluded in the signing of the Pacific Salmon Treaty (PST) in 1985. The PST was renegotiated in 1999 and again in 2008 with an increased effort to implement abundance based management regimes. Renegotiation occurs roughly every 10 years and the current negotiations are intended to result in a fourth renewal of the treaty starting in January, 2019, with amendments focusing on reductions in harvest to some mixed-stock fisheries impacting transboundry Chinook stocks that are not recovering as quickly as hoped.

The resultant U.S. Canada agreement(s) through the Treaty process reflects a political balance of the fishing and conservation interests of Alaska, Washington, Oregon, Idaho, 24 southern U.S. treaty Indian tribes, and Canada. Various annexes in the PST provide policy guidance to the salmon management regimes in place in Southeast Alaska, specific limits are applied to Chinook salmon harvests in Southeast Alaska, limits are applied to Sockeye salmon harvests in specific Alaskan fisheries near the U.S. Canada border in the southern portion of the region, and limits are applied to harvests of salmon originating from Canadian waters of the three transboundary rivers (Taku, Stikine, and Alsek). The PST, through annexes provides fishery management authority, direction, and policy guidance to ADF&G staff responsible for management of the salmon fisheries in Southeast Alaska. The PST also put into place a cooperative management program in the Yukon River that is intended to ensure adequate passage of Canadian origin Yukon River salmon through Alaskan fisheries for both conservation and continuation of Canadian fisheries that utilize these stocks. The PST through the Yukon Article thus provides fishery management authority, direction, and policy guidance to ADF&G staff responsible for fishery management of Yukon salmon fisheries.

North Pacific Anadromous Fish Commission

The North Pacific Anadromous Fish Commission (NPAFC) is an inter-governmental organization established by the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean. The Convention was signed on February 11, 1992, and took effect on February 16, 1993. The objective of the Commission is to promote the conservation of anadromous stocks (Pacific salmon and steelhead trout) in the Convention Area. The Convention Area includes the international waters of the North Pacific Ocean and its adjacent seas north of 33° North beyond the 200-mile zone (exclusive economic zones) of the coastal States. Current member countries include: Canada, Japan, the Republic of Korea, the Russian Federation and the United States of America. The US is represented on the Commission by the National Marine Fisheries Service. Alaska supports the efforts of the NPAFC by providing harvest and enhancement data.

3 Evaluation Procedure

3.1 Harmonised Fishery Assessment

3.2 Previous assessments

The Alaska Salmon fishery was certified as part of the original Alaska Salmon assessment in 2000 and reassessments in 2005 and 2012. It also includes the PWS UoC to which a scope extension occurred in 2017. All previous assessments and surveillance audits for this fishery can be found here: https://fisheries.msc.org/en/fisheries/alaska-salmon/@@view.

There are three conditions which carryover from the previous assessment. This was planned as part of their original timelines specifying "exceptional circumstances." The timelines for completion of these client action plans remains unchanged and simply carries on into the new certification period. **Table 28** provides a summary of previous assessment conditions indicating which are closed and which remain open. Full justifications for each condition can be found in MRAG Americas 2018, the fourth surveillance report for these fisheries.

Table 28. Summary of Previous Assessment Conditions. Details can be found in MRAG Americas 2018.

Condition	PI(s)	Year closed	Justification
1 (SEAK)- By the end of 2023, the SG 80 scoring requirements must be met in full. This will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a): It is highly likely that the Chum salmon enhancement activities in SEAK do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Chum salmon stocks.	1.3.1	Not yet closed	Deadline for closing this condition is 2023, in line with the State of Alaska's hatchery/wild interaction research program timeline.
2 (SEAK)- By the end of the fourth year of certification, the SG 80b scoring requirements must be met for Chum salmon. This will be achieved when it has been demonstrated that: a) (PI 1.3.2, SG80b): There is some objective basis for confidence that the strategy is effective, based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts (e.g., related to verifying and achieving acceptable proportions of hatchery-origin fish in the natural spawning escapement).	1.3.2	2017	Rescoring of PI 1.3.2 for the SEAK unit is given in Appendix 1 of MRAG Americas 2018.
3 (SEAK)-- By the end of the fourth year of certification, the SG 80 scoring requirements for PI 1.3.3, and the SG80e scoring requirements for PI 2.5.2 must be met in full. This will be achieved when it has been demonstrated that: a) (PI 1.3.3, SG80a): Sufficient relevant information is available on the contribution of enhanced Chinook, Coho, Pink and Chum salmon to the harvest and wild escapement of the stocks. b) (PI 1.3.3, SG80b): The assessment includes estimates of the impacts of enhancement	1.3.3, 2.5.2	2017	Rescoring of the PIs 1.3.3 and 2.5.2 for the Southeast Alaska unit are given in Appendix 1 of MRAG Americas 2018.

Condition	PI(s)	Year closed	Justification
activities on wild stock status, productivity and diversity. (PI 2.5.2, SG80e): There is a tested and evaluated artificial production strategy, if necessary, with sufficient monitoring in place and evidence is available to reasonably ensure with high likelihood that strategy is effective in achieving the SG 80 outcome.			
4 (Copper/Bering District)-- By the end of the fourth year of certification, the SG 80 scoring requirements must be met in full. This will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a): It is highly likely that the Gulkana hatchery enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of Copper/Bering District stocks of Sockeye salmon, b) (PI 1.3.2, SG80b): There is some objective basis for confidence that the strategy is effective, based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts (e.g., related to verifying and achieving acceptable proportions of hatchery-origin fish in the natural spawning escapement), c) (PI 1.3.3, SG80a): Sufficient relevant information is available on the contribution of enhanced Sockeye salmon to the harvest and wild escapement of the wild Sockeye salmon stock, d) (PI 1.3.3, SG80b): The assessment includes estimates of the impacts of enhancement activities on wild Sockeye salmon stock status, productivity and diversity.	1.3.1 1.3.2 1.3.3	2016	Rescoring of PIs 1.3.1, 1.3.2, and 1.3.3. for the Copper/Bering unit are given in Appendix 1 of MRAG Americas 2018.
5 (Kodiak)-- By the end of the ninth year of certification, the SG 80 scoring requirements for PI 1.3.1 and PI 1.3.3, and the SI 80e requirements for PI 2.5.2, must be met in full. With respect to the current hatchery programs at Pillar Creek and Kitoi Bay for Chinook, Coho, Pink and Chum salmon, this will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a) it is highly likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks. b) (PI 1.3.3, SG80a) sufficient relevant information is available on the contribution of enhanced Chinook, Coho, Pink and Chum salmon to the harvest and wild escapement of the stocks.	1.3.1 1.3.3 2.5.2	Not yet closed	Deadline for closing this condition is 2023. It is currently open and on target according to the action plan given in MRAG Americas 2018.

Condition	PI(s)	Year closed	Justification
c) (PI 1.3.3, SG80b) the assessment includes estimates of the impacts of enhancement activities on wild stock status, productivity and diversity. d) (PI 2.5.2, SG80e) there is a tested and evaluated artificial production strategy, if necessary, with sufficient monitoring in place and evidence is available to reasonably ensure with high likelihood that strategy is effective in achieving the SG 80 outcome.			
6 (Chignik)-- By the end of the fourth year of certification, the SG 80 scoring requirements must be met in full. This will be achieved when it has been demonstrated that: (PI 1.1.2, SG80a) Reference points are appropriate for the wild stock and can be estimated, (PI 1.1.2, SG80b) The limit reference point (e.g., lower end of the Sustainable Escapement Goal or equivalent) is set above the level at which there is an appreciable risk of impairing reproductive capacity, (PI 1.1.2, SG80c) The target reference point is such that the stock is maintained at a level consistent with BMSY or some measure or surrogate with similar intent or outcome and, (PI 1.1.2, SG80e) Where the wild stock is a management unit comprised of more than one subcomponent, it is highly likely that the target and limit reference points are consistent with maintaining the inherent diversity and reproductive capacity of each stock subcomponent.	1.1.2	2015	This condition was closed prior to MRAG Americas taking over the AK salmon certification. Therefore there is no rescoring of this PI in Appendix 1 of MRAG Americas 2018a however there is an explanation in the Results section of he abovementioned report. In addition PI 1.1.2 pertaining to reference points no longer exists in the FCR v2.0 assessment tree.
PWS1 (PWS)-- Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness.	1.3.1	Not yet closed	Deadline for closing this condition is 2023, in line with the State of Alaska's hatchery/wild interaction research program timeline.
PWS2 (PWS)-- Demonstrate an objective basis for confidence that the enhancement strategy is effective for protecting wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.	1.3.2	Not yet closed	Deadline for closing this condition is 2023, in line with the State of Alaska's hatchery/wild interaction research program timeline.
PWS3 (PWS)-- Provide information on the contribution of enhanced fish to the wild escapement of Pink and Chum Salmon, and relative fitness of hatchery-origin fish sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and	1.3.3	Not yet closed	Deadline for closing this condition is 2023, in line with the State of Alaska's hatchery/wild interaction research program timeline.

Condition	PI(s)	Year closed	Justification
diversity.			

3.3 Assessment Methodologies

This assessment used FCR v2.0 (1 October 2014) and associated Guidance (GFCR v2.0). The report was produced with MSC Full Assessment Reporting Template: Salmon fisheries v1.0 (8 October 2014). The Evaluation Processes and Techniques

3.3.1 Site Visits

Thirty days prior to the site visit, all stakeholders from the full assessment were informed of the visit and the opportunity to provide information to the auditors in advance of, or during, the site visit. We received no requests from outside stakeholders to take part in meetings or provide information remotely.

The reassessment visit was conducted concurrently with the 4th surveillance audit site visit in Kodiak, Anchorage, and Juneau, AK on November 13-17, 2017 (Table 29).

Information supplied by the clients and management agencies was reviewed by the assessment team ahead of the onsite meeting, and discussions with the clients, hatchery operators, and management agencies centered on the content within the provided documentation. In cases where relevant documentation was not provided in advance of the meeting, it was requested by the assessment team and subsequently supplied during, or shortly after the meetings.

3.3.2 Consultations

See Table 29, with respect to details of the individuals interviewed during the site visit, and summary of topics discussed.

Table 29. Agenda and participation for site visit meetings.

Date	Time	Location	Subject	Attendance[1]	Affiliation
Monday November 13	8:30 am - noon	Kodiak KRAA office	Introduction to meeting KRAA marking	Glenn Reed Tina Fairbanks Raymond May Jeff Stephan Harvey Goodell Trenten Dodson Matthew Moir Kevin Schaberg Oliver Holm Randy Mason (phone) Al Seal (phone)	Pacific Seafood Processors Assn. (client) Kodiak Regional Aquaculture Association Commercial Fisherman, KRAA board United Fishermen's Marketing Association Commerical Fisherman, KRAA board KRAA North Pacific Seafoods ADFG Research KRAA Katoi Hatchery manager KRAA Pillar Creek hatchery manager KRAA
	1:15 pm	Kodiak ADF&G	Westward Status of fisheries, assessment programs and biological data	Glenn Reed Tina Fairbanks Kevin Schaberg Jeff Wadle James Jackson Nick Sagalkin Oliver Holm	PSPA (client) KRAA Executive Director ADFG Research ADFG Management ADFG Management ADFG Regional Supervisor Western Region KRAA Fishermen
Tuesday November 14	8:30 to Noon	Anchorage ADF&G	Hatchery/Wild Interaction Escapements Stocks of Concern	Heather Hoyt Chris Habicht Bill Templin Glenn Reed Kristen Gorman (phone)	ADFG Genetics Lab ADFG Genetics ADFG Chief Fishery Scientist PSPA (client) Prince William Sound Science Center
	1:15 pm – 3:00 pm		Bristol Bay Status of fisheries, assessment programs and biological data	Paul Salomone Aaron Poetter Jack Erikson	ADFG Bristol Bay ADFG Central Region ADFG Research Coordinator Central Region
	3:15 pm – 4:30 pm		Cook Inlet Status of fisheries, assessment programs and biological data	Jack Erikson Glenn Hollowell Ethan Ford (Phone) Alicia Frothingham (phone) Pat Shields (phone)	ADFG Research Coordinator Central Region ADFG Lower Cook Inlet management ADFG Central Region ADFG Upper Cook Inlet ADFG Upper Cook Inlet

Wednesday November 15	8:15 am – 9:45 am	ADF&G 333 Raspberry Rd	CIAA & PWSAC	Mike Wells Gary Fandrei Geoff Clark Casey Campbell Ethan Ford (Phone) Tommy Sheridan (phone)	Valdez Fisheries Development Assoc. Cook Inlet Aquaculture Association PWSAC PWSAC ADFG Central Region Silver Bay Seafoods
	10:00 AM - noon		PWS/Copper Bering: Status of fisheries, assessment programs and biological data	Jeremy Botz (phone) Charlie Russell (phone) Aaron Poetter Jack Erickson Mike Wells	ADFG PWS ADFG PWS ADFG ADFG VFDA
	1:30 pm - 3:30 pm		AYK Status of fisheries, assessment programs and biological data	John Lindermann	ADFG AYK Region
Thursday November 16	8:30 am - noon	Juneau ADF&G HQ	Changes at ADF&G Chinook Initiative	Scott Kelley Ed Jones Brian Elliot	ADFG Director Commercial Fisheries ADFG Sportfish ADFG SEAK Sportfish
			SEAK: Status of fisheries, assessment programs and biological data	Ed Jones Lowell Fair	ADFG Sportfish ADFG SEAK Region
	1:30 pm - 2:30 pm	DIPAC	SEAK Hatchery Issues	John Burke	SSRAA
	3:00 pm – 4:30 pm	Ted Stevens Marine Research Center	Chinook Research, SEAK Salmon Research	Phil Mundy Jim Murphy Jordon Watson Joshua Russell Andrew Gray	NOAA NOAA NOAA NOAA NOAA
Friday November 17			Closing meeting with client	Assessment Team Glenn Reed Dave Gaudet	MRAG Americas PSPA PSPA

[1] *The following participants were in attendance at all meetings: Amanda Stern-Pirlot, Scott Marshall, Ray Beamesderfer (Assessment Team), Dave Gaudet (Client Representative), Megan Atcheson (Marine Stewardship Council observer).*

3.3.3 Evaluation Techniques

MRAG published an announcement of the reassessment on our website and sent a direct email to all stakeholders on our stakeholder list. MSC posted the announcement on its Alaska Salmon track-a-fishery page, as well as sent it by email in their Fishery Announcements newsletter to all registered recipients. At this time, MRAG Americas also announced the assessment site visit dates and location, as well as the assessment team. This was done according to the process requirements as laid out in MSC's Fisheries Certification Requirements v2.0. The site visit for this assessment was held at the same time as the site visit for the 4th surveillance audit for these fisheries, and the announcements for both went to stakeholders together. Together, these media presented the announcement to a wide audience representing industry, agencies, and other stakeholders.

The assessment team and the clients set up meetings with Alaska salmon fishery management and science personnel, and industry, hatchery, and harvest-sector representatives relevant to the fishery assessment.

The FCR v2.0 default assessment tree for salmon fisheries was used for this assessment, comprising 31 'performance indicators', nine in Principle 1, 15 in Principle 2, and seven in Principle 3. The performance indicators are grouped in each principle by 'component.' Principle 1 has two components, Principle 2 has five, and Principle 3 has two. Each performance indicator consists of one or more 'scoring issues;' a scoring issue is a specific topic for evaluation. 'Scoring Guideposts' define the requirements for meeting each scoring issue at the 60 (conditional pass), 80 (full pass), and 100 (state of the art) levels. Note that some scoring issue may not have a scoring guidepost at each of the 60, 80, and 100 levels. The scoring issues and scoring guideposts are cumulative; this means that a performance indicator is scored first at the SG60 levels. If not all of the SG scoring issues meet the 60 requirements, the fishery fails and no further scoring occurs. If all of the SG60 scoring issues are met, the fishery meets the 60 level, and the scoring moves to SG80 scoring issues. If no scoring issues meet the requirements at the SG80 level, the fishery receives a score of 60. As the fishery meets increasing numbers of SG80 scoring issues, the score increases above 60 in proportion to the number of scoring issues met; performance indicator scoring occurs at 5-point intervals. If the fishery meets half the scoring issues at the 80 level, the performance indicator would score 70; if it meets a quarter, then it would score 65; and it would score 75 by meeting three-quarters of the scoring issues. If the fishery meets all of the SG80 scoring issues, the scoring moves to the SG100 level. Scoring at the SG100 level follows the same pattern as for SG80.

Principle scores result from averaging the scores within each component, and then from averaging the component scores within each Principle. If a Principle averages less than 80, the fishery fails.

Scoring for this fishery followed a consensus process in which the assessment team discussed the information available for evaluating performance indicators to develop a broad opinion of performance of the fishery against each performance indicator. Review of sections 3.2-3.5 by all team members assured that the assessment team was aware of the issues for each performance indicator. Subsequently, the assessment team member responsible for each principle, filled in the scoring table and provided a provisional score. The assessment team members reviewed the rationales and scores, and recommended modifications as necessary, including possible changes in scores.

Performance Indicator scores were entered into MSC's Fishery Assessment Scoring Worksheetto arrive at Principle-level scores.

Table 30. 3 Scoring elements

Component	Scoring Elements	SEAK	Yak	PWS	C/B	LCI	UCI	BB	YR	Kusk	Kotz	NS	Kod	Chig	P/A	Main/Not main	Data deficient or not
Target Species	Sockeye Salmon (*Oncorhynchus nerka*)	X	X	X	X	X	X	X	--	X	--	--	X	X	X	N/A	Not
Target Species	Chinook Salmon (*Oncorhynchus tshawytscha*)	X	X	--	X	--	X	X	X	X	--	--	X	X	X	N/A	Not
Target Species	Coho Salmon (*Oncorhynchus kisutch*)	X	X	--	X	--	X	X	X	X	--	X	X	--	X	N/A	Not
Target Species	Pink Salmon (*Oncorhynchus gorbuscha)*	X	X	X	--	X	X	X	--	X	--	X	X	X	X	N/A	Not
Target Species	Chum Salmon (*Oncorhynchus keta*)	X	--	X	--	X	X	X	X	X	X	X	X	X	X	N/A	Not
Non-local IPI	Pink Salmon (*Oncorhynchus gorbuscha)*	X			X												
Non-local IPI	Chum Salmon (*Oncorhynchus keta*)	X			X												
Non-local IPI	Sockeye Salmon (*Oncorhynchus nerka*)	X	X														

Component	Scoring Elements	SEAK	Yak	PWS	C/B	LCI	UCI	BB	YR	Kusk	Kotz	NS	Kod	Chig	P/A	Main/Not main	Data deficient or not
Non-local IPI	Coho Salmon (*Oncorhynchus kisutch*)	x	x			X											
Non-local IPI	Chinook Salmon (*Oncorhynchus tshawytscha*)	x	x			X											
Non-target IPI	Pink Salmon (*Oncorhynchus gorbuscha)*				x												
Non-target IPI	Chum Salmon (*Oncorhynchus keta*)		x		x												
Non-target IPI	Sockeye Salmon (*Oncorhynchus nerka*)											x					
Non-target IPI	Coho Salmon (*Oncorhynchus kisutch*)			x		X								x			
P Non-target IPI	Chinook Salmon (*Oncorhynchus tshawytscha*)			x		X							x				
Primary Species non-salmon	Lingcod	x	x													Not main	Not

<table>
<tr><th>Component</th><th>Scoring Elements</th><th>SEAK</th><th>Yak</th><th>PWS</th><th>C/B</th><th>LCI</th><th>UCI</th><th>BB</th><th>YR</th><th>Kusk</th><th>Kotz</th><th>NS</th><th>Kod</th><th>Chig</th><th>P/A</th><th>Main/Not main</th><th>Data deficient or not</th></tr>
<tr><td>Primary species non-salmon</td><td>Pacific Halibut</td><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Not main</td><td>Not</td></tr>
<tr><td>Secondary Species</td><td>Misc. species e.g., starry flounder (Platichthys stellatus), Dolly Varden (Salvelinus malma malma), sculpin (Cottoidea spp.), various rockfish.</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td><td></td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>Not main</td><td>Not</td></tr>
<tr><td>ETP</td><td>Seabirds (various)</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>N/A</td><td>Not</td></tr>
<tr><td>ETP</td><td>Marine Mammals (various)</td><td>x</td><td></td><td>x</td><td></td><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td>x</td><td></td><td>x</td><td>N/A</td><td>Not</td></tr>
<tr><td>Habitat</td><td>Freshwater</td><td colspan="14">All</td><td>N/A</td><td>Not</td></tr>
<tr><td>Habitat</td><td>Nearshore and offshore pelagic</td><td colspan="14">All</td><td>N/A</td><td>Not</td></tr>
<tr><td>Ecosytem</td><td></td><td colspan="14">All</td><td></td><td></td></tr>
</table>

Hatchery Impact Guideline Clarification

Principle 1 includes performance indicators for outcomes, management and information regarding hatchery enhancement activities (PI 1.3.1, 1.3.2, 1.3.3). The key question is whether enhancement activities negatively impact wild stocks. Information on the incidence of hatchery-origin Salmon in natural spawning areas is essential for addressing this question in areas where large-scale hatchery program exist. The lack of this information was one of the fundamental impediments to PWS moving forward in the 2013 reassessment. In the interim since the 2013 Alaska Reassessment, the AHRP has estimated the incidence of hatchery-origin Pink and Chum Salmon in representative streams throughout PWS. Therefore, evaluation criteria regarding hatchery impacts are a particular focus of this assessment.

No objective criteria are identified in CR1.3 for evaluating hatchery impacts but guidance was subsequently developed in modifications to the default assessment tree for Salmon fisheries in CR2.0. This guidance is not obligatory for either CR1.3 or CR2.0 but provides useful benchmark for evaluating the likelihood of negative hatchery impacts due to straying. Default guidelines for acceptable hatchery impacts are identified in Box GSC1 of CR2.0. The intent of this guidance is to help ensure that the majority of genetic diversity and productive capacity of the SMU is protected from risks of enhancement activities in freshwater production areas.

Default guidelines were based on the percentage of hatchery-origin fish spawning in natural production areas. Different guidelines are identified for "integrated" and "segregated" hatchery programs (Table 18).

> Integrated hatchery programs are those where a composite hatchery and wild population spawns in both the hatchery and the wild and the natural environment continues to drive adaptation and fitness. Integrated hatchery programs require regular incorporation of significant percentages of natural-origin spawners in the hatchery broodstock (pNOB) and limits on percentages on hatchery-origin spawners (pHOS) in natural spawning areas.
>
> Segregated hatchery programs are maintained as reproductively distinct or genetically segregated from wild production. Segregated programs do not involve continuing use of significant percentages of natural-origin fish in hatchery broodstock. In this case, more stringent limitations on pHOS from segregated programs are identified to avoid the potential for negative hatchery influences where the adaptation and fitness of the hatchery subpopulation is no longer driven by the natural environment.

According to CR2.0 guidance, the objective criteria identified based on pHOS are derived from studies on Chinook, Coho, Sockeye and Steelhead. The guidance also indicates that impact guidelines for Pink and Chum may be relaxed from these levels with sufficient justification. The basis for this distinction is that Pink and Chum Salmon are released at early ages (a few months) which probably leads to a lower risk of genetic changes than in Chinook, Coho, Sockeye and Steelhead which are typically reared in the hatchery for one year. Specific numerical criteria are not identified.

Table 31. Summary of default acceptable impact guidelines for artificial production based on percentage of hatchery origin spawners (pHOS) in natural production areas (CR 2.0 Box GSC1 pg. 496). Guidelines are derived from studies on freshwater-rearing Chinook, Coho, Sockeye and Steelhead species.

Program Type	Scoring Guidepost	Stock Management Unit	Populations
Integrated	60	pHOS ≤33%	pHOS <1% in >50% of populations
	80	Based on proportion of natural origin broodstock	
Segregated	60	pHOS ≤10%	
	80	pHOS ≤5%	

[a] *Populations should be representative of the productivity and genetic diversity of populations within the SMU.*

Table 32. Impact guidelines for percentage of hatchery origin spawners (pHOS) in natural production areas identified by this assessment for of Pink and Chum Salmon based on guidance in CR 2.0 (Box GSC1 pg. 496).

Program Type	Scoring Guidepost	Stock Management Unit	Populations
Integrated	60	pHOS ≤33%	pHOS <5% in >50% of populations
	80	Based on proportion of natural origin broodstock	
Segregated	60	pHOS ≤20%	pHOS <5% in >50% of populations
	80	pHOS ≤10%	pHOS <1% in >50% of populations

Based on CR2.0 guidance, this assessment identified criteria in Table 19 for Pink and Chum Salmon. These guidelines incrementally increase allowable hatchery fractions from those developed for stream-rearing Salmonid populations. This standard reflects differences in the life history of Pink and Chum Salmon characterized by a naturally higher incidence of inter-population straying. This pattern is evinced by a genetic stock structure for these species where inter-populations differences are small or negligible based on research conducted in PWS and Southeast Alaska. Pink and Chum Salmon often spawn in small streams and even inter-tidal habitats whose availability can vary considerably from year to year depending on environmental conditions. As a result, straying behavior is thought to be naturally much more common among these species than in freshwater rearing species like Chinook, Coho and Sockeye Salmon.

CR2.0 guidance regarding percentages of hatchery-origin spawners in natural spawning areas presume some level of reduction in wild diversity and fitness due to hatchery influence. While empirical data are available in other areas on the impact of this introgression in stream-rearing species (Chinook, Coho and Steelhead), no such information is available for marine-rearing species (Pink, and Chum Salmon). The AHRP includes evaluations of introgression effects which are expected to better inform this issue in the future.

4 TRACEABILITY

4.1 Eligibility Date

The Target Eligibility date will be the date of the publication of the Public Comment Draft Report (PCDR).

4.2 Traceability within the Fishery

All landings from the Alaska Salmon fishery are recorded and reported through fish tickets. Processing occurs at shore-side plants and on at-sea processing vessels, where landings are monitored by fishery enforcement officers and recorded by the licensed processing facility. Most landings are made to tenders (i.e., are trans-shipped) and transported to processing facilities. Processors control the transport of their products from landing locations to processing facilities.

There is no potential for vessels to fish outside any particular UoC or for non-certified fish to be substituted for certified fish because of the management and enforcement processes employed in the fishery that minimises opportunities for fishing contrary to permit specifications. Alaska law allows for a Salmon vessel to fish in only one Salmon region per year. On some occasions, tender vessels may transport fish harvested in one UoC to a distant processing facility receiving fish from a different UoC. However, state and local taxing requirements necessitate that the fish are recorded and reported to the area of actual harvest. In the event that a tender vessel collected fish from different UoCs, such fish would have to be stored and transported separately.

Table 33. Traceability Factors within the Fishery:

Traceability Factor	Description of risk factor if present. Where applicable, a description of relevant mitigation measures or traceability systems (this can include the role of existing regulatory or fishery management controls)
Potential for non-certified gear/s to be used within the fishery	Negligible risk; all salmon fishing gears are included within the UoAs.
Potential for vessels from the Unit of Certification to fish outside the Unit of Certification or in different geographical areas (on the same trips or different trips)	Negligible risk; There is no potential for vessels to fish outside any particular UoC or for non-certified fish to be substituted for certified fish because of the management and enforcement processes employed in the fishery that minimises opportunities for fishing contrary to permit specifications. Alaska law allows for a Salmon vessel to fish in only one Salmon region per year. On some occasions, tender vessels may transport fish harvested in one UoC to a distant processing facility receiving fish from a different UoC. However, state and local taxing requirements necessitate that the fish are recorded and reported to the area of actual harvest. In the event that a tender vessel collected fish from different UoCs, such fish would have to be stored and transported separately.
Potential for vessels outside of the Unit of Certification or client group fishing the	Low risk factor. The entire AK salmon fishery is within the certified UoAs, however only client group members registered as such with PSPA and listed on their website

same stock	are within the UoC. Therefore there are processing entities or operators selling fish from the UoA who are outside of the UoC. If buyers with CoC certification are found to be buying from non-client-group members, the appropriate non-conformities are given under the CoC program and the relevant parties are made aware of how to join the client group, which is open to any party willing to abide by the cost sharing arrangement in place.
Risks of mixing between certified and non-certified catch during storage, transport, or handling activities (including transport at sea and on land, points of landing, and sales at auction)	Negligible risk. See above under the second traceability factor.
Risks of mixing between certified and non-certified catch during processing activities (at-sea and/or before subsequent Chain of Custody)	Negligible risk. See above under the second traceability factor. There is no at-sea processing of AK salmon and no processing of non-AK salmon on floating or shoreside processing facilities.
Risks of mixing between certified and non-certified catch during transhipment	Negligible risk. There is no transshipment except possibly by tender vessels between certified UoAs. See above under the second traceability factor and in the preceding text for details on how traceability is maintained.
Any other risks of substitution between fish from the Unit of Certification (certified catch) and fish from outside this unit (non-certified catch) before subsequent Chain of Custody is required	None identified.

4.3 Eligibility to Enter Further Chains of Custody

Any certified products from the fishery would be clearly identifiable and would be eligible to enter further certified chains of custody. The fishery certification will end, and chain of custody begin, at the point at which landings are made from fishing vessels to a named processing facility or to a tender or other collecting vehicle of a named processing facility (i.e., at the point of change of ownership). To continue a chain of custody, all named processing companies will require separate Chain of Custody (CoC) certification. In addition to Pink Salmon, Chum Salmon, and Sockeye Salmon included as Units of Certification in Prince William Sound, Chinook Salmon and Coho Salmon considered to meet IPI requirements would also be eligible to enter further chains of custody.

4.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to Enter Further Chains of Custody

IPI stocks as identified in this report have been requested for eligibility to enter further chains of custody along with the certified product according to MSC variation request submitted on 16 March 2019 and awaiting response by MSC.

5 EVALUATION RESULTS

5.1 Principle Level Scores

Table 34. Final Principle Scores by Unit of Asessment.

Principle	SEAK	Yak	PWS	C-B	LCI	UCI	Bristol	Yukon	Kusko	Kotz	Norton	Kodiak	Chignik	Pen/AI
1 – Target Species	83.2	97.5	87.6	96.2	87.6	92.1	99.6	92.1	92.1	95.8	90.4	81.0	99.6	99.6
2 – Ecosystem	89.3	90.0	87.3	89.3	87.3	89.3	90.3	90.3	90.3	90.3	90.3	89.3	90.3	90.3
3 – Management System	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1

5.2 Summary of PI Level Scores

Table 35. Summary of Performance Indcator level scores.

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in Principle	Score													
								SEAK	Yak	PWS	C-B	LCI	UCI	Bristol	Yukon	Kusko	Kotz	Norton	Kodiak	Chignik	Pen/AI
One	1	Outcome	0.33	1.1.1	Stock status	1	0.333	85	95	100	95	100	85	100	85	95	85	80	85	100	100
				1.1.2	Stock rebuilding	0	0.000	na	na	na	na	na	na	na	na	na	na	na	na	na	na
		Management	0.33	1.2.1	Harvest strategy	0.25	0.083	95	95	100	95	100	95	100	95	95	95	95	95	100	100
				1.2.2	Harvest control rules & tools	0.25	0.083	95	100	100	100	100	95	100	95	100	100	95	95	100	100
				1.2.3	Information & monitoring	0.25	0.083	80	100	90	90	90	80	100	80	80	80	80	80	100	100
				1.2.4	Assessment of stock status	0.25	0.083	95	95	95	90	95	95	95	95	95	90	95	95	95	95
		Enhancement	0.33	1.3.1	Enhancement outcome	0.333	0.111	60	100	60	100	60	100	100	100	100	100	100	60	100	100
				1.3.2	Enhancement management	0.333	0.111	80	100	70	100	70	100	100	100	100	100	100	80	100	100
				1.3.3	Enhancement information	0.333	0.111	80	100	70	100	70	100	100	100	100	100	100	60	100	100
								83.2	97.5	87.6	96.2	87.6	92.1	99.6	92.1	95.8	92.1	90.4	81.0	99.6	99.6

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in Principle	Score													
								SEAK	Yak	PWS	C-B	LCI	UCI	Bristol	Yukon	Kusko	Kotz	Norton	Kodiak	Chignik	Pen/AI
Two	1	Retained species	0.2	2.1.1	Outcome	0.333	0.067	100	100	100	100	100	100	100	100	100	100	100	100	100	100
				2.1.2	Management	0.333	0.067	95	95	80	95	80	95	95	95	95	95	95	95	95	95
				2.1.3	Information	0.333	0.067	100	95	85	100	85	100	100	100	100	100	100	100	100	100
		Bycatch species	0.2	2.2.1	Outcome	0.333	0.067	100	100	100	100	100	100	100	100	100	100	100	100	100	100
				2.2.2	Management	0.333	0.067	90	90	90	90	90	90	90	90	90	90	90	90	90	90
				2.2.3	Information	0.333	0.067	95	95	95	95	95	95	95	95	95	95	95	95	95	95
		ETP species	0.2	2.3.1	Outcome	0.333	0.067	80	80	80	80	80	80	80	80	80	100	80	80	80	80
				2.3.2	Management	0.333	0.067	80	80	80	80	80	80	80	80	80	100	80	80	80	80
				2.3.3	Information	0.333	0.067	80	80	80	80	80	80	80	80	80	100	80	80	80	80
		Habitats	0.2	2.4.1	Outcome	0.333	0.067	100	100	100	100	100	100	100	100	100	100	100	100	100	100
				2.4.2	Management	0.333	0.067	80	80	80	80	80	80	80	80	80	80	80	80	80	80
				2.4.3	Information	0.333	0.067	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		Ecosystem	0.2	2.5.1	Outcome	0.333	0.067	90	100	90	90	90	90	100	100	100	100	100	100	90	100
				2.5.2	Management	0.333	0.067	85	90	85	85	85	85	90	90	90	90	90	90	85	90
				2.5.3	Information	0.333	0.067	85	85	85	85	85	85	85	85	85	85	85	85	85	85
								89.3	90	87.3	89.3	87.3	89.3	90.3	90.3	90.3	90.3	90.3	89.3	90.3	90.3

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in Principle	Score													
								SEAK	Yak	PWS	C-B	LCI	UCI	Bristol	Yukon	Kusko	Kotz	Norton	Kodiak	Chignik	Pen/AI
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.3	0.150	100	100	100	100	100	100	100	100	100	100	100	100	100	100
				3.1.2	Consultation, roles &	0.3	0.150	100	100	100	100	100	100	100	100	100	100	100	100	100	100
				3.1.3	Long term objectives	0.3	0.150	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.25	0.125	90	90	90	90	90	90	90	90	90	90	90	90	90	90
				3.2.2	Decision making processes	0.25	0.125	95	95	95	95	95	95	95	95	95	95	95	95	95	95
				3.2.3	Compliance & enforcement	0.25	0.125	100	100	100	100	100	100	100	100	100	100	100	100	100	100
				3.2.4	Management performance	0.25	0.125	80	80	80	80	80	80	80	80	80	80	80	80	80	80
								95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1

5.3 Summary of Conditions

Table 36. Summary of Conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1-SEAK	By the end of 2023, the SG 80 scoring requirements must be met in full. This will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a): It is highly likely that the Chum salmon enhancement activities in SEAK do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Chum salmon stocks.	**1.3.1**	**Yes, it is a carryover—see Table 28 for details.**
5-Kodiak	By the end of the ninth year of certification, the SG 80 scoring requirements for PI 1.3.1 and PI 1.3.3, and the SI 80e requirements for PI 2.5.2, must be met in full. With respect to the current hatchery programs at Pillar Creek and Kitoi Bay for Chinook, Coho, Pink and Chum salmon, this will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a) it is highly likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks. b) (PI 1.3.3, SG80a) sufficient relevant information is available on the contribution of enhanced Chinook, Coho, Pink and Chum salmon to the harvest and wild escapement of the stocks. c) (PI 1.3.3, SG80b) the assessment includes estimates of the impacts of enhancement activities on wild stock status, productivity and diversity. d) PI 2.5.2, SG80e) there is a tested and evaluated artificial production strategy, if necessary, with sufficient monitoring in place and evidence is available to reasonably ensure with high likelihood that strategy is effective in achieving the SG 80 outcome.	**1.3.1** **1.3.3** **2.5.2**	**Yes, it is a carryover of Condition 5 in the previous assessmnt—see Table 28 for details.**
3-PWS1	Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness.	**1.3.1**	**Yes, it is a carryover of Condition PWS1 in the previous assessmnt—see Table 28 for details.**
4-PWS2	Demonstrate an objective basis for confidence that the enhancement strategy is effective for protecting wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.	**1.3.2**	**Yes, it is a carryover of Condition PWS2 in the previous assessmnt—see Table 28 for details.**
5-PWS3	Provide information on the contribution of enhanced	**1.3.3**	**Yes, it is a carryover of**

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
	fish to the wild escapement of Pink and Chum Salmon, and relative fitness of hatchery-origin fish sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.		**Condition PWS3 in the previous assessmnt—see Table 28 for details.**
6 – LCI1	Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness.	**1.3.1**	**No**
7 – LCI2	Demonstrate an objective basis for confidence that the enhancement strategy is effective for protecting wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.	**1.3.2**	**No**
8 – LCI3	Provide information on the contribution of enhanced fish to the wild escapement of Pink Salmon, and relative fitness of hatchery-origin fish sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.	**1.3.3**	**No**

5.4 Recommendations

Recommendation 1: For the marine gill net fisheries of Cook Inlet, Kodiak, the AK Penninsula, Bristol Bay and AYK (Yukon, Kuskokwim and Kotzebue), certainty could be increased if the earlier observation of test fisheries were repeated, or an equivalent study to update verification of the degree of interaction between these fisheries and seabirds were conducted. This would have the potential to increase the score for 2.3.3 and also would have implications for the score for 2.3.1.

5.5 Determination, Formal Conclusion and Agreement

On the basis of the assessment team's evaluation, and peer and public review, MRAG Americas has determined that the Alaska Salmon fishery should be recertified against the MSC Standard, as no indicator scored less than 60, and all overall principle scores were above 80. **Note this is a draft determination and not a final certification result.**

For FCR

1. The report shall include a formal statement as to the certification action taken by the CAB's official decision-makers in response to the Determination recommendation.

5.6 Changes in the fishery prior to and since Pre-Assessment

N/A, this fishery is currently certified.

6 REFERENCES

Acoura Marine. 2017. MSC Sustainable Fisheries Certification, British Columbia salmon fishery (Sockeye Salmon, Pink Salmon and Chum Salmon). Acoura Marine. https://fisheries.msc.org/en/fisheries/british-columbia-salmon/@@assess

ADFG. 2015. 2015 -2016 Statewide Groundfish Commercial Fishing Regulations. Juneau. https://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2015-2016_statewide_commercial_groundfish.pdf

ADFG. 2018a. 2018 Eastern Gulf of Alaska area Lingcod allocation announcement. ADFG. Sitka Ak. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/884415479.pdf

ADFG. 2018b. 2018 Southeast Alaska directed Black Rockfish fishery announcement. ADFG Sitka, Ak http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/884634797.pdf

ADG&G. 2006. Our wealth maintained: a strategy for conserving Alaska's diverse wildlife and fish resources. ADFG, Juneau. http://www.adfg.alaska.gov/static/species/wildlife_action_plan/cwcs_full_document.pdf.

Aydin, K, S Gaichas, I Ortiz, D Kinzey, and N Friday. 2007. A Comparison of the Bering Sea, Gulf of Alaska, and Aleutian Islands Large Marine Ecosystems Through Food Web Modeling. NOAA Tech Memo NMFSAFSC 178, 298p.

Batten, S. D., G. T. Ruggerone, and I. Ortiz. 2018. Pink Salmon induce a trophic cascade in plankton populations in the southern Bering Sea and around the Aleutian Islands. Fisheries Oceanography 27(6): 548-549. https://doi.org/10.1111/fog.12276

Bernard, D. R., J. J. Hasbrouck, B. G. Bue, and R. A. Clark. 2009. Estimating risk of management error from precautionary reference points (PRPs) for non-targeted Salmon stocks. Alaska Department of Fish and Game, Special Publication No. 09-09, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/SP09-09.pdf

Blejwas, K. M., and S. K. Wright. 2012. By-catch of Kittlitz's murrelet (Brachyramphus brevirostris) in commercial salmon gillnet fisheries in the Gulf of Alaska: A qualitative risk assessment. Alaska Department of Fish and Game, Wildlife Research Report ADF&G/DWC/WRR-2012-8, Juneau. http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/research_pdfs/wrr_2012_8.pdf

Botz, J., and M. A. Somerville. 2017. Management of salmon stocks in the copper river, report to the Alaska Board of Fisheries: December 1-5, 2017, Valdez, Alaska. ADF&G Special Publication 17-13.

Brenner, R.E., Moffitt, S.D. and W.S. Grant. 2012. Straying of hatchery Salmon in Prince William Sound, Alaska. Environmental Biology of Fishes, V. 94, pp. 179-195.

Bue, B. G., and J. J. Hasbrouck. Escapement goal review of salmon stocks of Upper Cook Inlet. Alaska Department of Fish and Game, Report to the Alaska Board of Fisheries, November 2001 (and February 2002), Anchorage, unpublished document.

Byerly, M., B. Brooks, B. Simonson, H. Savikko and H. Geiger. Alaska commercial salmon catches, 1878 – 1997. Regional Information Report No. 5J99-05. Juneau. http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.1999.05.pdf

Cederholm, C.J., M.D. Kuntz, T. Mutota, and S. Atuhiro. 1999. Pacific Salmon carcasses: essential contributions of nutrients and energy for aquatic ecosystems. Fisheries, Vol. 24,pp 6-15.

Chaffee, C., Ruggerone, G., Beamesderfer, R. & L.W. Botsford. 2007. The commercial Alaska salmon fisheries managed by the ADF&G; A 5-year re-assessment based on the Marine Stewardship Council program. Scientific Certification Systems, Inc., Emeryville, California. 350 pp. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments

Clark, R. A., D. M. Eggers, A. R. Munro, S. J. Fleischman, B. G. Bue, and J. J. Hasbrouck. 2014. An evaluation of the percentile approach for establishing Sustainable Escapement Goals in lieu of stock productivity information. Alaska Department of Fish and Game, Fishery Manuscript Series No. 14-06, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS14-06.pdf

Cooney, R. T., J. R. Allen, M. A. Bishop, D. L. Eslinger, T. Kline, B. L. Norcross, et al. 2001a. Ecosystem controls of juvenile Pink salmon (Oncorhynchus gorbuscha) and Pacific herring (Clupea pallasi) populations in Prince William Sound, Alaska. Fish. Oceanog. 10(Suppl. 1):1-13.

Cooney, R. T., K. O. Coyle, E. Stockmar, and C. Stark. 2001b. Seasonality in surface-layer net zooplankton in Prince William Sound, Alaska. Fish. Oceanog. 10 (Suppl.): 97-109.

Crane, P., W. Templin, D. Eggers, and L. Seeb. 2000. Genetic stock Identification of Southeast Alaska Chinook Salmon fishery catches. Ak. Dept. Fish and Game Regional Info. Rpt. No. 5J00-01. http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.2000.01.pdf

Cross, A.D., Beauchamp, D.A., Armstrong, J.L., Blikshteyn, M., Boldt, J.L., Davis, N.D., Haldorson, L.J., Moss, J.H., Myers, K.W. and R.V. Walker. 2005. Consumption demand of juvenile Pink Salmon in Prince William Sound and the coastal Gulf of Alaska in relation to prey biomass. Deep-Sea Research Part II-Topical Studies in Oceanography, V. 52, pp. 347-370.

Davis, N. C. D. 2003. Feeding ecology of Pacific Salmon (*Oncorhynchus* spp.) in the Central North Pacific Ocean and Central Bering Sea, 1991-2000. Ph.D. Dissertation. Hokkaido University. Hakodate Japan.

Deriso, R. B., M. N. Maunder, and W. H. Pearson. 2008. Incorporating covariates into fisheries stock assessment models with application to Pacific herring. Ecol. Applic. 18(5):1270-1286.

Elison, T., P. Salomone, T. Sands, M. Jones, C. Brazil, G. Buck, F. West, T. Krieg, and T. Lemons. 2015. 2014 Bristol Bay area annual management report. Alaska Department of Fish and Game, Fishery Management Report No. 15-24, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR15-24.pdf

English, K, T. Mochizuki and D. Robichaud. 2012. Review of north and central Coast salmon indicator streams and estimating escapement, catch and run size for each Salmon Conservation Unit. LGL Limited Environmental Research Associates. Sidney, BC. http://salmonwatersheds.ca/libraryfiles/lib_1.pdf

Erickson, J. W., T. M. Willette, and T. McKinley. 2017. Review of salmon escapement goals in Upper Cook Inlet, Alaska, 2016. Alaska Department of Fish and Game, Fishery Manuscript No. 17-03, Anchorage.

Evenson, M. J., J. J. Hasbrouck, S. D. Moffitt, and L. Fair. 2008. Escapement goal review for Copper River, Bering River, and Prince William Sound Salmon stocks. Alaska Department of Fish and Game, Fishery Manuscript Series No. 08-01, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/fms08-01.pdf

Fair, L. F., S. D. Moffitt, M. J. Evenson, and J. Erickson. 2008. Escapement goal review of Copper and Bering rivers, and Prince William Sound Pacific Salmon stocks, 2008. Alaska Department of Fish and

Game, Fishery Manuscript Series No. 08–02, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fms08-02.pdf

Fair, L. F., S. D. Moffitt, M. J. Evenson, and J. W. Erickson. 2011. Escapement goal review of Copper and Bering rivers, and Prince William Sound Pacific Salmon stocks, 2011. Alaska Department of Fish and Game, Fishery Manuscript Series No. 11–07, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS11-07.pdf

Fenske, K, C. Lunsford, P-J Hulson, D. Hanselman and K. Shotwell. Assessment of Dusky Rockfish stock in the Gulf of Alaska. NOAA. REFM Doc. https://www.afsc.noaa.gov/REFM/Docs/2017/GOAdusky.pdf

Ford, M. J., J. Hempelmann, M. B. Hanson, K. L. Ayres, R. W. Baird, C. K. Emmons, J. I. Lundin, G. S. Schorr, S. K. Wasser, and L. K. Park. 2016. Estimation of a killer whale (Orcinus orca) population's diet using sequencing analysis of DNA from feces. PLoS ONE. 11(1):e0144956. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4703337/

Gaichas, S. K., and R. C. Francis. 2008. Network models for ecosystem-based concepts and application to the Gulf of Alaska food web. Canadian Journal of Fisheries and Aquatic Sciences 65:1965-1982.

Gray, D., and eight coauthors. 2017. Annual Management Report of the 2016 Southeast Alaska Commercial Purse Seine and Drift Gillnet Fisheries. Alaska Department of Fish and Game Fishery Management Report 17-35.

Habicht, C., Simpson, E.M. and J.E. Seeb. 2000. Broodstock acquisition and release sites for hatcheries producing Pink Salmon in Prince William Sound. ADFG, Department of Commercial Fisheries Regional Information Report 5J00-07. http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.2000.07.pdf.

Hanson, M. B., R. W. Baird, J. K. B. Ford, J. Hempelmann-Halos, D. M. Van Doornik, J. R. Candy, C. K. Emmons, G. S. Schorr, B. Gisborne, K. L. Ayres, S. K. Wasser, K. C. Balcomb, K. Balcomb-Bartok, J. G. Sneva, and M. J. Ford. 2010. Species and stock identification of prey consumed by endangered southern resident killer whales in their summer range. Endang.Spec. Res. 11: 69-82. http://www.cascadiaresearch.org/files/Hansonetal2010ESR.pdf

Habicht, C., Simpson, E.M. and J.E. Seeb. 2000. Broodstock acquisition and release sites for hatcheries producing Pink Salmon in Prince William Sound. ADFG, Department of Commercial Fisheries Regional Information Report 5J00-07. http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.2000.07.pdf.

Harper, P., and L. McCarthy. 2015. Brown Bear Management and Survey Investigation Activities, 1 July 2012 – 30 June 2014. Alaska Department of Fish and Game Special Management Report 2015-1.

Hilborn, R. and D. Eggers. 2000. A review of the hatchery programs for Pink Salmon in Prince William Sound and Kodiak Island, Alaska. Transactions of the American Fisheries Society, V. 129, pp. 333-350.

Hilborn, R. and D. Eggers. 2001. A review of the hatchery programs for Pink Salmon in Prince William Sound and Kodiak Island, Alaska: Response to comment. Transactions of the American Fisheries Society, V. 130, pp. 720-724.

Hollowell, G., E. O. Otis, and E. Ford. 2017. 2016 Lower Cook Inlet Area Finfish Management Report. Alaska Department of Fish and Game Fishery Management Report 17-26.

IFC (Intertek Fisheries Certification). 2015. First Annual Surveillance Report Alaska Salmon Fishery. February 2015. Marine Stewardship Council. London UK.

IMM (Intertek Moody Marine). 2013. Alaska salmon fishery final determination report. October 2013. Marine Stewardship Council. London UK. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments.

International Pacific Halibut Commission (IPHC). 2016. Annual Report, 2016. IPHC, Seattle. https://iphc.int/uploads/pdf/ar/IPHC-2016-Annual-Report.pdf

Jasper, J., C. Habicht, S. Moffitt, R. Brenner, J. Marsh, B. Lewis, E. Fox, Z. Grauvogel, S. D. Rogers Olive, and W. S. Grant. 2013. Source-sink estimates of genetic introgression show influence of hatchery strays on wild Chum Salmon populations in Prince William Sound, Alaska. PLoS ONE 8(12):e81916.

Jeffrey, K. M., I. M. Cote, J. R. Irvine, and J. D. Reynolds. 2016. Changes in body size of Canadian Pacific salmon over six decades. Canadian Journal of Fisheries and Aquatic Sciences. 74(2): 191-201.

Johnson, R.H., W.S. Middleton, and R.L. Murphy. 2018. North Alaska Peninsula commercial salmon annual management report, 2017. Alaska Department of Fish and Game Fishery Management Report 18-09.

Kaeiyama, M. and R. Edpalina . 2003. Evaluation of carry capacity of Pacific salmon in the North Pacific Ocean for ecosystem-based sustainable conservation. [in} Leber, K.M., S. Kotada, H.L. Blankenship, and T. S. Vasand editors . Stock enhancement and sea ranching: Developments, pitfalls and opportunities. Blackwell Publishing. Ames Iowa.

Knudsen, E., and eight coauthors. 2015a. Interactions of Wild and Hatchery Pink Salmon and Chum Salmon in Prince William Sound and Southeast Alaska, Progress Report for 2013. Prince William Sound Science Center, Sitka Sound Science Center, and D. R. Bernard Consulting report to the Alaska Department of Fish and Game.

Knudsen, E., and eight coauthors. 2015b. Interactions of Wild and Hatchery Pink Salmon and Chum Salmon in Prince William Sound and Southeast Alaska, Progress Report for 2014. Prince William Sound Science Center, Sitka Sound Science Center, and D. R. Bernard Consulting report to the Alaska Department of Fish and Game.

Knudsen, E., and eight coauthors. 2016. Interactions of Wild and Hatchery Pink Salmon and Chum Salmon in Prince William Sound and Southeast Alaska, Progress Report for 2015. Prince William Sound Science Center, Sitka Sound Science Center, and D. R. Bernard Consulting report to the Alaska Department of Fish and Game.

Knudsen, E., P.S. Rand and K.B. Gorman. In prep. Spatial and Temporal Distribution in the Returns of Hatchery- and Natural-origin Pink Salmon and Chum Salmon to Prince William Sound, Alaska during 2013-2015. Draft submitted to the AHRP Science Panel, available upon request.

Kyla, J., I, Cote, J. Irvine, and J. Rynolds. 2017. Changes in body size of Canadian Pacific salmon over six decades . Canadian Journal of Fisheries and Aquatic Sciences, 2017, 74(2): 191-201. https://doi.org/10.1139/cjfas-2015-0600

Levi, T., C.T. Darimount, M. MacDuffee, M. Mangel, P. Paquet. 2012. Using Grizzly Bears to Assess Harvest – Ecosystem Tradeoffs in Salmon Fisheries. PLOS Biology 10(4).

Lewis, B., Botz, J., Brenner, R., Moffitt, S., Hollowell, G., Gray, D., Regnart, J., Palmer, S., Farrington, C. and B. White. 2009. Alaska Department of Fish and Game internal review of Prince William Sound Aquaculture Corporation. ADF&G, Special Publication 09-10, Anchorage. 207 pp.

Lewis, B., W. S. Grant, R. E. Brenner, and T. Hamazaki. 2015. Changes in size and age of Chinook Salmon Onchorynchus tshawytscha returning to Alaska. PLoSONE10(6):e0130184.doi:10.1371/ journal.pone.0130184.

Mahnken, C., G. Ruggerone, W. Waknitz, and T. Flagg. 1998. A historical perspective on Salmonid production from Pacific Rim hatcheries. North Pacific Anadromous Fish Commission Bulletin 1:38-53.

Manly, B. 2006. Incidental catch and interactions of marine mammals and birds in the Cook Inlet salmon driftnet and set net fisheries, 1999-2000. Western EcoSystems Tecnology. Cheyenne Wy. https://alaskafisheries.noaa.gov/sites/default/files/1999-2000cookinlet.pdf

Manly, B. 2007. Incidental take and interactions of marine mammals and birds in the Kodiak Island salmon set gillnet fishery, 2002 and 2005. Western EcoSystems Tecnology. Cheyenne Wy. https://alaskafisheries.noaa.gov/sites/default/files/kodiakreport02_05.pdf

Manly, B. 2009. Incidental Take and Interactions of Marine Mammals and Birds in the Yakutat Salmon set net fishery, 2007 and 2008. Western EcoSystems Tecnology. Cheyenne Wy. https://alaskafisheries.noaa.gov/sites/default/files/yakutat07-08.pdf

Manly, B. 2014. Incidental takes and interactions of marine mammals and birds in District 6, 7, and 8 Southeast Alaska drift gillnet fishery 2012 and 2013. Western EcoSystems Technology, Inc. Laramie WY. https://alaskafisheries.noaa.gov/sites/default/files/incidentaltakes2012-2013.pdf

Moran, J. R., and J. M. Straley. 2017. Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound. Restoration Project Final Report (Restoration Project: 16120114-N), National Marine Fisheries Service, Juneau, Alaska.

Mortensen, D., A. Wertheimer, S. Taylor, and J. Landingham. 2000. The relationship between early marine growth of Pink salmon, Oncorhynchus gorbuscha, and marine water temperature, secondary production, and survival to adulthood. Fish. Bull. US 98:319-335.

MRAG Americas. 2017. MSC final report and determination for Alaska Salmon – Prince William Sound scope extension assessment. MRAG Americas. Seattle. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments

MRAG Americas. 2016. Second annual MSC surveillance report Alaska Salmon fishery. MRAG Americas. Seattle.

MRAG Americas. 2017. Third annual MSC surveillance report Alaska Salmon fishery. MRAG Americas. Seattle.

MRAG Americas. 2018. Annual MSC Surveillance Report Alaska Salmon Fishery #1 for Prince William Sound #4 for all other Regions. MRAG Americas. Seattle. https://cert.msc.org/FileLoader/FileLinkDownload.asmx/GetFile?encryptedKey=Vzh7LOQyenKjCm9MDBpjNy1+SLPsSZZ7PiARTZ7NWj7fG81CqdboBVrs+H7oaewL

Munro, A. R., and E. C. Volk. 2016. Summary of Pacific Salmon escapement goals in Alaska with a review of escapements from 2007 to 2015. Alaska Department of Fish and Game, Fishery Manuscript Series No. 16- 04, Anchorage.

Munro, A. R., and E. C. Volk. 2017. Summary of Pacific salmon escapement goals in Alaska with a review of escapements from 2008 to 2016. Alaska Department of Fish and Game, Fishery Manuscript Series No. 17-05, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS17-05.pdf

Munro, A. R. 2018. Summary of Pacific salmon escapement goals in Alaska with a review of escapements from 2009 to 2017. Alaska Department of Fish and Game, Fishery Manuscript Series No. 18-04, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS18-04.pdf

NMFS (National Marine Fisheries Service). 2014. Status Review of Southeast Alaska Herring (Clupea pallasi), Threats Evaluation and Extinction Risk Analysis. Report to National Marine Fisheries Service, Office of Protected Resources, pp. 183. https://alaskafisheries.noaa.gov/sites/default/files/statusrev0314.pdf

NOAA. 2014. Endangered species act section 7 consultation biological opinion: Authorization of the Alaska groundfish fishery under the proposed revised Steller Sea Lion protection measures. NOAA. Juneau. Ak. https://alaskafisheries.noaa.gov/sites/default/files/final0414.pdf

North Pacific Fishery Management Council, National Marine Fisheries Service – Alaska Region and State of Alaska Department of Fish and Game. 2018. Fishery Management Plan for the salmon fisheries in the EEZ of Alaska. North PCIFIC Management Council, Anchorage. https://www.npfmc.org/wp-content/PDFdocuments/fmp/Salmon/SalmonFMP.pdf

Olson, A. J. Stahl, B. Williams, M. Jaenicke and S. Meyer. 2017. Assessment of demersal shelf rockfish stock complex in the Southeast Outside Subdistrict of the Gulf of Alaska. NOAA REFM Doc. Seattle. https://www.afsc.noaa.gov/REFM/Docs/2017/GOAdsr.pdf

Pacific Salmon Commission Joint Chinook Technical Committee (PSC-JCTC). 2017a. Annual report of catch and escapement 2016. Report TC Chinook (17-2). Pacific Salmon C.mission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/Chinook/

Pacific Salmon Commission Joint Chinook Technical Committee (PSC-JCTC). 2017b. 2016 Exploitation rate analysis and model calibration supplement – data notebook. Report TC Chinook (17-1). Pacific Salmon Commission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/Chinook/

Pacific Salmon Commission Joint Northern Boundary Technical Committee (PSC-JNBTC). 2017. U.S./Canada Northern Boundary Area 2016 salmon fisheries management report and 2017 preliminary expectations. Report TCNB (17)-1 Pacific Salmon Commission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/northern-boundary/

Pacific Salmon Commission Joint Transboundary Technical Committee (PSC-JTTC). 2017. Final estimates of Transboundary River Salmon production, harvest and escapement and a review of joint enhancement activities in 2015. Pacific Salmon Commission Report (17)-2. PSC Vancouver B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/transboundary/

Pacific Salmon Commission. 2018. 2017/2018 Thirty-third annual report. Pacific Salmon Commission. Vancouver, B.C. https://www.psc.org/publications/annual-reports/commission/

Pearson, W., R. B. Deriso, R. A. Elston, S. E. Hook, K.R. Parker, and J. W. Anderson. 2012. Hypotheses concerning the decline and poor recovery of Pacific herring in Prince William Sound, Alaska. Rev

Fish. Biol. Fisheries 22:95-135. https://link.springer.com/content/pdf/10.1007/s11160-011-9225-7.pdf

Peterman, R. M. 1991. Density-dependent marine processes in North Pacific Salmonids: Lessons for experimental design of large-scale manipulations of fish stocks. ICES Marine Science Symposium 192:69-77. https://www.ices.dk/sites/pub/Publication%20Reports/Marine%20Science%20Symposia/ICES%20Marine%20Science%20Symposia%20-%20Volume%20192%20-%201991%20-%20Part%2014%20of%2041.pdf

Piston. A. 2003. Limnological and Fisheries Investigations at Virginias Lake, Southeast Alaska. 2003. ADFG RIR. No. 1J04-7. Juneau. http://www.adfg.alaska.gov/FedAidPDFs/RIR.1J.2004.17.pdf

Piston A.W. & S.C. Heinl. 2011a. Chum Salmon stock status and escapement goals in Southeast Alaska. Special Publication No. 11-21. ADF&G, Anchorage, Alaska.

Piston, A.W. & S.C. Heinl. 2011b. Pink Salmon stock status and escapement goals in Southeast Alaska. Special Publication No. 11-18. ADF&G. Division of Commercial Fisheries, Ketchikan, Alaska.

Piston, A.W. & S.C. Heinl. 2012a. Hatchery Chum Salmon straying studies in Southeast Alaska, 2008-2010. Fishery Manuscript Series 12-01. ADF&G, Anchorage, Alaska.

Piston, A.W. & S.C. Heinl. 2012b. Hatchery Chum Salmon straying studies in Southeast Alaska, 2011. Fishery Manuscript Series 12-45. ADF&G, Anchorage, Alaska.

Regnart, J., R. Josephson, and J. Hasbrouck. 2010. Prince William Sound permit alteration requests. ADFG memorandum to J. Hilsinger and C. Swanton. April 19,2010. http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2018-2019/july_petitions/adfg_par.pdf

Ricker W.E. 1981. Changes in the average size and age of Pacific Salmon. Canadian Journal of Fisheries and Aquatic Sciences, 1981, 38(12): 1636-1656, https://doi.org/10.1139/f81-213

Ricker, W. E. 1954. Stock and recruitment. Journal of Fisheries and Research Board of Canada 11: 559–623.

Ruggerone, G. T., and J. R. Irvine. 2018. Numbers and Biomass of Natural- and Hatchery-Origin Pink Salmon, Chum Salmon, and Sockeye Salmon in the North Pacific Ocean, 1925–2015. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 10:152–168. https://onlinelibrary.wiley.com/doi/full/10.1002/mcf2.10023

Ruggerone, G. T., and B. M. Connors. 2015. Productivity and life history of Sockeye Salmon in relation to competition with Pink and Sockeye Salmon in the North Pacific Ocean. Canadian Journal of Fisheries and Aquatic Sciences. 72(6): 818-833. http://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2014-0134#.WlZXx9-nHZs

Ruggerone, G. T., and J. L. Nielsen 2004. Evidence for competitive dominance of Pink Salmon (Oncorhynchus gorbuscha) over other Salmonids in the North Pacific Ocean. Reviews in Fish Biology and Fisheries 14:371-390. https://link.springer.com/article/10.1007/s11160-004-6927-0

Ruggerone, G. T., E. Farley, J. Nielsen, and P. Hagen 2005. Seasonal marine growth of Bristol Bay Sockeye Salmon (Oncorhynchus nerka) in relation to competition with Asian Pink Salmon (O. gorbuscha) and the 1977 ocean regime shift. Fish. Bull. 103:355-370.https://alaska.usgs.gov/products/pubs/2005/2005_Ruggerone_etal_FishBull_103.pdf

Ruggerone, G., A. Springer, L. Shaul and G, van Vliet. 2019. Unprecedented biennial pattern of birth and mortality in an endangered apex predator, the southern resident killer whale, in the eastern North Pacific Ocean. MEPS 608:291-296 (2019) . https://www.int-res.com/abstracts/meps/v608/p291-296

Ruggerone, G. T., M. Zimmermann, K. W. Myers, D. E., Rogers 2003. Competition between Asian Pink Salmon (Oncorhynchus gorbuscha) and Alaskan Sockeye Salmon (O. nerka) in the North Pacific Ocean. Fisheries Oceanography 12(3):209-213. http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2419.2003.00239.x/full

Ruggerone, G. T., R. M. Peterman, B. Dorner, and K. W. Myers. 2010. Magnitude and trends in abundance of hatchery and wild Pink, Chum, and Sockeye Salmon in the North Pacific Ocean. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 2:306-328. http://www.bioone.org/doi/abs/10.1577/C09-054.1

Ruggerone, G.T, and F.A. Goetz. 2004. Survival of Puget Sound Chinook Salmon (Oncorhynchus tshawytscha) in response to climate-induced competition with Pink Salmon (Oncorhynchus gorbuscha). Canadian Jour. Fish and Aquatic Sci. 61:1756-1770. http://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2014-0134#.WlZVw9-nHZs

Russell, C.W., J. Boltz, S. Haught, and S. Moffitt. 2017. 2016 Prince William Sound Area Finfish Management Reprot. ADF&G Fishery Management Report 17-37.

Schindler, D. 1980. Salmon-derived nutrients and dynamics of coastal ecosystems: how good is the story; In Salmon and nutrients: a seminar on science and policy; Speaking for the salmon series, Simon Frazer University. http://www.sfu.ca/coastal/research-series/listing/SpeakingfortheSalmon.html

Schrof, S. and S. Honnald. 2003. Salmon Enhancement, Rehabilitation and Evaluation and Monitoring Efforts Conducted in the Kodiak Management Area Through 2001. ADFG ROR No. 4K03-41. Kodiak.

Science Sub-Committee (SSC). 2016. North Pacific Anadromous Fish Commission Science Plan 2016-2020. NPAFC Doc. 1665. 8 pp. The Science Sub-Committee (SSC), Committee on Scientific Research and Statistics (CSRS) . http://www.npafc.org/new/publications/Documents/PDF%202016/1665(NPAFC%20Science%20Plan).pdf

Shaul, L. and H. Geiger. 2016. Effects of climate and competition for off shore prey on growth, survival, and reproductive potential of Coho salmon in Southeast Alaska. N. Pac. Anadr. Fish Comm. Bull. 6: 329–347. https://npafc.org/wp-content/uploads/2017/09/bulletin6.pd

Shields, P., and A. Frothingham. 2018. Upper Cook Inlet Commercial Fisheries Annual Management Report, 2017. Alaska Fish and Game Fishery Management Report 18-10.

Springer, A., G. van Vliet, N. Bool, M. Crowley, P.Fullagare, M. Lea, R. Monash, C. Price, C. Vertiganc, and E. Woehler. 2018 Transhemispheric ecosystem disservices of pink salmon in a Pacific Ocean macrosystem. PNAS. vol. 115. no. 22. https://www.pnas.org/content/115/22/E5038

Stopha, M. 2013a. An evaluation of the Solomon Gulch Salmon hatchery for consistency with statewide policies and prescribed management practices. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report SJ13-04, Anchorage.

Stopha, M. 2013b. An evaluation of the Cannery Creek Salmon hatchery for consistency with statewide policies and prescribed management practices. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report SJ13-06, Anchorage.

Stopha, M. 2013c. An evaluation of the Wally Noerenberg Hatchery for consistency with statewide policies and prescribed management practices. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. SJ13-10, Anchorage.

Stopha, M. 2013d. An evaluation of the Armin F. Koernig Salmon hatchery for consistency with statewide policies and prescribed management practices. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report SJ13-11, Anchorage.

Stopha, M. 2016. Alaska fisheries enhancement annual report 2015. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J16-03, Anchorage.

Sturdevant, M. V, R. Brenner, E. A. Fergusson, J. A. Orsi, and W. R. Heard. 2013. Does Predation by Returning Adult Pink Salmon Regulate Pink Salmon or Herring Abundance? North Pacific Anadromous Fish Commission Technical Report No. 9: 153-164.

Sturdevant, M. V., and L. B. Hulbert. 1999b. Diet overlap, prey selection and food competition among allopatric and sympatric forage fish species in Prince William Sound, 1996. pgs. 72-100 in: Forage fish diet overlap,1994-1996. Exxon Valdez Oil spill Restoration Project Final Report (Restoration Project 971963C). https://goa.nceas.ucsb.edu/#view/doi:10.5063/F1V985ZZ

Sturdevant, M. V., J. A. Orsi and E. A. Fergusson. 2012b. Diets and Trophic Linkages of Epipelagic Fish Predators in Coastal Southeast Alaska during a Period of Warm and Cold Climate Years, 1997–2011. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 4(1):526-545.

Sturdevant, M. V., T. M. Willette, S. C. Jewett, E. Debevec, L. B. Hulbert, and A. L. J. Brase. 1999a. Diet composition, diet overlap, and size of 14 species of forage fish collected monthly in Prince William Sound, Alaska, 1994-1996. Pgs. 10-37 in: Forage fish diet overlap,1994-1996. Exxon Valdez oil spill restoration project final report (Restoration Project 971963C). http://www.evostc.state.ak.us/Universal/Documents/Publications/FinalAndAnnualReports.pdf

Sturdevant, M.V. (2013). Memorandum to the Alaska salmon MSC assessment team regarding Prince William Sound hatcheries and herring non-recovery. 4pp.

Sturdevant, M.V. 2012. Memorandum to the Alaska Salmon MSC assessment team regarding Prince William Sound hatcheries and herring non-recovery. 4pp.

Sturdevant, M.V., Fergusson, E., Hillgruber, N., Reese, C., Orsi, J., Focht, R., Wertheimer, A. and W. Smoker. 2012a. Lack of trophic competition among wild and hatchery juvenile Chum Salmon during early marine residence in Taku Inlet, Southeast Alaska. Environmental Biology of Fishes, V. 94, pp. 101-116.

U.S. Fish and Wildlife Service. 2008. Birds of conservation concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. https://www.fws.gov/migratorybirds/pdf/management/BCC2008.pdf

U.S. Fish and Wildlife Service. 2013. Southwest Alaska Distinct Popoulation Segment of the Northern Sea Otter -Recovery Plan . U.S. Fish and Wildlife Service , Region 7, Alaska. 171pp.

Wertheimer, A.C., Heard, W.R., Maselko, J.M. and W.W. Smoker. 2004. Relationship of size at return with environmental variation, hatchery production, and productivity of wild Pink Salmon in Prince William Sound, Alaska: does size matter? Reviews in Fish Biology and Fisheries, V. 14, pp. 321-334.

Wertheimer, A.C., Smoker, W.W., Joyce, T.L. and W.R. Heard. 2001. Comment: A review of the hatchery programs for Pink Salmon in Prince William Sound and Kodiak Island, Alaska. Transactions of the American Fisheries Society, V. 130, pp. 712-720.

Wiese, A., T. Sheridan, J. Botz, S. Moffitt and R. Brenner. 2014 Prince William Sound area finfish management report. Fish. Mgmt. Rpt. No 15-34. Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR14-43.pdf

Wiese, A., T. Sheridan, J. Botz, S. Moffitt, and R. Brenner. 2015. 2014 Prince William Sound Area Finfish Management Report. Alaska Department of Fish and Game, Fishery Management Report No. 15-34

Willette, T. M., M. V. Sturdevant, and S. C. Jewett. 1997. Prey resource partitioning among several species of forage fishes in Prince William Sound, Alaska. Pgs. 11-29 in: Forage Fishes in Marine Ecosystems Alaska Sea Grant College Program AK-SG-97-01, 816 pgs.

Wynne, K. D. Hicks and N. Munro. 1992. 1991 marine mammal observer program for the salmon driftnet fishery of Prince William Sound, Alaska. Final Report, May 1, 1992. Saltwater, Inc, Anchorage. 61pp. https://alaskafisheries.noaa.gov/sites/default/files/1991pws.pdf

Wynne, K. Hicks, D. And N. Munro. 1990. Salmon gillnet fisheries observer programs in Prince William Sound and South Unimak Alaska. Saltwater Inc, Anchorage. https://alaskafisheries.noaa.gov/sites/default/files/1990pws.pdf

Wynne, K.M., Hicks, D.L. and N.M. Munro. 1992. 1991 marine mammal observer program for the Salmon driftnet fishery of Prince William Sound, Alaska. Final Report, May 1, 1992. By Saltwater, Inc, for NMFS. 61 pp. http://alaskafisheries.noaa.gov/protectedresources/observers/bycatch/1991pws.pdf

Zador, Stephani; Aydim, Kerim; Yasumiishi, Ellen; Holsman, Kirstin; Ortiz, Ivonne. 2015. Ecosystem Considerations 2015: Status of Alaska's Marine Ecosystems. Resource Ecology and Fisheries Management Division, Alaska Fisheries Science Center, NMFS, NOAA.

Zeiser, N. L., and R. A. Hoffman. 2017. Annual management report of the 2016 Yakutat Area commercial salmon fisheries. Alaska Department of Fish and Game, Fishery Management Report No. 17-36, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-36.pdf

APPENDIX 1 SCORING AND RATIONALES

Evaluation Table for PI 1.1.1 – Stock status

<table>
<tr><td colspan="2">PI 1.1.1</td><td colspan="3">The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">A</td><td colspan="4">Stock status</td></tr>
<tr><td>Guide post</td><td>It is likely that the SMU is above the limit reference point (LRP).</td><td>It is highly likely that the SMU is above the LRP.</td><td>There is a high degree of certainty that the SMU is above the LRP.</td></tr>
<tr><td>Met?</td><td>Yes (all UoCs)</td><td>Yes (all UoCs)</td><td>No: Kotzebue, Norton Sound
Yes: Southeast Alaska, Yakutat, Copper/Bering, Prince William Sound, Lower Cook Inlet, Upper Cook Inlet, Bristol Bay, Yukon, Kuskokwim, Kodiak Chignik, Peninsula/Aleutian Island</td></tr>
<tr><td>Justification</td><td colspan="3">Alaska salmon are managed to achieve spawning escapement goal ranges which effectively serve as target reference points (TRP). In the Alaska system, escapement goals are identified as sustainable escapement goals (SEGs) or biological escapement goals (BEGs). SEGs are defined as a level of escapement that is known to provide for sustained yield over at least a 5 to 10-year period. BEGs are defined as levels of escapement that provide the greatest potential for maximum sustained yield (MSY).

Limit reference points are not generally defined for Alaska salmon because target reference points function effectively to avoid low escapements where recruitment might be impaired. When annual salmon runs periodically fall below levels where minimum escapement goal targets can be achieved, the management practice is to curtail fishing to limit impacts on the stock status.

The escapement goal approach used in Alaska salmon fishery management is precautionary because it is set well above a limit reference point at which reproductive capacity would be impaired. This approach ensures that SMUs are above LRPs when escapement goals are consistently met.

Because fisheries are curtailed to near zero harvests at the lower end of the biological or sustainable escapement goals established by ADF&G (equivalent of target reference points), weak stocks are inherently protected at levels far above what would be considered a “limit reference point”.

Southeast – In the Southeast Alaska fishery, local stocks of Sockeye, Chinook, Coho, Pink and Chum salmon are treated as target stocks under P1. Non-Southeast Alaska Sockeye, Chinook, Coho, Pink and Chum are considered as Inseparable/Practically Inseparable (IPI) species, and therefore are addressed under the Performance Indicators under Principle 2.</td></tr>
</table>

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	Escapements of Sockeye, Coho and Pink Chum salmon have generally exceeded the lower end of the target referent point or TRP (escapement goal) for the recent period (2008-2016) (Munro & Volk 2017). These stocks are consistently well above a level that might cause recruitment to be impaired. Underages occur only occasionally in response to normal variation in run sizes which are characteristic of salmon. Sockeye stocks have rebounded from 2008-2009 when many did not meet their escapement goals. Weak returns were related to marine survival conditions rather than to any management actions (Munro & Volk 2012). More recently, SEAK Sockeye are consistently meeting or exceeding established goals. The exception is McDonald Lake which is achieving escapement goals roughly half the time – this stock is currently designated a stock of yield concern. Chum salmon have generally met or exceeded escapement goals since 2011 except in the Northern Southeast Inside (NSI). The NSI area is also an area where hatchery enhancement of Chum salmon has led to significant straying in some streams. As with Sockeye, SEAK Chum salmon have largely rebounded from poor returns in 2008-2010 during a period of more-favorable marine conditions. Pink salmon have been in an extended period of high returns for the last 20 years and consistently met or exceeded escapement goals in most areas of Southeast Alaska although even year goals have not been met in a few areas beginning in 2012. Widespread declines in Chinook salmon have been observed throughout SEAK in 2016 and 2017. Similar declines have been seen throughout much of Alaska following a extended period of warm water conditions in the Gulf of Alaska. As a result of the inability to to maintain escapements despite use of specific management measures, Chinook stocks in the Chilkat, King Salmon, and Unuk rivers were designated as stocks of management concern in 2017. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a).[8] Periodic low escapements are characteristic of		

[8] For this application, 50% of the lower bound of the yield-based escapement goal range which is used by this system as a target reference point was treated as a proxy for a target reference point. This definition is consistent with stock-recruitment theory and functions by which salmon fisheries are typically managed in Alaska.

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Yakutat** - The Yakutat fishery is considered to target Sockeye, Chinook, Coho and Pink salmon. Chum salmon is classed as an IPI species in the Yakutat Unit of Certification as there is very limited local production. Sockeye goals are consistently being met or exceeded in 3 of 4 populations. Sockeye escapement goals in Lost River were not indexed or met from 2012-2016. Prior to 2012, Pink Salmon consistently met escapement goals but goals were not met in even years 2012-2016 (Munro and Volk 2017). Widespread declines in Chinook salmon in Alaska in 2016 and 2017 have included the Yakutat region following an extended period of warm water conditions in the Gulf of Alaska. Chinook escapement goals were not achieved in 2016-2017. Coho Salmon escapement goals have consistently been met or exceeded. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Prince William Sound** – Target species include Pink, Chum and Sockeye salmon. Coho and Chinook Salmon are IPI species in PWS. Escapements of Pink salmon have consistently exceeded the upper bound of the SEG's in odd years, and generally met in even years (Munro & Volk 2017). Hatchery contributions to Pink salmon spawning escapements have been assessed and hatchery-origin fish contribute to natural production in some streams, particularlily near release sites. The sole exception was 2014 when three of eight goals were not achieved due to a below average run size. Escapement goals for Chum salmon have been consistently achieved over the last 9 years. Sockeye escapement goals are consistently met or exceeded except Coghill Lake which was met in five of nine years from 2008-2016. Overall, salmon escapements in PWS have consistently exceeded 50% of the lower bound of the escapement goal range in most years. Low hatchery contributions documented for Pink and Chum salmon demonstrate that natural escapements are being met		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	primarily with natural-origin fish. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. There is a high degree of certainty that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Copper/Bering Districts** – Target stocks include Sockeye, Chinook, and Coho salmon. Pink and Chum salmon are IPI species in the Copper Bering District. Copper River Sockeye have consistently met or exceeded escapement goals over the last nine years (Munro & Volk 2017; Botz & Somerville 2017). Bering River Sockeye salmon met the lower bound in five of nine years from 2008-2016. Until recently, Copper River Chinook escapements general exceeded target goals. However, with the recent downturn in Chinook runs throughout much of Alaska, escapements have fallen below minimum goals in 2010, 2014 and 2016. In 2016, escapement was just half of the lower bound SEG (Russel et al. 2017). Coho salmon have consistently met escapement goals in both the Copper and Bering rivers from 2008-2016. In one of these years, the Bering River was underescaped and and in one year the Copper River goal was exceeded. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Lower Cook Inlet** - The fishery is considered to target Sockeye, Pink and Chum salmon. Chinook and Coho salmon areclassed as IPI species in Lower Cook Inlet (LCI)		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	commercial fisheries. Salmon-producing systems in LCI are generally small and returns can vary from system to system. The 18 Pink salmon systems have consistently met or exceed escapement goals from 2008-2016 except for 2016 in a year of widespread, below-normal Pink salmon abundance (Munro & Volk 2017). Hatchery contributions to Pink salmon spawning escapements have been assessed and hatchery-origin fish contribute to natural production in some streams, particularily near release sites (Hollowell et al. 2017). Sockeye salmon goals were met or exceeded 70% of the time from 2008-2016. The 12 Chum salmon systems have exceeded the lower end of the escapement goals 70% of the time over this period. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. There is a high degree of certainty that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Upper Cook Inlet** –Sockeye, Chinook, Coho, Pink and Chum salmon are treated as target stocks under P1. Kenai and Kasilof Sockeye salmon stocks account for the majority of the Sockeye run and consistently meet or exceed escapement goals. Susitna Sockeye are indexed with three populations and escapements regularly fall below goals. Due to a decline numbers, Susitna River Sockeye salmon were designated a stock of yield concern in 2007. Chinook salmon productivity and run sizes in Upper Cook Inlet have declined substantially since 2000. Escapements are monitored in 21 systems relative to goals and individual goals are achieved 60% of the time from 2008-2016 (Munro & Volk 2017). Over this period, annual goals were achieved less than 50% of the time in nine systems. As a result, six Upper Cook Inlet (UCI) Chinook populations were designated as stocks of management concern and one as a stock of yield concern. Poor returns appear primarily related to marine rearing conditions and unrelated to commercial fishery harvest rates. Coho salmon are indexed relative to goals in three systems. Individual goals are achieved or exceeded about 60% of the time from 2008-2016 but goals in two systems have been achieved in fewer than 50% of these years. For Pink salmon, there are no formal escapement goals for Upper Cook Inlet but runs		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	are evaluated from commercial fisheries catch rates and escapement counts directed at other species, primarily Chinook and Sockeye salmon. Commercial fishery effort is low for Pink salmon and harvests are small. Pink salmon exploitation rates are very low and the evidence suggests fisheries have minimal impact on stock status (Willette et al. 2003). Chum salmon are indexed relative to goals in one system. This escapement goal has consistently been achieved or exceeded in most years. Like Pink salmon, Chum salmon are not heavily exploited in Upper Cook Inlet. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Bristol Bay** - Sockeye, Chinook, Coho, Pink and Chum salmon are treated as target stocks under P1. Escapements of Sockeye salmon have exceeded the lower end of the TRP (sustainable or optimum escapement goal in each of the past nine years (Munro & Volk 2017) in all drainages. The Kvichak River did not meet escapement in 2003 and 2004 but has met or exceeded the lower end of the goal in every year since. Chinook salmon escapements in the relatively large Nushagak River have exceeded the lower end of the TRP in each of the past nine years (Munro & Volk 2017). Escapements of smaller stocks inhabiting the Naknek, Alagnak, and Egegik rivers have fluctuated around the lower end of escapement goal ranges and fallen below in 2015 and 2016 with the widespread downturn in marine conditions for Chinook Salmon. Odd-year Pink salmon are largely absent in Bristol Bay. Until recently, even-year Pink salmon in Bristol Bay were harvested with relatively low effort by locally based vessels; CPUE and sonar counts were used to manage the fishery. The fishing effort increased in 2010 and 2012, and ADF&G established a lower end SEG of 165,000 for the even-year run effective in beginning in 2014. Nushagak River Chum salmon are incidentally taken in large numbers in the fishery for Sockeye salmon; escapement exceeded the lower-bound SEG of 190,000 in every year from 2008-2016.		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	(SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. There is a high degree of certainty that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Yukon River** – Target species are Chinook, Coho and Chum Salmon. Sockeye and Pink salmon are considered IPI species in the Yukon UoC because few Sockeye are present and because few Pink salmon are harvested (although abundance can be high in lower areas in some years). Between 2008 and 2016, escapement goals in the Yukon (Alaska portion) have been achieved 80% of the time for Chinook(Munro & Volk 2017). However, escapements to Canada were not achieved in 3 of four years from 2010-2013. In 2008-2016, escapement goals have been met or exceeded 90% of the time for summer Chum salmon. Since 2010, Fall Chum salmon goals have been met 85% of the time following a couple of years of lower runs. The single Coho salmon escapement goal in the Yukon has been met or exceeded in eight of nine years from 2008-2016. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Kuskokwim** – All five salmon species are addressed under P1 although commercial effort has not been significant since 2012 for Pink, Chinook, Sockeye or Chum salmon due to the lack of a large scale commercial buyer. Significant numbers of Coho salmon were caught commercially through 2015 but not in 2016-2017. Escapements of Chum		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	salmon have generally varied around escapement goal ranges in 2006-2016 (Munro and Volk 2017). Coho and Sockeye salmon escapement goals have consistently been met or exceeded. Chinook salmon runs to the Kuskowim have been poor since 2012 due to an extended period of unfavorable ocean conditions for Chinook salmon runs throughout much of Alaska. Escapement goals for Chinook salmon have not been consistently achieved for most of the monitored individual stocks from 2008-2013. ADF&G subsequently reconstructed the total run of Chinook salmon to the Kuskokwim River - based on this new analysis it was concluded that previous goals for tributaries were too high (Hamazaki et al. 2012). The run reconstruction and escapement goal analysis were published by ADF&G and externally reviewed by the USFWS and associates. In January 2013, the Board of Fisheries (BOF) adopted the basinwide Chinook salmon escapement goal and the revised goals for several tributaries. The new aggregate goal was met in six years from 2008-2016 including 2015 and 2016. The Kuskokwim River drainagewide escapement goal was also likely achieved in 2017, pending completion of post season analyses. Escapements in some tributaries regularly continued to fall short of goals. Also, based on a recent analysis of subsistence needs in the basin by ADF&G, the BOF increased the amount of Chinook salmon needed for subsistence in the basin—a decision that provides greater protection of subsistence needs over commercial fishing. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Kotzebue** - The Kotzebue salmon fishery is considered to target only Chum salmon. No significant harvest of Sockeye, Chinook, Coho or Pink salmon occurs in this area which are considered IPI species for the purposes of this assessment. Chum salmon have met the escapement goals in most years when surveys have been conducted but weather often prohibits aerial surveys (Menard 2012, Menard and Kent 2012; Munro and Volk 2017). Inseason test fishing and CPUE indicate the stocks indicate adequate abundance in recent years.		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	(SG60) – See SG80. (SG80) – Escapement goals and inseason monitoring (600 fish index catch) enable the manager to close fishing well above a level that might impair reproductive capacity. The fishery meets this level of performance. (SG100) - The fishery does not meet this level of performance due to the limited availability of data escapement estimates in many years. **Norton Sound** – Target species include Coho, Pink and Chum salmon. There was no reported catch of Chinook salmon in recent years. The catch of Sockeye salmon was 0.5% of the total harvest. Therefore, Sockeye and Chinook salmon are considered IPI species. Chum salmon abundance has increased since the early 2000s (Menard 2012a) and all escapement goals have been met or exceeded since 2013. Prior to that, Chum salmon have fluctuated about the lower escapement goal. Escapements of Coho, Sockeye and Pink salmon have consistently exceeded the lower end of the target goals in recent years (Munro & Volk 2017). Escapements of Chinook salmon have regularly failed to meet the lower escapement goal, even though commercial harvests have been very limited. (SG60) – See SG80. (SG80) – The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. (SG100) - This fishery fails to meet this level of performance because Chinook have widely failed to reach the lower end of the escapment goals over the last few years. **Kodiak** – Target species include Sockeye, Coho, Pink, and Chum salmon. ommercial fisheries are not currently directed toward Chinook salmon which are harvested incidentally in directed Sockeye and Pink salmon fisheries (Fuerst and Jackson 2018). Catches of Chinook salmon may be significant in relation to established escapement goals and fisheries are actively managed for Chinook salmon goals. Therefore, all five salmon species are assessed under P1 for the Kodiak SMU as was the case in the previous assessment. Non-local stocks of Sockeye and Chinook salmon harvested in Kodiak area fisheries but destined for other areas of Alaska are considered to be IPI species.		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	Escapements of Sockeye, Coho, Chum and Pink salmon have generally met or exceeded escapement goals in most years from 2009-2016 (Munro & Volk 2017). Kodiak fisheries previously harvested significant numbers of Chinook salmon but catches and local escapements have declined substantially over the last 10 years concurrent with a widespread decline in marine survival. Escapements of the two index stocks, Karluk and Ayakulik, have consistently failed to meet escapement goals. However, current fishery impact on depressed local stocks are limited by time and area restrictions and a non-retention requirement. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. It is highly likely that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Chignik** – Sockeye, Chinook, Chum and Pink salmon are targeted by the commercial fishery in this SMU. Coho salmon qualify as an IPI species as catches average only 3% of the annual total. Escapements of Sockeye, Chinook, Chum and Pink salmon have generally met or exceeded escapement goals in 2009-2016 (Munro & Volk 2017). The Chinook salmon goal was reached in eight of nine years. The Chum salmon goal was met in every year. Pink salmon goals were met 80% of the time. Sockeye salmon goals were reached in every year. Quantitative reference points have not been developed for Chignik Coho because fishing effort is low on this late returning species (Anderson & Nichols 2012). The previous assessment identified a condition for establishing appropriate reference points. ADFG subsequently conducted additional assessments and determined that the large majority of the run returns after the fishing season. The surveillance team recognized that the current harvest rate on Chignik Lake system Coho salmon is very low and does not warrant a conservation concern, especially given that the habitat is relatively pristine and there is no hatchery production. An analysis of Chignik Coho salmon performance against the IPI requirements subsequently closed the previous condition in 2015 (IFC 2015). (SG60) – See SG80.		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	(SG80) – See SG100. (SG100) - The fishery meets this level of performance. There is a high degree of certainty that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. **Peninsula/Aleutian Is.** - All five salmon species are targeted by the commercial fishery in the SMU. There are no IPI species in this fishery. Sockeye, Coho, Chum and Pink salmon have consistently met or exceeded escapement goals in 2008-2016 (Munro & Volk 2017). In the three Coho systems monitored for escapements, the lower thresholds were exceeded 80% of the time over the past 9 years of monitoring. Chum salmon in five index streams met or exceeded goals 70% of the time. Pink salmon met or exceeded goals 50% of the time. Sockeye salmon exceeded lower escapement goals 80% of the time over the past 9 years for the 14 established escapement goals. Swanson Lagoon Sockeye have been declared a stock of concern because of natural blockage to the entrance of the lagoon. The directed fishery has been closed in waters adjacent to Swanson Lagoon. Chinook are primarily harvested incidental to Sockeye Salmon fisheries although periodically there are directed fisheries. Chinook escapements have met or exceeded escapement goals about 50% of the time from 2008-2017 (Munro & Volk 2017; Johnson et al. 2018) This fishery intercepts significant numbers of Sockeye and Chum salmon destined for other areas of western Alaska, notably including Bristol Bay. Therefore, status of other stocks is also a consideration in the scoring of the Peninsula/ Aleutian Island SMU. However, related escapement goals are consistently being achieved. (SG60) – See SG80. (SG80) – See SG100. (SG100) - The fishery meets this level of performance. There is a high degree of certainty that target stocks in this SMU are above the point where recruitment is impaired because spawning escapements generally meet or exceed objective goals that have been demonstrated to be sustainable and maintain high levels of production. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. However, escapements very seldom fall below 50% of the lower bound of the escapement goal range where risks to long-term viability might substantially increase (MSC 2012a). Long-term assessment data has		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity.		
B	Stock status in relation to target reference point (TRP, e.g. target escapement goal or target harvest rate)		
Guide pos		The SMU is at or fluctuating around its TRP.	There is a **high degree of certainty** that the SMU has been fluctuating around its TRP, or has been above its target reference point over recent years.
Met?		Yes (all UoCs)	No: Southeast Alaska, Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Kodiak Yes: Prince William Sound, Lower Cook Inlet, Bristol Bay, Chignik, Peninsula/Aleutian Island
Justification	Target reference points (TRP) in Alaska salmon fishery management are defined by escapement goal ranges established for specific species, stocks and areas. Three types of goals are defined depending on the nature of the available escapement assessment information. SEGs are defined as a level of escapement that is known to provide for sustained yield over at least a 5 to 10-year period. BEGs are defined as levels of escapement that provide the greatest potential for maximum sustained yield (MSY). Optimum Escapement Goals (OEG) are a specific management objective that considers biological and allocative factors – OEGs are by definition sustainable. A variety of methods are used to develop the escapement goals, but all methods are consistent with maintaining the potential for relatively high production. Munro & Volk (2012) describe the 12 methods that may be used to develop escapement goals. Escapement goal reports for each management area provide details on the methods selected to develop the goals in that region. The methods used reflects the type of information that is available. Typically, the escapement goals are based on many years of data. Large interannual variations in run returns are common in Pacific salmon and this "abundance" based strategy, has resulted in sustained high levels of productivity in virtually all of the wild salmon runs in Alaska over the long term. Some species and stocks periodically fall below target goals due to normal variation in environmental conditions. This run size variability is characteristic of salmon population dynamics and is generally related to variability in marine survival conditions. Long-term		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. A high degree of resilience is afforded by the productivity of freshwater habitats that are intact and functional throughout most of the range of Alaska salmon. This guidepost was assessed based on the success in meeting salmon escapement goals which function as target reference points in the Alaska salmon management system. The SMU was assessed to be at or fluctuating around its TRP when index stocks for all target species are generally meeting or exceeding escapement goals over the last decade but some stocks might fall below goals in some years. There is a high degree of certainty that the SMU has been fluctuating around its TRP, or has been above its target reference point over recent years when index stocks for all target species have been consistently meeting or exceeding escapement goals over the last decade. **Southeast** – Escapements of Sockeye, Coho, Pink and Chum salmon have generally exceeded the lower end of the TRP (escapement goal) for the recent period (2008-2016) (Munro & Volk 2017). These stocks are consistently well above a level that might cause recruitment to be impaired. Underages occur only occasionally in response to normal variation in run sizes which are characteristic of salmon. Sockeye salmon stocks have rebounded from 2008-2009 when many did not meet their escapement goals. Weak returns were related to marine survival conditions rather than to any management actions (Munro & Volk 2012). More recently, SEAK Sockeye are consistently meeting or exceeding established goals. The exception is McDonald Lake which is achieving escapement goals roughly half the time – this stock is currently designated a stock of yield concern. Chum salmon have generally met or exceeded escapement goals since 2011 except in the Northern Southeast Inside (NSI). The NSI area is also an area where hatchery enhancement of Chum salmon has led to significant straying in some streams. As with Sockeye, SEAK Chum salmon have largely rebounded from poor returns in 2008-2010 during a period of more-favorable marine conditions. Pink salmon have been in an extended period of high returns for the last 20 years and consistently met or exceeded escapement goals in most areas of Southeast Alaska although even year goals have not been met in a few areas beginning in 2012. Widespread declines in Chinook salmon have been observed throughout SEAK in 2016 and 2017. Similar declines have been seen throughout much of Alaska following a extended period of warm water conditions in the Gulf of Alaska. As a result of the inability to to maintain escapements despite use of specific management measures, Chinook stocks in the Chilkat, King Salmon, and Unuk rivers were designated as stocks of management concern in 2017. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points.		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	(SG100) – This standard is not achieved because Chinook salmon have often fallen below goals in recent years. **Yakutat** – Sockeye salmon goals are consistently being met or exceeded in 3 of 4 populations. Sockeye salmon escapement goals in Lost River were not indexed or met from 2012-2016. Prior to 2012, Pink salmon consistently met escapement goals but goals were not met in even years 2012-2016 (Munro and Volk 2017). Widespread declines in Chinook salmon in Alaska in 2016 and 2017 have included the Yakutat region following an extended period of warm water conditions in the Gulf of Alaska. Chinook salmon escapement goals were not achieved in 2016-2017. Coho salmon escapement goals have consistently been met or exceeded. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points. (SG100) – This standard is not achieved because Chinook salmon have often fallen below goals in recent years. **Prince William Sound** – Pink salmon are the primary target species in Prince William Ssound (PWS) with odd year returns generally much larger than even year returns. SEGs in PWS are set for each of eight districts and separately for even and odd years. Odd year escapements have generally been substantially above the upper bound of the SEG range, while even year escapements have almost always been met (Munro and Volk 2017). The sole exception was 2014 when three of eight goals were not achieved due to a below average run size. While there is a large hatchery program for Pink salmon in PWS, studies have shown that the percentage of hatchery –origin fish in the wild stock escapement has been 10% (Knudsen et al. 2015b). Chum salmon escapements have been established as lower bounds of SEGs for each of the eight districts. Escapement goals for Chum salmon have been consistently achieved over the last 9 years. Sockeye salmon escapement goals are consistently met or exceeded except Coghill Lake which was met in five of nine years from 2008-2016. Overall, salmon escapements in PWS have consistently exceeded 50% of the lower bound of the escapement goal range in most years. Low hatchery contributions to escapement documented for Pink and Chum salmon demonstrate that natural escapements are being met primarily with natural-origin fish. (SG80) – See SG100 (SG100) – The fishery meets this level of performance as all stocks are fluctuating around escapement goals which function as target reference points. **Copper/Bering Districts** – Copper River Sockeye have consistently met or exceeded escapement goals over the last nine years (Munro & Volk 2017; Botz & Somerville 2017). Bering River Sockeye salmon met the lower bound in five of nine years from 2008-2016. Until recently, Copper River Chinook salmon escapements general exceeded target goals. However, with the recent downturn in Chinook salmon runs		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	throughout much of Alaska, escapements have fallen below minimum goals in 2010, 2014 and 2016. In 2016, escapement was just half of the lower bound SEG (Russel et al. 2017). Coho salmon have consistently met escapement goals in both the Copper and Bering rivers from 2008-2016. In one of these years, the Bering River was underescaped and and in one year the Copper River goal was exceeded. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points. (SG100) – This standard is not achieved because Chinook Salmon have often fallen below goals in recent years. **Lower Cook Inlet -** Salmon-producing systems in Lower Cook Inlet are generally small and returns can vary from system to system. The 18 Pink salmon systems have consistently met or exceed escapement goals from 2008-2016 except for 2016 in a year of widespread, below-normal Pink salmon abundance (Munro & Volk 2017). Hatchery contributions to Pink salmon spawning escapements have been assessed and hatchery-origin fish contribute to natural production in some streams, particular near release sites (Hollowell et al. 2017). Sockeye goals were met or exceeded 70% of the time from 2008-2016. The 12 Chum systems have exceeded the lower end of the escapement goals 70% of the time over this period. (SG80) – See SG100 (SG100) – The fishery meets this level of performance as all stocks are fluctuating around escapement goals which function as target reference points. **Upper Cook Inlet** – Kenai and Kasilof Sockeye salmon stocks account for the majority of the Sockeye run and consistently meet or exceed escapement goals. Susitna Sockeye salmon are indexed with three populations and escapements regularly fall below goals. Due to a decline in numbers, Susitna River Sockeye salmon were designated a stock of yield concern in 2007. Chinook salmon productivity and run sizes in Upper Cook Inlet (UCI) have declined substantially since 2000. Escapements are monitored in 21 systems relative to goals and individual goals are achieved 60% of the time from 2008-2016 (Munro & Volk 2017). Over this period, annual goals were achieved less than 50% of the time in nine systems. As a result, six UCI Chinook salmon populations were designated as stocks of management concern and one as a stock of yield concern. Poor returns appear primarily related to marine rearing conditions and unrelated to commercial fishery harvest rates. Coho salmon are indexed relative to goals in three systems. Individual goals are achieved or exceeded about 60% of the time from 2008-2016 but goals in two systems have been achieved in fewer than 50% of these years. For Pink salmon, there are no formal escapement goals for UCI but runs are evaluated from commercial fisheries catch rates and escapement counts directed at other species, primarily Chinook and Sockeye salmon. Commercial fishery effort is low for		

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Scoring Issue	SG 60	SG 80	SG 100
	Pink salmon and harvests are small. Pink salmon exploitation rates are very low and the evidence suggests fisheries have minimal impact on stock status (Willette et al. 2003). Chum salmon are indexed relative to a goal in one system. This escapement goal has consistently been achieved or exceeded in most years. Like Pink salmon, Chum salmon are not heavily exploited in UCI. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points. (SG100) – This standard is not achieved because Chinook, Sockeye and Coho Salmon have often fallen below goals in recent years. **Bristol Bay** - Escapements of Sockeye salmon have exceeded the lower end of the TRP (escapement goal (SEG or OEG) in each of the past nine years in all drainages (Munro & Volk 2017). The Kvichak River did not meet escapement in 2003 and 2004 but has met or exceeded the lower end of the goal in every year since. Chinook salmon escapements in the relatively large Nushagak River have exceeded the lower end of the TRP in each of the past nine years (Munro & Volk 2017). Escapements of smaller stocks inhabiting the Naknek, Alagnak, and Egegik rivers have fluctuated around the lower end of the escapement goal ranges and fallen below in 2015 and 2016 with the widespread downturn in marine conditions for Chinook salmon. Odd-year Pink salmon are largely absent in Bristol Bay. Until recently, even-year Pink salmon in Bristol Bay were harvested with relatively low effort by locally based vessels; CPUE and sonar counts were used to manage the fishery. The fishing effort increased in 2010 and 2012, and ADF&G established a lower end SEG of 165,000 for the even-year run effective in beginning in 2014. Nushagak River Chum salmon are incidentally taken in large numbers in the fishery for Sockeye salmon; escapement exceeded the lower-bound SEG of 190,000 in every year from 2008-2016. (SG80) – See SG100 (SG100) – The fishery meets this level of performance as all stocks are fluctuating around escapement goals which function as target reference points. **Yukon River** – Between 2008 and 2016, escapement goals in the Yukon (Alaska portion) have been achieved 80% of the time for Chinook(Munro & Volk 2017). However, escapements to Canada were not achieved in 3 of four years from 2010-2013. In 2008-2016, escapement goals have been met or exceeded 90% of the time for summer Chum. Since 2010, Fall Chum goals have been met 85% of the time following a couple years of lower runs. The single Coho salmon goal in the Yukon has been met or exceeded in eight of nine years from 2008-2016. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	long term around escapement goals which function as target reference points. (SG100) – This standard is not achieved because Chinook Salmon have periodically fallen below goals. **Kuskokwim** –Escapements of Chum salmon have generally varied around escapement goal ranges in 2006-2016 (Munro and Volk 2017). Coho and Sockeye salmon goals have consistently been met or exceeded. Chinook salmon runs to the Kuskowim have been poor since 2012 due to an extended period of unfavorable ocean conditions for Chinook salmon throughout much of Alaska. Escapement goals for Chinook salmon have not been consistently achieved for most of the monitored individual stocks from 2008-2013. ADF&G subsequently reconstructed the total run of Chinook salmon to the Kuskokwim River - based on this new analysis it was concluded that previous goals for tributaries were too high (Hamazaki et al. 2012). The run reconstruction and escapement goal analysis were published by ADF&G and externally reviewed by the USFWS and associates. In January 2013, the BOF adopted the basinwide Chinook escapement goal and the revised goals for several tributaries. The new aggregate goal was met in six years from 2008-2016 including 2015 and 2016. The Kuskokwim River drainagewide escapement goal was also likely achieved in 2017, pending completion of post season analyses. Escapements in some tributaries regularly continued to fall short of goals. Based on a recent analysis of subsistence needs in the basin by ADF&G, the BOF increased the amount of Chinook salmon needed for subsistence in the basin—a decision that provides greater protection of subsistence needs over commercial fishing. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points. (SG100) – This fishery fails to meet this level of performance due to questions regarding the status of Chinook Salmon during an extended period of poor returns. Although new analyses suggest Chinook salmon escapement has been meeting an aggregate goal in recent years, population-specific goals are not always reached. **Kotzebue** - Chum salmon have met the escapement goals in most years when surveys have been conducted but weather often prohibits aerial surveys (Menard 2012, Menard and Kent 2012; Munro and Volk 2017). Inseason test fishing and CPUE indicate the stocks indicate adequate abundance in recent years. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points. (SG100) – The fishery does not meet this level of performance due to the limited availability of data escapement estimates in many years. **Norton Sound** – Chum abundance has increased since the early 2000s (Menard 2012a) and all escapement goals have been met or exceeded since 2013. Prior to that, Chum salmon have fluctuated about the lower escapement goal. Escapements of Coho, Sockeye and Pink salmon have consistently exceeded the lower end of the		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	target goals in recent years (Munro & Volk 2017). Escapements of Chinook salmon have fluctuated regularly fail to reach the lower escapement goal. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points. (SG100) – This standard is not achieved because hinook salmon have often fallen below goals in recent years. **Kodiak** – Escapements of Sockeye, Coho, Chum and Pink salmon have generally met or exceeded escapement goals in most years from 2009-2016 (Munro & Volk 2017). Kodiak fisheries previously harvested significant numbers of Chinook salmon but catches and local escapements have declined substantially over the last 10 years concurrent with a widespread decline in marine survival for all Chinook salmon stocks. Escapements of the two index stocks, Karluk and Ayakulik, have consistently failed to meet escapement goals. However, current fishery impact on depressed local stocks are limited by time and area restrictions and a non-retention requrirement. (SG80) – The fishery meets this level of performance as all stocks are fluctuating in the long term around escapement goals which function as target reference points. While Chinook stocks regularly fall below historical target reference points, escapements do not appear limited by the commercial fishery because numbers have not rebounded following fishery restrictions to protect Chinook. (SG100) – This standard is not achieved because Chinook Salmon have periodically fallen below goals in recent years. **Chignik** – Escapements of Sockeye, Chinook, Chum and Pink salmon have generally met or exceeded escapement goals in 2009-2016 (Munro & Volk 2017). The Chinook salmon goal was reached in eight of nine years. The Chum salmon goal was met in every year. Pink salmon goals were met 80% of the time. Sockeye salmon goals were reached in every year. Quantitative reference points have not been developed for Chignik Coho salmon because fishing effort is low on this late returning species (Anderson & Nichols 2012). The previous assessment identified a condition for establishing appropriate reference points. ADFG subsequently conducted additional assessments and determined that the large majority of the run returns after the fishing season. The surveillance team recognized that the current harvest rate on Chignik Lake system Coho salmon is very low and does not warrant a conservation concern, especially given that the habitat is relatively pristine and there is no hatchery production. An analysis of Chignik Coho salmon performance against the IPI requirements resulted in closure of the previous condition in 2015 (IFC 2015). (SG80) – See SG100 (SG100) – The fishery meets this level of performance as all stocks are fluctuating around escapement goals which function as target reference points. **Peninsula/ Aleutian Is**. - Sockeye, Coho, Chum and Pink salmon have consistently met		

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Scoring Issue	SG 60	SG 80	SG 100
	or exceeded escapement goals in 2009-2016 (Munro & Volk 2017). In the three Coho salmon systems monitored for escapements, the lower thresholds were exceeded 80% of the time over the past 9 years of monitoring. Chum salmon in five index streams met or exceeded goals 70% of the time. Pink salmon met or exceeded goals 50% of the time. Sockeye salmon exceeded lower escapement goals 80% of the time over the past 9 years for the 14 established escapement goals. Swanson Lagoon Sockeye have been declared a stock of concern because of natural blockage to the entrance of the lagoon. The directed fishery has been closed in waters adjacent to Swanson Lagoon. This fishery intercepts significant numbers of Sockeye and Chum salmon destined for other areas of western Alaska, notably including Bristol Bay. Therefore, status of other stocks is also a consideration in the scoring of the Peninsula/ Aleutian Island SMU. However, related escapement goals are consistently being achieved. (SG80) – See SG100 (SG100) – The fishery meets this level of performance as all stocks are fluctuating around escapement goals which function as target reference points.		
C	Status of component populations		
Guide post			The **majority** of component populations in the SMU are within the range of expected variability
Met?			No: Southeast Alaska, Upper Cook Inlet, Yukon, Norton Sound, Kodiak Yes: Yakutat, Copper/Bering, Prince William Sound, Lower Cook Inlet, Bristol Bay, Chignik, Kuskokwim, Kotzebue, Peninsula/Aleutian Island
Justification	Alaska has a formal policy and procedure for recognizing stocks or populations which chronically fall below the range of expected variability. This guidepost was assessed on the basis of this designation. Alaska's Policy for the Management of Sustainable Salmon Fisheries (SSFP; 5 AAC 39.222) directs ADF&G to provide the BOF with reports on the status of Salmon stocks and identify any salmon stock that presents a concern. In consultation with ADF&G, the BOF may designate Stocks of Concern. The SSFP defines three levels of concern (Yield, Management, and Conservation) with yield being the lowest level of concern and conservation the highest level of concern.		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	A stock of Yield Concern is defined as "a concern arising from a chronic inability, despite the use of specific management measures, to maintain specific yields, or harvestable surpluses. Chronic inability is defined as "the continuing or anticipated inability to meet expected yields over a 4 to 5 year period. A stock of Management Concern is defined as "a concern arising from a chronic inability, despite the use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, OEG, or other specified management objectives for the fishery. A stock of Conservation Concern is defined as "a concern arising from a chronic inability, despite the use of specific management measures, to maintain escapements for a stock above a sustained escapement threshold (SET). sustained escapement threshold (SET) is defined as "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. However, a consistent methodology for identifying an SET has not been established and a stock of conservation concern has never been designated. The BOF requires recovery plans for stocks of concern. The ADF&G has developed or is in the process of developing recovery plans for all stocks listed as of management concern (ADF&G 2011b, ADF&G 2011c, ADF&G 2011d). The guidepost is met for an SMU where no stocks of concern have been designated. The guidepost is not met for SMUs where stocks of concern have been identified. **Southeast** – The fishery does not meet the SG100 standard. Three Chinook stocks of management concern (Chilkat King Salmon and Unuk Rivers) were designated in 2017 with the widespread downturn in Chinook returns throughout much of Alaska due to unfavorable ocean conditions. McDonald Lake Sockeye were also designated as a stock of management concern in 2017. McDonald Lake Sockeye was previously classified as a stock of management concern following low escapements from 2006 to 2009. The stock was removed as a stock of concern in 2012 because of the strength of natural run returns in 2010 and 2012 and strong fry production in the lake (Heinl et al. 2011). However, numbers have subsequently declined. **Yakutat** - The fishery meets the SG100 standard. There are no stocks of concern in the Yakutat UoC. **Prince William Sound** - The fishery meets the SG100 standard. There are no stocks of concern in the PWS UoC. **Copper/Bering Districts** - The fishery meets the SG100 standard. There are no stocks of concern in the Copper/Bering UoC. **Lower Cook Inlet** - The fishery meets the SG100 standard. There are no stocks of concern in LCI. **Upper Cook Inlet** - The fishery does not meet the SG100 standard. There are seven		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	Chinook salmon stocks of concern based on yield (1) or management (6) issues and there is one Sockeye salmon stock of yield concern. A number of Chinook salmon stocks are designated as stocks of concern. Although the Chinook salmon decline is likely marine based, and Susitna Sockeye salmon decline is poorly understood, the precise cause of the declines of all of the stocks of concern are unknown and until research demonstrates a cause and effect, the rebuilding of the stock in any specific timeframe is uncertain. ADF&G is continuing to research the causes of the decline and have decreased harvest rates on all commercial fisheries where the fishery is no longer considered to be a significant factor in affecting the recovery of the depressed stocks. Action plans have been implemented for the depressed Sockeye and Chinook salmon stocks (ADF&G 2011b, ADF&G 2011c, ADF&G 2011d). **Bristol Bay** - The fishery meets the SG100 standard. No stocks of concern exist in Bristol Bay.The Kvichak River Sockeye salmon stock was previously listed as a stock of concern but was removed from the list in 2012. The stock was previously listed because of escapements below the lower bound of the SEG that were observed prior to 2005. Conservative management actions played an important role in the rebuilding of this stock that is now consistently meeting or exceeding the lower end of the goal (Munro & Volk 2012). **Yukon River** – The fishery does not meet the SG100 standard. Chinook salmon have been designated as a stock of yield concern since 2000. This designation was upheld in the most recent review in 2015. Although the Chinook salmon stocks are not currently providing the desired level of harvest, they are generally meeting escapement goals. **Kuskokwim** - The fishery meets the SG100 standard. There are no stocks of concern in the Kuskokwim UoC. Most Chinook salmon stocks have not been meeting the previous goal, but ADF&G reconstructed the total run of Chinook salmon to the Kuskokwim River, based on a new analysis, and concluded that previous goals for tributaries were too high, suggesting that it is likely that Chinook salmon are above the point of recruitment impairment. Both the run reconstruction and escapement goal analysis received external review by the USFWS and associates. Both analyses have been published as technical reports by ADF&G (e.g., Hamazaki et al. 2012). In January 2013, the BOF adopted the basinwide Chinook salmon escapement goal and revised goals for several tributaries. **Kotzebue** - The fishery meets the SG100 standard. There are no depleted stocks in Kotzebue. **Norton Sound** – The fishery does not meet the SG100 standard. One Chinook salmon stock and one Chum salmon stock are currently designated as stocks of yield concern since 2003 and 2000 respectively. There are no stocks of management concern. **Kodiak** - The fishery does not meet the SG100 standard. Karluk River Chinook salmon is classified as stock of management concern. Directed commercial fisheries have been closed and sportfish harvests have been curtailed. Although Chinook salmon		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	decline is unprecedented in the history of the fishery, the precise cause of the decline is unknown and until research demonstrates a cause and effect, the rebuilding of the stock in any specific timeframe is uncertain. **Chignik** - The fishery meets the SG100 standard. There are no stocks of concern in the Chignik UoC. **Peninsula/ Aleutian Is.** – The fishery meets the SG100 standard. While Swanson Lagoon Sockeye salmon were designated as a stock of management concern in 2012, it is an anomaly in these SMU. A natural blockage of access to the lagoon is responsible for recent poor escapements. The recovery will depend upon habitat modification or intervention. No plans are currently available to intervene with natural blockage of access to the lagoon. There is no directed fishery on the Swanson Lagoon Sockeye salmon.		
References	Heinl et al. (2011), Munro & Volk 2012, MSC (2012a), Peterman & Dorner (2011), Piston & Heinl (2011a), Piston & Heinl (2012a), Piston & Heinl (2012b). Bernard & Jones III (2010), Dann et al. (2011), Dann et al. (2012a), Der Hovanisian & Geiger (2005), Eggers & Bernard (2011), Munro & Volk (2012). Dann et al. (2011), Dann et al. (2012a), Fair et al. (2011), Munro & Volk (2012), Templin et al. (2011a). Munro & Volk (2012); Hammarstrom & Ford 2011; Hollowell et al. 2012 ADF&G (2011b), ADF&G (2011c), ADF&G (2011d), Barclay et al. (2010), Barclay et al. (2012), Munro & Volk (2012), Shields & Dupuis (2012), Willette et al. (2003). Dann et al. (2011), Dann et al. (2012a), Jones et al. (2012), Munro& Volk (2012). ADF&G (2012a), ADF&G (2012b), Estensen et al. (2012), Munro & Volk (2012). ADF&G (2012a), ADF&G (2012b), Dann et al. (2011), Dann et al. (2012a), Brannian et al. (2006), Estensen et al. (2012), Munro & Volk (2012). Brannian et al. (2007), Hamazaki (2011), Hamazaki et al. (2012), Munro & Volk (2012). ADF&G 2011a, Brannian et al. (2007), Dann et al. (2011), Dann et al. (2012a), Munro & Volk (2012). Menard (2012b), Menard & Kent (2012), Menard et al. (2012), Munro & Volk (2012), Volk et al. (2009). Dann et al. (2011), Dann et al. (2012a), Menard (2012b), Munro & Volk (2012), Volk et al. (2009). Menard (2012a), Brannian et al. (2006), Conitz et al. (2012), Dann et al. (2011), Dann et al. (2012a), Munro & Volk (2012), Volk et al. (2009). Dann et al. (2011), Dann et al. (2012a), Eggers et al. (2011), Gregory-Eaves et al. (2003), Munro & Volk (2012), Nemeth et al. (2010b). Ruggerone & Rogers (1992), Anderson & Nichols (2012), Munro & Volk (2012).		

PI 1.1.1	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue	SG 60	SG 80	SG 100
	Dann et al. (2011), Dann et al. (2012a), Eggers et al. (2011), Munro & Volk (2012), Nemeth et al. (2010). Dann et al. (2011), Dann et al. (2012a), Eggers et al. (2011), Munro & Volk (2012), Sagalkin & Erickson (2012), Wittiveen et al. (2009).		
Stock Status relative to Reference Points			
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Reference point used in scoring relative to LRP (SI a)	Escapement goals (EGs) including Sustainable EGs and Biological EGs.	Variable, depending on stock (see Munro & Volk 2012)	Variable, depending on stock, and all stocks are fluctuating within the EG range (see Munro & Volk 2012).
Reference point used in scoring relative to TRP (SI b)	The lower bound of the EG acts as an effective and precautionary LRP.	Variable, depending on stock (see Munro & Volk 2012)	Variable, depending on stock, but all stocks are above the escapement goal the majority of the time. Because the lower bound of the escapement goals is highly precautionary, the stock status indicates that there is a low probability of recruitment overfishing (see Munro & Volk 2012).

OVERALL PERFORMANCE INDICATOR SCORE:

UoC	a	b	c	Score
Southeast	100	80	--	85
Yakutat	100	80	100	95
Prince William Sound	100	100	100	100
Copper/Bering Districts	100	80	100	95
Lower Cook Inlet	100	100	100	100
Upper Cook Inlet	100	80	--	85
Bristol Bay	100	100	100	100
Yukon River	100	80	--	85
Kuskokwim	100	80	100	95
Kotzebue	80	80	100	85
Norton Sound	80	80	--	80
Kodiak	100	80	--	85
Chignik	100	100	100	100
Peninsula/ Aleutian Is.	100	100	100	100

CONDITION NUMBER (if relevant):	--

Evaluation Table for PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock management unit (SMU) is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
A	**Rebuilding timeframes**			
	Guide post	A rebuilding timeframe is specified for the SMU **that is the shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for SMU.
	Met?	Not applicable		Not applicable
	Justification	This PI is scored only when stock status does not meet the SG80 level in PI 1.1.1 due to low stock levels, such that the SMU needs rebuilding.		
B	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the fishery-based rebuilding strategies are effective in rebuilding the SMU within the specified timeframe.	There is **evidence** that the fishery-based rebuilding strategies are being implemented effectively, or it is likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the SMU within the specified timeframe.	There is **strong evidence** that the rebuilding strategies are being implemented effectively, or it is highly likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the SMU within the specified timeframe.
	Met?	Not applicable	Not applicable	Not applicable
	Justification	This PI is scored only when stock status does not meet the SG80 level in PI 1.1.1 due to low stock levels, such that the SMU needs rebuilding.		
C	Use of enhancement in stock rebuilding			
	Guide post	Enhancement activities are **not routinely used** as a stock rebuilding strategy but may be temporarily in place as a conservation measure to	Enhancement activities are **very seldom used** as a stock rebuilding strategy.	Enhancement activities are **not used** as a stock rebuilding strategy.

PI 1.1.2		Where the stock management unit (SMU) is reduced, there is evidence of stock rebuilding within a specified timeframe		
		preserve or restore wild diversity threatened by human or natural impacts.		
	Met?	Not applicable	Not applicable	Not applicable
	Justification	This PI is scored only when stock status does not meet the SG80 level in PI 1.1.1 due to low stock levels, such that the SMU needs rebuilding.		
References				
OVERALL PERFORMANCE INDICATOR SCORE:				
Not applicable				
CONDITION NUMBER (if relevant):				--

Evaluation Table for PI 1.2.1 – Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
A	Harvest strategy design			
	Guide post	The harvest strategy is **expected** to achieve SMU management objectives reflected in PI 1.1.1 SG80 including measures that address component population status issues.	The harvest strategy is responsive to the state of the SMU and the elements of the harvest strategy **work together** towards achieving SMU management objectives reflected in PI 1.1.1 SG80 including measures that address component population status issues.	The harvest strategy is responsive to the state of the SMU and is **designed** to achieve SMU management objectives reflected in PI 1.1.1 SG80 including measures that address component population status issues.
	Met?	Yes (all UoCs)	Yes (all UoCs)	Yes (all UoCs)
	Justification	The primary objective of the harvest strategy for Alaska salmon fisheries is to achieve escapement goals established to sustain high levels of production and yield. Within the bounds of sustainability, secondary objectives allocate harvest among various user and gear groups. The strategy is designed to ensure that escapement goals are met regardless of run size. The strategy has proven very effective in responding to fluctuations in wild stock abundance as witnessed by the fact that while the annual harvests have varied by more than an order of magnitude, escapements have routinely been met for most stocks (Wiese et al. 2015). Fisheries are primarily focused in terminal areas which allow fishing effort to be regulated based on fish abundance. The fishing area is split into numerous fishing districts and statistical areas so that the manager can close specific locations as a means to protect the local spawning stock and achieve the TRP. The primary factor used to determine whether or not fishing will be allowed in a specific area is the status of the escapement to the area where the stocks in the fishing area are destined to spawn. Fishing effort is regulated based on real time run size and stock composition information which allows fishing effort to be increased or decreased consistent with progress toward escapement. Fishing effort is increased at large run sizes and decreased at small run sizes to adjust exploitation rates accordingly. Terminal fisheries ideally focus on specific species and stocks but in many fisheries multiple species or stocks harvest that have a similar or overlapping timing. In these cases, fisheries are generally regulated according to the most constraining goals. Time and area fishery openings and closures by gear and district are the primary management tool for control harvest. Fishery openings in a particular place and time are used to control the harvest of stocks bound for, or within a particular district or sub-district in order to ensure that escapement goals are met. Local area managers are delegated with emergency order authority which allows fishery openings and		

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		closings on a real time basis. Most salmon fisheries are intensively managed on a daily or even hourly basis. Area management according to escapement goal guidance and species or area specific management plans are developed by the Alaska Board of Fisheries. In-season, the harvest of each species and effort in each fishing district or sub-district is monitored daily. Commercial harvest is generally reported each day and moniotirng includes catch per effort and catch composition by species, age, sex, and length where appropriate. Escapement is monitored throughout the fishing season by aerial counts, weirs, sonar, or video. In places where hatchery production is significant, hatchery composition of the catch may be also assessed by time and area – in places like Prince William Sound hatchery assessments occur in real time during the season based on otolith samples from the harvest (hatchery fish are 100% otolith-marked). There are slight variations in different areas depending on particularities of local stocks and fisheries. In addition to widespread terminal fisheries, a number of mixed stock interception fisheries occur in Alaska waters. These include a Troll fishery in Southeast Alaska and Yakutat, and the False pass fishery on the Alaska Peninsula. Interception fisheries are generally managed for catch quotas established at a low percentage of the forecasted run size such that the fishery has low risk to the targeted or non-targeted fish stocks being exploited. Numerous studies have been conducted of interception fisheries by ADF&G over the past 30 years, primarily driven by allocation concerns of terminal harvesters and in many of the systems, escapements of the component stocks or harvest rates of non target stocks have been determined (e.g. Dann et al. 2011, Dann et al. 2012a, Eggers et al. 2011). SG60 – All UoCs meet this level of performance. (see above description.) SG80 - All UoCs meet this level of performance. (see above description.) SG100 - All UoCs meet this level of performance. (see above description.)		
B	Harvest strategy evaluation			
	Guide post	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may not have been **fully tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain SMUs at target levels.
	Met?	Yes (all UoCs)	Yes (all UoCs)	No: Southeast Alaska, Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Kodiak

PI 1.2.1	There is a robust and precautionary harvest strategy in place			
				Yes: Prince William Sound, Lower Cook Inlet, Bristol Bay, Chignik, Peninsula/Aleutian Island
	Justification	**<u>SG60</u>** - All UoCs meet this level of performance. See SG80 **<u>SG80</u>** - All UOCs meet this level of performance. Fishing performance and management activities in each area are reported every year in annual management reports, which are available online. Escapement goals and performance against the goals are periodically summarized and reviewed throughout the state in a single comprehensive report (e.g., Munro & Volk 2012). Direct evidence including documentation of in-season restrictions based on abundance and assessments of spawning escapement, demonstrates that the harvest strategy is generally achieving its objectives. Established regulations and in-season measures have consistently distributed spawning escapements around established goals. Stocks are at or above target levels for most years. In the case of sequential poor harvests or escapements below the lower bound of the TRP (SEG or BEG), actions are taken and recovery plans are completed. SG100: **Southeast** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining stocks at target levels. Chinook have widely failed to reach the lower end of the escapment goals over the last few years. As a result of the inability to to maintain escapements despite use of specific management measures, Chinook salmon stocks in the Chilkat, King Salmon, and Unuk rivers were designated as stocks of management concern in 2017. **Yakutat** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining stocks at target levels. Widespread declines in Chinook salmon in Alaska in 2016 and 2017 have included the Yakutat region following an extended period of warm water conditions in the Gulf of Alaska. Chinook Salmon have often fallen below goals in recent years. **Prince William Sound** - The fishery meets this level of performance. The harvest strategy has been fully evaluated and evidence on fishery regulation in response to abundance and escapement monitoring demonstrates that it is consistently able to maintain SMUs at target levels. Low hatcherys contributions to escapements documented for Pink and Chum salmon demonstrate that natural escapements are being met primarily with natural-origin fish. **Copper/Bering Districts** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining stocks at target levels. Chinook salmon have often fallen below goals in recent years. **Lower Cook Inlet** - The fishery meets this level of performance. The harvest strategy has been fully evaluated and evidence on fishery regulation in response to		

PI 1.2.1		There is a robust and precautionary harvest strategy in place
		abundance and escapement monitoring demonstrates that it is consistently able to maintain SMUs at target levels. **Upper Cook Inlet** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining stocks at target levels. Chinook, Sockeye and Coho salmon have often fallen below goals in recent years. Some Chinook and Sockeye salmon stocks have been designated as stocks of concern. **Bristol Bay** - The fishery meets this level of performance. The harvest strategy has been fully evaluated and evidence on fishery regulation in response to abundance and escapement monitoring demonstrates that it is consistently able to maintain SMUs at target levels. **Yukon River** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining stocks at target levels. Chinook salmon escapements are not consistently achieving the lower escapement (target) goal. **Kuskokwim** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining all Chinook salmon stocks at target levels. Commercial harvests of Chinook salmon in the Kuskokwim River are incidental and relatively small compared with overall escapement goals, and managers have reduced mesh size to further reduce Chinook bycatch. However, it is not clear that the new goal effectively protects all populations. **Kotzebue** - The fishery does not meet this level of performance due to limitations of the available escapement information for effective inseason management. Although inseason monitoring (CPUE in test fishery & commercial fishery) suggest escapements are being maintained, weather conditions prohibit annual aerial surveys that would enable full evaluation. **Norton Sound** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining stocks at target levels. Although fisheries management is responsive to low abundances of Chinook salmon, escapements have fallen below the lower escapement goal in some years largely due to low abundances. **Kodiak** - The fishery does not meet this level of performance because the management strategy has not been entirely successful in maintaining stocks at target levels. Chinook salmon have undergone recent declines and are a stock of management concern at Karluk Lake despite changes in the harvest strategy for their protection. **Chignik** - The fishery meets this level of performance. The harvest strategy has been fully evaluated and evidence on fishery regulation in response to abundance and escapement monitoring demonstrates that it is consistently able to maintain SMUs at target levels. **Peninsula/Aleutian Is.** - The fishery meets this level of performance. The harvest

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		strategy has been fully evaluated and evidence on fishery regulation in response to abundance and escapement monitoring demonstrates that it is consistently able to maintain SMUs at target levels.		
C	Harvest strategy monitoring			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Yes (all UoCs)		
	Justification	SG60 – All SMUs meet this level of performance. **Southeast** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Numerous counting weirs, aerial overflights and field foot surveys are conducted during the fishery throughout SEAK. This information is used to effectively control harvests in order to meet the TRP. For the troll fishery, harvests are closely monitored to achieve Treaty quotas and the fishery is not a factor in the conservation of these stocks at the current rate of exploitation (PSC 2012). **Yakutat** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Woods and Zeiser (2012b) explain: “Set gillnet fisheries in the Yakutat area are managed by adjusting fishing times and areas in response to inseason assessments of run strength. These actions are taken to provide adequate spawning escapements and to allow harvests of salmon that are surplus to escapement goals. Inseason assessment methods include both fishery performance and spawning escapement information. In the glacial systems, fishery performance data is utilized for management because poor visibility prevents the accurate observations of spawning escapements. BEGs and SEGs have been establishedfor all major areas and salmon species in the Yakutat area.” **Prince William Sound** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Long term in-season monitoring to determine success of the harvest strategy includes the following key components: Escapements are determined by aerial surveys for Pink and Chum Salmon and by weirs and video for Sockeye Salmon; Catch and effort, by district and opening is determined in-season as well as the contribution of hatchery and wild stocks. This information is used to effectively control harvests in order to meet the TRP. **Copper/Bering Districts** - Inseason harvests of each species and effort in each fishing district are monitored daily by the manager. Daily and cumulative Sockeye salmon spawning escapements are monitored with respect to escapement curves based on historical timing and at least weekly aerial surveys are conducted for Pink and Chum salmon. **Lower Cook Inlet** - Inseason harvests of each species and effort in each fishing district are monitored daily by the manager. Daily and cumulative Sockeye salmon		

PI 1.2.1		There is a robust and precautionary harvest strategy in place
		spawning escapements are monitored with respect to escapement curves based on historical timing and at least weekly aerial surveys are conducted for Pink and Chum salmon. **Upper Cook Inlet** - Inseason harvests of each species and effort in each fishing district are monitored daily by the manager. Daily and cumulative Sockeye and Chinook salmon spawning escapements are monitored with respect to escapement curves based on historical timing. **Bristol Bay** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Monitoring in place includes aerial, tower, and sonar counts as well as the monitoring of daily fish tickets. Stock structure is monitored by age composition analyses in some watersheds. Commercial catch in the districts is monitored by genetic stock identification (e.g., Dann et al. 2011). Escapement goals and the methods to derive goals are reviewed every three years by the Alaska BOF (e.g., Fair et al. 2012). This review process is consistent with the text of this Scoring Indicator, and allows the fishery to meet this level of performance. **Yukon River** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Inseason, managers use a series of gillnet test fisheries and mainstem sonar projects to monitor timing and abundance of each of the targeted species. Managers compare CPUE in the test fisheries and counts in the mainstem sonar with historical estimates as a means to determine whether there is sufficient abundance to open commercial fisheries while also meeting escapement goals. **Kuskokwim** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. The test fishery at Bethel is used to guide openings of the commercial fishery based on CPUE of each species and migration timing curves. This information is used to effectively control harvests in order to meet the TRP. A good relationship between the test fishery and Chinook salmon escapement to Kuskokwim tributaries was recently developed. **Kotzebue** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Inseason effort and harvests of Chum salmon in each fishing subdistrict are monitored by the manager (Menard 2012b, Menard and Kent 2012). **Norton Sound** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Test fisheries and commercial fishing indices are evaluated to estimate run strength when a commercial fishery is being considered, based on pre-season forecasts and the presence of buyers. Spawning escapements are monitored inseason with respect to anticipated escapement and historical timing. Commercial fisheries do not occur unless a buyer is present.. Commercial fisheries also use mesh size to reduce bycatch of species such as Chinook salmon. Fisheries for Chum salmon have been curtailed if incidental harvests of Chinook salmon will impact the ability to achieve the escapement goal

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
		for Chinook salmon. **Kodiak** - In-season harvests of each species and effort in each fishing district are monitored daily by the manager. Daily and cumulative Chum, Pink, Coho, Sockeye and Chinook salmon spawning escapements are monitored with respect to escapement curves based on historical timing. Most of the significant systems producing salmon are monitored by weirs or aerial counts. This information is used to effectively control harvests in order to meet the TRP. **Chignik** - Inseason harvests of each species and effort in each fishing district are monitored daily by the manager. Daily and cumulative Sockeye and Chinook salmon spawning escapements are monitored with respect to escapement curves based on historical timing. This information is used to effectively control harvests in order to meet the TRP. For Coho salmon, daily escapements through the Chignik weir are monitored through August and early September. **Peninsula/ Aleutian Is.** - Inseason harvests of each species and effort in each fishing district are monitored daily by the manager. Daily and cumulative Sockeye and some Coho spawning escapements are monitored with respect to escapement curves based on historical timing. This information is used to effectively control harvests in order to meet the TRP. For other species weekly aerial counts of spawning escapements are used to monitor and open or close fisheries in real time.		
D	Harvest strategy review			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Yes (all UoCs)
	Justification	SG100 – All UoCs meet this level of performance. Results of the management program are evaluated every year by the area staff and these reports are reviewed and approved by the regional staff. A statewide assessment of success in meeting escapement goals is completed annually (e.g., Munro & Volk 2017). Escapement goals and the methods to derive goals are reviewed every three years for each management area. Methods used to set escapement goals have been periodically evaluated and published by scientists within the Department and by scientists contracted by ADF&G. Every three years the BOF conducts an open public meeting to review performance of the management program. As part of that process, the BOF accepts and evaluates proposals from ADF&G, public, stakeholders and interested parties to improve management of the fishery through changes in regulatory management plans which define harvest strategies.		
E	Shark finning			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
	Met?	Not relevant	Not relevant	Not relevant
	Justification	Sharks are not taken by this fishery		
F	**Review of alternative measures**			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	There is not unwanted catch of target species.		
References		Munro & Volk (2012), PSC (2012). Munro & Volk (2012), Woods & Zeiser (2012a), Woods & Zeiser (2012b). Botz et al. (2012), Fair et al. (2011), Munro & Volk (2012). Munro & Volk (2012); Otis et al. (2010). Fair et al. 2010, Fair et al. (2011), Hasbrouk & Edmundson (2007), Munro & Volk (2012). Dann et al. (2011), Jones et al. (2012), Munro & Volk (2012). Conitz et al. (2012), Munro & Volk (2012). ADF&G (2011a), Brazil et al. (2011), Munro & Volk (2012). Anderson & Nichols (2012), Munro & Volk (2012), Nemeth et al. (2010). Munro & Volk (2012), Murphy & Wilburn (2012), Wilburn & Murphy (2012), Poetter & Keyse (2012), Poetter (2012), Wittiveen et al. (2009).		

OVERALL PERFORMANCE INDICATOR SCORE:

UoC	a	b	c	d	Score
Southeast	100	80	60	100	95
Yakutat	100	80	60	100	95
Prince William Sound	100	100	60	100	100
Copper/Bering Districts	100	80	60	100	95
Lower Cook Inlet	100	100	60	100	100
Upper Cook Inlet	100	80	60	100	95
Bristol Bay	100	100	60	100	100
Yukon River	100	80	60	100	95
Kuskokwim	100	80	60	100	95
Kotzebue	100	80	60	100	95
Norton Sound	100	80	60	100	95

PI 1.2.1	There is a robust and precautionary harvest strategy in place				
Kodiak	100	80	60	100	95
Chignik	100	100	60	100	100
Peninsula/ Aleutian Is.	100	100	60	100	100
CONDITION NUMBER (if relevant):					--

Evaluation Table for PI 1.2.2 – Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
A	HCRs design and application			
	Guide post	**Generally understood** HCRs are in place or available which are expected to reduce the exploitation rate as the SMU LRP is approached.	**Well defined** HCRs are in place that ensure that the exploitation rate is reduced as the LRP is approached, are expected to keep the SMU fluctuating around a target level consistent with MSY.	The HCRs are expected to keep the SMU fluctuating at or above a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, most of the time.
	Met?	Yes (all UoCs)	Yes (all UoCs)	Yes (all UoCs)
	Justification	**SG60**: All UoCs meet this level of performance. See SG100 **SG80**: All UoCs meet this level of performance. See SG100 **SG100:** Well defined harvest control rules in the form of time, area and gear regulations are in place to scale exploitation rates to ensure that spawning escapement goals consistent with high levels of sustained production are achieved. Spawning escapement goals have been developed and the fishery is managed to achieve these goals. Overarching regulations and statutes are published every three years by the Department. These regulations specify such things as fishing districts, closed waters, allowable gear, vessel specifications, seasons, openings by emergency order only, reporting requirements, allocation plans among gear groups, hatchery management plans, registration and licensing requirements, prohibited acts, setting of escapement goals by the department and other things. With a basic regulatory framework in place, management is based on in-season assessment of run strength and the ability of area management staff to quickly open fishing for specified times and in specified areas to harvest fish in excess of those estimated to be in excess escapement goal requirements. This system permits evaluation of the primary uncertainty – brood year survival – to determine the allowable fishing. Salmon "harvest control rules" are based on the expected escapement each week or so (based on historical data and timing to achieve the total stock escapement goal for the entire run. Harvests are regulated so that escapement of salmon occurs		

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
		throughout the run, generally in proportion to total abundance.		
B	HCRs robustness to uncertainty			
	Guide post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide range** of uncertainties including the ecological role of the SMU, and there is evidence that the HCRs are robust to the main uncertainties.
	Met?		Yes (all UoCs)	Yes (all UoCs)
	Justification	<u>SG80</u>: All UoCs meet this level of performance. See SG100 <u>SG100:</u> All UoCs meet this level of performance. The main uncertainty in management of Alaska Salmon fisheries is annual variation in run size. Normal variation in brood year survival due to unpredictable environmental conditions can produce large differences in harvestable fish numbers from year to year. In season assessment of run strength through escapement estimation, age composition estimation, sex ratio monitoring, catch and effort monitoring and hatchery contribution to catches provides the data needed to address the main uncertainties. The very nature of the dynamic in-season assessment management system employed which only permits fishing in times and areas where surplus production exists, was explicitly designed to address this uncertainty. The terminal location of most fisheries in close proximity to rivers of origin, locally-delegated management authority, and the ability to open and close fishing districts on a daily or hourly basis depending on real-time evaluation of stock abundances all combine to ensure that harvest control rules are robust to uncertain run strength in any given year. The few interception fisheries that occur (Troll fishery in Southeast Alaska and Yakutat, and the False pass fishery on the Alaska Peninsula) are managed for catch quotas established at a low percentage of the forecasted run size such that the fishery has low risk to the targeted or non-targeted fish stocks being exploited. These low rates provide a robust means of limiting risks of overfishing due to variable run strengths in any year. Where significant hatchery enhancement occurs, uncertainty is also introduced by the numbers and distribution of hatchery-origin which have the potential to confound management for wild escapements. This uncertainty is effectively addressed in harvest control rules by assessing hatchery contributions in the fishery by time and area (based on hatchery marking and sampling for marks). Fishery districts, times and areas are designed to allow for focused management on hatchery and wid fish.		
C	**HCRs evaluation**			
	Guide post	There is **some evidence** that tools used or available to implement	**Available evidence** indicates that the tools in use are appropriate and	**Evidence clearly shows** that the tools in use are effective in achieving the

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
		HCRs are appropriate and effective in controlling exploitation.	effective in achieving the exploitation levels required under the HCRs.	exploitation levels required under the HCRs.
	Met?	Yes (all UoCs)	Yes (all UoCs)	Yes (all UoCs)
	Justification	**SG60**: All UoCs meet this level of performance. See SG100 **SG80**: All UoCs meet this level of performance. **SG100**: All UoCs meet this level of performance. Prescriptive management plans, records of intensive annual fishery management based on abundance, and the history of effective management to achieve escapement goals provides clear evidence that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules. Excellent documentation to this effect is provided in realtime reporting of harvest and escapements, and annual fishery management reports published after each season and available on the internet.		
D	Maintenance of wild population components			
	Guide post	It is **likely** that the HCRs and tools are consistent with maintaining the diversity and productivity of the wild component population(s).	It is **highly likely**, that the HCRs and tools are consistent with maintaining the diversity and productivity of the wild component population(s).	There is a **high degree of certainty** that the HCRs and tools are consistent with maintaining the diversity and productivity of the wild component population(s).
	Met?	Yes (all UoCs)	Yes (all UoCs)	No: Southeast Alaska, Upper Cook Inlet, Yukon, Norton Sound, Kodiak Yes: Yakutat, Copper/Bering, Prince William Sound, Lower Cook Inlet, Bristol Bay, Chignik, Kuskokwim, Kotzebue, Peninsula/Aleutian Island
	Justification	**SG60**: All UoCs meet this level of performance. See SG80 **SG80**: All UoCs meet this level of performance. It is highly likely, that the HCRs and tools are consistent with maintaining the diversity and productivity of the wild component populations due to the detailed information available to estimate the significance of fishery harvests on stock components. This includes spawning escapement estimates for representative runs of significant target species, monitoring across the breadth of salmon runs and extensive fishery monitoring by gear, time and areas. This information is compared to extensive historical databases. **SG100**: The guidepost is met for an SMU where no stocks of concern have been designated. The guidepost is not met for SMUs where stocks of concern have been		

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place
		identified. **Southeast** – The fishery does not meet the SG100 standard. Three Chinook salmon stocks of management concern (Chilkat King Salmon and Unuk Rivers) were designated in 2017 with the widespread downturn in Chinook salmon returns throughout much of Alaska due to unfavorable ocean conditions. McDonald Lake Sockeye salmon were also designated as a stock of management concern in 2017. McDonald Lake Sockeye salmon was previously classified as a stock of management concern following low escapements from 2006 to 2009. The stock was removed as a stock of concern in 2012 because of the strength of natural run returns in 2010 and 2012 and strong fry production in the lake (Heinl et al. 2011). However, numbers have subsequently declined. **Yakutat** - The fishery meets the SG100 standard. There are no stocks of concern in the Yakutat UoC. **Prince William Sound** - The fishery meets the SG100 standard. There are no stocks of concern in the PWS UoC. **Copper/Bering Districts** - The fishery meets the SG100 standard. There are no stocks of concern in the Copper/Bering UoC. **Lower Cook Inlet** - The fishery meets the SG100 standard. There are no stocks of concern in LCI. **Upper Cook Inlet** - The fishery does not meet the SG100 standard. There are seven Chinook salmon stocks of concern based on yield (1) or management (6) issues and there is one Sockeye salmon stock of yield concern. Chinook salmon stocks were designated although the Chinook salmon decline is likely marine based.The Susitna Sockeye salmon decline is poorly understood, the precise cause of the declines of all of the stocks of concern are unknown and rebuilding timeframes are uncertain. ADF&G is continuing to research the causes of the decline and have decreased harvest rates on all commercial fisheries where the fishery is no longer considered to be a significant factor in affecting the recovery of the depressed stocks. Action plans have been implemented for the depressed Sockeye and Chinook salmon stocks (ADF&G 2011b, ADF&G 2011c, ADF&G 2011d). **Bristol Bay** - The fishery meets the SG100 standard. No stocks of concern exist in Bristol Bay.The Kvichak River Sockeye salmon stock was previously listed as a stock of concern but was removed from the list in 2012. The stock was previously listed because of escapements below the lower bound of the SEG that were observed prior to 2005. Conservative management actions played an important role in the rebuilding of this stock that is now consistently meeting or exceeding the lower end of the goal (Munro & Volk 2012). **Yukon River** – The fishery meets the SG80? standard. The fishery does not meet the SG100 standard. Chinook have been designated as a stock of yield concern since 2000. This desgination was upheld in the most recent review in 2015. Although the Chinook salmon stocks are not currently providing the desired level of harvest, they are generally meeting escapement goals.

PI 1.2.2	There are well defined and effective harvest control rules (HCRs) in place
	Kuskokwim - The fishery meets the SG100 standard. There are no stocks of concern in the Kuskokwim UoC. Most Chinook salmon stocks have not been meeting the previous goal, but ADF&G reconstructed the total run of Chinook salmon to the Kuskokwim River, based on a new analysis, and concluded that previous goals for tributaries were too high, suggesting that it is likely that Chinook salmon are above the point of recruitment impairment. Both the run reconstruction and escapement goal analysis received external review by the USFWS and associates. Both analyses have been published as technical reports by ADF&G (e.g., Hamazaki et al. 2012). In January 2013, the BOF adopted t a basinwide Chinook salmon escapement goal and the revised goals for several tributaries. **Kotzebue** - The fishery meets the SG100 standard. There are no depleted stocks in Kotzebue. **Norton Sound** – The fishery does not meet the SG100 standard. One Chinook salmon stock and one Chum salmon stock are currently designated as stocks of yield concern since 2003 and 2000 respectively. There are no stocks of management concern. **Kodiak** - The fishery does not meet the SG100 standard. Karluk River Chinook salmon is classified as stock of management concern. Directed commercial fisheries have been closed and sportfish harvests have been curtailed. Although the Chinook salmon decline is unprecedented in the history of the fishery, the precise cause of the decline is unknown and until research demonstrates a cause and effect, the rebuilding of the stock in any specific timeframe is uncertain. **Chignik** - The fishery meets the SG100 standard. There are no stocks of concern in the Chignik UoC. **Peninsula/ Aleutian Is.** – The fishery meets the SG100 standard. While Swanson Lagoon Sockeye salmon were designated as a stock of management concern in 2012, it is an anomaly in this SMU. A natural blockage of access to the lagoon is responsible for recent poor escapements. The recovery will depend upon habitat modification or intervention. No plans are currently available to intervene with natural blockage of access to the lagoon. There is no directed fishery on the Swanson Lagoon Sockeye salmon.
References	Munro & Volk (2012), Woods & Zeiser (2012a), Woods & Zeiser (2012b). Barclay et al. (2010), Barclay et al. (2012), Shields & Dupuis (2012), Willette et al. (2003). Brazil et al. (2011), Munro & Volk (2012).

OVERALL PERFORMANCE INDICATOR SCORE:

UoC	a	b	c	d	Score
Southeast	100	100	100	80	95
Yakutat	100	100	100	100	100
Prince William Sound	100	100	100	100	100
Copper/Bering Districts	100	100	100	100	100
Lower Cook Inlet	100	100	100	100	100

PI 1.2.2	There are well defined and effective harvest control rules (HCRs) in place				
Upper Cook Inlet	100	100	100	80	95
Bristol Bay	100	100	100	100	100
Yukon River	100	100	100	80	95
Kuskokwim	100	100	100	100	100
Kotzebue	100	100	100	100	100
Norton Sound	100	100	100	80	95
Kodiak	100	100	100	80	95
Chignik	100	100	100	100	100
Peninsula/ Aleutian Is.	100	100	100	100	100
CONDITION NUMBER (if relevant):					--

Evaluation Table for PI 1.2.3 – Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
A	Range of information			
	Guide post	**Some** relevant information related to SMU structure, SMU production and fleet composition is available to support the harvest strategy. Indirect or direct information is available on some component populations.	**Sufficient** relevant information related to SMU structure, SMU production, fleet composition and other data is available to support the harvest strategy, including harvests and spawning escapements for a representative range of wild component populations.	A **comprehensive range** of information (on SMU structure, SMU production, fleet composition, SMU abundance, fishery removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available, including estimates of the impacts of fishery harvests on the SMU and the majority of wild component populations.
	Met?	Yes (all UoCs)	Yes (all UoCs)	No: Southeast Alaska, Copper/Bering, Prince William Sound, Lower Cook Inlet, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Kodiak Yes: Yakutat, Bristol Bay, Chignik, Peninsula/Aleutian Island

PI 1.2.3		Relevant information is collected to support the harvest strategy
	Justification	**<u>SG60</u>**: All UoCs meet this level of performance. See SG80 **<u>SG80</u>**: All UoCs meet this level of performance. Extensive information is available on stock structure, stock productivity, fleet composition, stock abundance, escapement, hatchery returns, fishery removals, and hatchery contributions to harvest and escapement. The fishery is managed closely and fleet/fisher composition is known. There is a long history of collecting and reporting the harvest by District/Sub-district and fishing period to document fishery removals. Though small in relation to commercial catches, sport and subsistence harvests are also estimated. The number of boats allowed to fish is strictly controlled and documented under Alaska's limited entry program. Statutes and regulations strictly describe the allowed gear. **Southeast** – There is a long history of monitoring of harvest and spawning escapement by District. Aerial surveys, weir counts and age composition provide information of stock structure and escapement. Genetic studies have been conducted to identify Sockeye salmon populations throughout the region. Coded wire tagging is used for monitoring Coho and Chinook salmon harvest, supplemented by genetic work for the Chinook salmon fishery. Otolith marking is employed in much of the hatchery production. Limnological data are available for all of the major Sockeye salmon lakes. For Chinook, Coho, Pink and Chum salmon, catch, effort and escapement data are available. For example, aerial surveys document the spawning escapement of stock components (individual streams) of Pink and Chum salmon; weir counts are used for many Sockeye and Chinook salmon streams. Spawning escapements are monitored almost continuously (e.g., weir counts) or on a weekly basis (aerial counts on streams). Harvest data are available for each fishing district. Aerial surveys document the relative abundances of Sockeye salmon in tributary streams connected to the rearing lakes. The troll fishery has been subject to extensive stock of origin analysis using GSI methods. Sockeye, Chinook, Coho and Pink salmon meet this level of performance. Chum harvests are of mixed stocks or in hatchery terminal areas. Composition and harvest rates from specific systems and hatchery components are not well defined compared with the other species. Because of the large component of hatchery stocks in the harvest, the estimates of the significance of fish harvests on stock components is not well defined for Chum salmon. Information on the relative productivity (fitness) of hatchery and wild Salmon in natural spawning areas is being collected but is not yet available. **Yakutat** – Aerial surveys, weir counts, float surveys, and age composition provide information of stock structure and escapement for Chinook, Sockeye, Coho, and Pink salmon. Genetics stock structure data are collected on Sockeye and Chinook salmon for use in GSI studies elsewhere in SEAK where harvest composition is monitored (Woods & Zeiser 2012a). Genetic stock structure data are available for Sockeye and Chinook salmon. **Prince William Sound** – Aerial survey escapement estimates for Pink and Chum

PI 1.2.3		Relevant information is collected to support the harvest strategy
		salmon are made weekly, weather permitting, for a large number (currently 130) individual streams which are then complied by District. Weirs and video are used to estimate Sockeye salmon escapements. Hatchery contributions to the harvest are estimated for each District by week. Sampling of Pink and Chum salmon escapements have defined the range of contributions of hatchery and wild fish. Genetic stock structure has also been determined for Pink and Chum salmon populations and show little differentiation within the PWS (except between even and odd year line of Pink salmon). There is an extensive physical oceanographic monitoring program in PWS http://pwssc.org/research/ . **Copper/Bering Districts** - Genetic studies have been conducted to identify Sockeye and Chinook salmon populations throughout the watersheds (Ackerman 2010, Ackerman et al. 2011, Templin et al. 2011a). Extensive tagging, radio telemetry, and genetic data have been assembled to characterize these stocks (Templin et al. 2008, Botz et al. 2012). Upper Copper River and Copper River Delta runs of Sockeye salmon have separate escapement goals and are monitored. Aerial surveys and weir counts document the spawning escapement of Sockeye, Chinook, and Coho salmon. **Lower Cook Inlet** - Aerial surveys, weir counts and age composition provide information of stock structure and escapement (Hammarstrom & Ford 2011, Hollowell et al. 2012). Limnological data are available for all of the major lakes system and are used in determining escapement goals. **Upper Cook Inlet** - Aerial surveys, weir counts and age composition provide information of stock structure and escapement. Genetic studies have been conducted to identify Sockeye salmon populations throughout the watershed. Limnological data are available for all of the major lakes system and are used in determining escapement goals. **Bristol Bay** - Aerial surveys, sonar counts and age composition, and genetic data on Sockeye, Pink, and Chinook salmon provide information of stock structure and escapement. Genetic studies have been conducted to identify Sockeye and Chum salmon populations throughout Bristol Bay. Early and late components of the Sockeye salmon run are monitored, and Sockeye recruitment data extend for more than 50 years (Fair 2003, Baker et al. 2009). The University of Washington Alaska Salmon Program maintains three field camps where scientists conduct extensive study on all species, in cooperation with ADF&G (see for example Flynn et al. 2004, Hilborn 2006, Bue et al. 2008, Kendall et al. 2011, Quinn et al. 2012). **Yukon River** - Aerial surveys, mainstem sonar counts, weir counts and age composition provide information of stock structure and escapement. There is good information available on Chinook and Chum salmon stock components based on genetic sampling throughout the mixed stock fisheries, as well as at Pilot Station (JTC 2012). Summer and fall Chum salmon stocks are managed separately. Managers recognize that early arriving Chinook salmon tend to migrate farther upriver and into Canada. The fishery is managed closely and fleet/fisher composition is known. Coho salmon abundance is monitored in the mainstem at Pilot Station relative to an escapement goal and the harvest rate on this late returning species is low.

PI 1.2.3		Relevant information is collected to support the harvest strategy
		Kuskokwim - Aerial surveys, weir counts and age composition (Sockeye, Chinook, Coho and Chum salmon) provide information of stock structure. Genetic studies have been conducted to identify Sockeye, Chinook, Coho and Chum populations in the Kuskokwim River. **Kotzebue** - Aerial surveys, weir counts and age composition provide information of stock structure and escapement. **Norton Sound** - Aerial surveys, weir counts and age composition (depending on species and stock) in each of the Norton Sound subdistricts provide information about stock structure and escapement. **Kodiak** - Aerial surveys, weir counts and age composition provide information of stock structure and escapement. Genetic studies have been conducted to identify Sockeye salmon populations throughout the various watersheds. Early and late components of the Sockeye salmon run are monitored if appropriate and escapements from 14 Sockeye salmon systems are evaluated. Sockeye salmon recruitment data extend back to 1921 for Karluk Lake. Limnological data are available for all major Sockeye salmon lakes in the KMA, with studies dating back to the early 20th century for Karluk Lake. Sediment coring for marine isotope signatures from salmon carcasses has extended decadal escapement time series for several thousand years (Gregory-Eaves et al. 2003) on Karluk Lake. For Chinook, Coho, Pink and Chum salmon, catch, effort and escapement data are available. **Chignik** - Aerial surveys, weir counts and age composition provide relevant information of stock structure and escapement. Genetic studies have been conducted to identify Sockeye salmon populations throughout the watershed. Early and late components of the Sockeye run are monitored, and Sockeye recruitment data extend back to 1922. Limnological data are available. For Chinook, Coho, Pink and Chum salmon, catch, effort and escapement data are available. **Peninsula/ Aleutian Is.** - Aerial surveys, weir counts and age composition provide information of stock structure and escapement. Genetic studies have been conducted to identify Chum and Sockeye populations throughout the region where the catch may have originated. Previous conditions from the last MSC certification in 2007 have been met with the submission of the findings of the WASSIP program (http://www.adfg.alaska.gov/index.cfm?adfg=wassip.reports). Limnological data are available for many lakes in the Peninsula/Aleutian Islands area (Honnold et al. 1996). SG100: **Southeast –** The fishery does not meet the SG100 standard. Only a small proportion of the Chum salmon streams are monitored, and there is understood to be difficulty in identifying Chum versus Pink salmon when conducting aerial surveys (Heinl 2005). Stray hatchery Chum salmon can confound escapement counts of wild Chum salmon in some streams in NSI **Yakutat –** The fishery meets this level of performance due to the comprehensive range of information available (see SG80). **Prince William Sound –** The fishery does not meet the SG100 standard. Information

PI 1.2.3		Relevant information is collected to support the harvest strategy
		on the relative productivity (fitness) of hatchery and wild Salmon in natural spawning areas is being collected but is not yet available. Information on the relative escapements of hatchery fish into natural production areas has only recently become available. It is unclear the degree to which this information has been incorporated in estimates of relative harvest rates of wild and hatchery stock components in different areas of the sound. **Copper/Bering Districts –** Sufficient information is collected on the salmon stocks for managing the fishery, but the assessment team concludes that it is not sufficiently comprehensive to meet this high standard. In part, the lack of comprehensive information is related the large size of the watershed and the complex metapopulation structure of Chinook salmon which are harvested in aggregate by the fishery. **Lower Cook Inlet –** Sufficient information is collected on the salmon stocks for managing the fishery, but the assessment team concludes that it is not sufficiently comprehensive to meet this high standard. Recent assessments have identified significant numbers of stray hatchery-origin Pink Salmon in a number of areas and the effects on stock productivity are unclear. **Upper Cook Inlet –** Sufficient information is collected on the salmon stocks for managing the fishery, but the assessment team concludes that it is not sufficiently comprehensive to meet this high standard. Comprehensive information is not available on abundance, productivity and exploitation rates of component stocks of Susitna Sockeye salmon. Information on Coho salmon productivity and exploitation is uncertain and escapement monitoring of this species is limited. While Pink and Chum Salmon do not appear to be heavily exploited, only very limited information on productivity and abundance of these species exists. **Bristol Bay –** The fishery meets this level of performance due to the comprehensive range of information available (see SG80 explanation). **Yukon River –** Sufficient information is collected on the salmon stocks for managing the fishery, but the assessment team concludes that it is not sufficiently comprehensive to meet this high standard. The lack of comprehensive information is related the large size of the watershed, the complex species, metapopulation, size and age structure; and successive harvest of this mixed stock complex in fisheries progressively upriver. **Kuskokwim –** Available information is adequate for supporting the harvest strategy but it is not comprehensive in part because the watershed is so large. For example, subcomponents of all stocks are not monitored, escapement counts are not available until most fish pass through the commercial fishery, and commercial fishery CPUE can be an imperfect index of run strength. The fishery does not meet this level of performance. **Kotzebue –** The information on Chum salmon collected in Kotzebue is not considered comprehensive (e.g., weather limits surveys), though it is sufficient to manage the modest commercial fishery.

<table>
<tr><th colspan="2">PI 1.2.3</th><th colspan="3">Relevant information is collected to support the harvest strategy</th></tr>
<tr><td></td><td></td><td colspan="3"> Norton Sound – Sufficient information is collected on the salmon stocks for managing the fishery, but the assessment team concludes that it is not sufficiently comprehensive to meet this high standard.
Kodiak – Sufficient information is collected on the salmon stocks for managing the fishery, but the assessment team concludes that it is not sufficiently comprehensive to meet this high standard. Interception rates of salmon destined for other UoCs and hatchery contributions to local harvests are not fully quantified. Factors limiting productivity of the Chinook Salmon are unclear. As such, the fishery does not meet this level of performance.
Chignik – A comprehensive range of information (see SG80) supports the harvest strategy, so allowing the fishery to meet this level of performance. Don't understand the reference to SG80 score is 95
Peninsula/ Aleutian Is. – The fishery meets this level of performance due to the comprehensive range of information available (see SG80). Genetic Stock Identifcation sampling is adequate to identify the stock composition of Sockeye in this mixed stock interception fishery. </td></tr>
<tr><td rowspan="4">B</td><td colspan="4">Monitoring</td></tr>
<tr><td>Guide post</td><td>SMU wild abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.</td><td>SMU wild abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.</td><td>All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.</td></tr>
<tr><td>Met?</td><td>Yes (all UoCs)</td><td>Yes (all UoCs)</td><td> No: Southeast Alaska, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Kodiak
Yes: Yakutat, Prince William Sound, Copper/Bering, Lower Cook Inlet, Bristol Bay, Chignik, Peninsula/Aleutian Island </td></tr>
<tr><td>Justification</td><td colspan="3"> <u>SG60</u>: All UoCs meet this level of performance. See SG80
<u>SG80</u>: All UoCs meet this level of performance. Daily harvests by fishing district are monitored through fish tickets which are considered to be sufficiently accurate to manage the fishery and escapement. A rigorous catch reporting system through fish </td></tr>
</table>

PI 1.2.3		Relevant information is collected to support the harvest strategy
		processors provides daily information in real time. Data are available on a near real time basis and used to manage the fishery. Abundance is estimated during and after the season from catch and escapement information. In most areas, spawning escapements are monitored almost continuously (e.g., weir counts) or on a weekly basis (aerial counts on streams). Managers recognize and understand the uncertainty in estimates. SG100: **Southeast** - The fishery does not meet the SG100 standard. Only a small proportion of the Chum salmon streams are monitored, and there is understood to be difficulty in identifying Chum versus Pink salmon when conducting aerial surveys (Heinl 2005). Stray hatchery Chum salmon can confound escapement counts of wild Chum salmon in some streams in NSI. **Yakutat** - The fishery meets this level of performance. Information required by the harvest control rule is monitored with high frequency and high certainty. Managers have a good understanding of the inherent uncertainties and the robustness of the assessments and strategy. **Prince William Sound** – The fishery meets this level of performance. Information required by the harvest control rule is monitored with high frequency and high certainty. This includes estimates of hatchery contributions from the fishery estimated by fishing area in real time. Managers have a good understanding of the inherent uncertainties and the robustness of the assessments and strategy. **Copper/Bering Districts** - The fishery meets this level of performance. Information required by the harvest control rule is monitored with high frequency and high certainty. Managers have a good understanding of the inherent uncertainties and the robustness of the assessments and strategy. **Lower Cook Inlet** - The fishery meets this level of performance. Information required by the harvest control rule is monitored with high frequency and high certainty. Managers have a good understanding of the inherent uncertainties and the robustness of the assessments and strategy. **Upper Cook Inlet** - The fishery does not meet the SG100 standard. Information on escapement of the Susitna Sockeye stock of concern is not available in real time such that the mixed Sockeye stock in the Central Inlet can be regulated based on abundance. Inseason estimates of Coho Salmon run sizes are also incomplete. **Bristol Bay** - The fishery meets this level of performance. Information required by the harvest control rule is monitored with high frequency and high certainty. Managers have a good understanding of the inherent uncertainties and the robustness of the assessments and strategy. **Yukon River** - Information for the harvest control rule is frequently collected but this information does not have a high degree of certainty because the watershed is so large. In general, managers recognize the uncertainties, but the assessment team concludes that, overall, the fishery does not meet this high standard. **Kuskokwim** - The fishery does not meet the SG100 standard. There is high frequency

PI 1.2.3		Relevant information is collected to support the harvest strategy		
		in monitoring in the Bethel test fishery, inseason commercial fishery, and daily weir counts. However, all subcomponents are not monitored, that escapement counts are not available until most fish pass through the commercial fishery, and that commercial fishery CPUE involves uncertainty. Aerial surveys are only peak counts. **Kotzebue** - The fishery does not meet the SG100 standard. Information is collected to support the harvest control rule, such as commercial harvests and CPUE. The test fishery occurs in only one key river. Managers recognize that uncertainty exists in the information, but understanding of the inherent uncertainties is not considered sufficient for the fishery to meet this level of performance. **Norton Sound** - Sufficient information is monitored by the managers to support the harvest control rule, but the assessment team does not consider this monitoring to be conducted at a sufficiently high frequency, degree of certainty or robustness, such that the fishery could be said to meet this level of performance. As such, the fishery does not meet this level of performance. **Kodiak** – Most of Kodiak stocks are terminal with some interceptions of stocks bound for other Alaskan systems. Interception fisheries have significant allocative and conservation implications. Much attention has been given to reduce interceptions in this area and to identify the composition of harvests from both local and non-local stocks where there is significant risks of high rates of interception. However, interception rates of salmon destined for other UoCs and hatchery contributions to local harvests are not fully quantified. Factors limiting productivity of the Chinook salmon are unclear. As such, the fishery does not meet this level of performance. **Chignik** - The fishery meets this level of performance. Information required by the harvest control rule is monitored with high frequency and high certainty. Managers have a good understanding of the inherent uncertainties and the robustness of the assessments and strategy. **Peninsula/ Aleutian Is.** - The fishery meets this level of performance. Information required by the harvest control rule is monitored with high frequency and high certainty. Managers have a good understanding of the inherent uncertainties and the robustness of the assessments and strategy.		
C	Comprehensiveness of information			
	Guide post		There is good information on all other fishery removals from the SMU.	
	Met?		Yes (all UoCs)	
	Justification	<u>**SG60**</u>: All UoCs meet this level of performance. See SG80 <u>**SG80**</u>: All UoCs meet this level of performance. All salmon species are monitored for commercial removals by district using fish tickets. Where appropriate, genetic stock identification is used to monitor the composition of selected species interception fisheries. Good information is also collected on subsistence, personal use and sport fishing harvest, and values are reported. Comprehensive sport harvest is estimated		

PI 1.2.3	Relevant information is collected to support the harvest strategy
	by area and species based on a statewide post season survey (https://www.adfg.alaska.gov/sf/sportfishingsurvey/). In significant sport fisheries, harvest is also assessed in real time based on inseason angler surveys. The Personal Use fishery allows Alaska residents to use non-sport gear to harvest fish for food, is limited to specific areas, requires a permit and requires catch reporting post season (http://www.adfg.alaska.gov/index.cfm?adfg=fishingpersonaluse.main). Assessments include salmon (Chinook, Chum) taken in the high seas pollock fishery. **Chignik** - All salmon species are monitored. Good information is collected on subsistence and sport fishing harvest. A portion of Sockeye salmon harvests at Cape Igvak (90% prior to July 25; Kodiak UoC) and Stepovak (80% prior to July 25; Peninsula UoC), are allocated to Chignik stock. Using this approach, management attempts to account for harvests of Chignik Sockeye salmon in other management areas. **Peninsula/ Aleutian Is.** - All salmon species and all fisheries are monitored. Good information is collected on subsistence and sport fishing harvest. Using this approach, management attempts to account for harvests of local stocks in other management areas and interceptions of stocks bound for other areas. The recent WASSIP program has provided extensive genetic mapping of stock origins, catches and escapements.
References	Woods & Zeiser (2012a), Woods & Zeiser (2012b). Ackerman (2010), Ackerman et al. (2011), Botz & Somerville (2011), Botz et al. (2012), Templin et al. (2008), Templin et al. (2011a), Templin et al. (2011b). Baker et al. (2009), Bue et al. (2008), Fair (2003), Dann et al. (2011), Dann et al. (2012a), Fair (2003), Flynn & Hilborn (2004), Hilborn (2006), Kendall & Quinn (2011), Quinn et al. (2012). ADF&G (2012a), ADF&G (2012b), Estensen et al. (2012), JTC (2012), Munro & Volk (2012).

OVERALL PERFORMANCE INDICATOR SCORE:

UoC	a	b	c	Score
Southeast	80	80	80	80
Yakutat	100	100	80	100
Prince William Sound	80	100	80	90
Copper/Bering Districts	80	100	80	90
Lower Cook Inlet	80	100	80	90
Upper Cook Inlet	80	80	80	80
Bristol Bay	100	100	80	100
Yukon River	80	80	80	80
Kuskokwim	80	80	80	80
Kotzebue	80	80	80	80
Norton Sound	80	80	80	80
Kodiak	80	80	80	80
Chignik	100	100	80	100

PI 1.2.3	Relevant information is collected to support the harvest strategy				
Peninsula/ Aleutian Is.	100	100	80		100
CONDITION NUMBER (if relevant):					--

Evaluation Table for PI 1.2.4 – Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status of the SMU		
Scoring Issue		SG 60	SG 80	SG 100
A	Appropriateness of assessment to stock under consideration			
	Guide post		The assessment **is appropriate** for the SMU and for the harvest control rule.	The assessment **takes into account** the major features relevant to the biology of the species and the nature of the UoA.
	Met?		Yes (all UoCs)	Yes (all UoCs)
	Justification	**SG80**: All UoCs meet this level of performance (see SG100). **SG100**: All UoCs meet this level of performance. The assessment includes in-season estimation of harvest, catch per effort, biological characteristics, timing and distribution of harvest and returns, and spawning escapement. Stocks incorporate populations that are managed as a group and they are specifically-defined, along with escapement goals, and monitoring. All harvests are documented by statistical area as a means to support evaluation of stock status. The harvest and escapement monitoring incorporates biological features such as migration timing. The harvest and escapement monitoring incorporates biological features such as genetic stock structure and migration timing. Spawning escapement is estimated for representative samples of stock management units for each species. Spawning escapements are monitored and directly compared with escapement goals (Munro & Volk 2012). Stock status is evaluated annually in area management reports. A more formal evaluation is conducted every three years when an escapement goal report is prepared by regional staff (typically not the fishery managers) to determine whether goals are appropriate based on the best available information and whether they are being acheived. The escapement goal review is considered by the Alaska BOF. The assessment is appropriate for the stocks by taking into account valid methods of escapement enumeration, run timing, sex ratio. Age composition, stock structure, and hatchery contribution. ADF&G provides a leadership role among salmon management agencies for using genetic methods to determine stock structure (e.g., Dann et al. 2012b). Managing fishing opportunity, by understanding the fleet's fishing power on a fine scale in time and space in response to the in-season assessment of run strength is highly appropriate.		
B	Assessment approach			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to salmon.	The assessment estimates stock status relative to reference points that are appropriate to the SMU and can be estimated.	The assessment estimates with a high level of confidence both stock status and reference points that are appropriate to the SMU and its wild

PI 1.2.4	There is an adequate assessment of the stock status of the SMU			
				component populations.
	Met?	Yes (all UoCs)	Yes (all UoCs)	No: Copper/Bering, Kotzebue Yes: Southeast, Yakutat, Prince William Sound, Lower Cook Inlet, Upper Cook Inlet, Bristol Bay, Yukon River, Kuskokwim, Norton Sound, Kodiak, Chignik, Peninsula/ Aleutian Is.
	Justification	**SG60**: All UoCs meet this level of performance. See SG80 **SG80**: All UoCs meet this level of performance. Spawning escapements are monitored and directly compared with escapement goals (Munro & Volk 2012). Alaska salmon are managed to achieve spawning escapement goal ranges which effectively serve as TRPs. In the Alaska system, escapement goals are defined as identified as SEGsBEGs. SEGs are defined as a level of escapement that is known to provide for sustained yield over at least a 5 to 10-year period. BEGs which are defined as levels of escapement that provides the greatest potential for (MSY. Spawning escapement is estimated for representative samples of stock management units for each species. Stocks incorporate populations that are managed as a group and they are specifically-defined, along with escapement goals, and monitoring. ADF&G has done extensive genetic studies of stock structure and considers the relatively fine structure of Sockeye and Chinook salmon populations in contrast to the relatively coarse population structure of the other species (e.g., Dann et al. 2009a; Templin et al. 2011b,c). Delection of index stocks is based on biological features including species distribution, migration timing, genetic stock structure and fishery sturcture. Limit reference points are not generally defined for Alaska Salmon because TRPs function effectively to avoid low escapements where recruitment might be impaired. When annual salmon runs periodically fall below levels where minimum escapement goal targets can be achieved, the management practice is to curtail fishing so that impacts are so small as to have no significant effect on the stock status. Although a variety of methods are used to develop the escapement goals, the methods are consistent with maintaining the potential for relatively high production. Munro & Volk (2012) describes the 12 methods that may be used to develop escapement goals. Escapement goal reports for each management area provide details on the methods selected to develop the goals in that region (e.g., Fair et al. 2011). The methods used reflect the type of information that is available. Typically, the escapement goals are based on many years of data. SG100: **Southeast** – The fishery meets this level of performance. The assessment estimates		

PI 1.2.4		There is an adequate assessment of the stock status of the SMU
		stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Quantitative escapement goals have been developed for Chum (8 including 3 aggregates), Pink (3 aggregates), Sockeye (9), Chinook (9), and Coho (11) Salmon. **Yakutat** – The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Quantitative escapement goals have been developed for Sockeye, Chinook, Coho and Pink salmon (Der Hovanisian & Geiger 2005, Bernard and Jones III 2010, Eggers & Bernard 2011, Munro & Volk 2012). Escapement goals have been used to management the fishery for 10 or more years. Goals are considered to be BEG except for Lost River Coho and Sockeye salmon that are SEG. **Prince William Sound** – The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Pink salmon are the primary target species in PWS with odd year returns generally much larger than even year returns. SEGs in PWS are set for each of eight districts and separately for even and odd years. Pink salmon escapement goals (SEG's) are based on multiple aerial surveys and a Percentile Method developed by Bue and Hasbrouck (2001) and implemented by Fair et al. (2011). This method contrasts the observed annual escapements (largest escapement divided by smallest escapement), measurement error in escapements, and exploitation rate of the stock to select percentiles of observed escapements for estimating lower and upper bounds of the escapement goal http://www.adfg.alaska.gov/FedAidPDFs/FMS14-06.pdf. Chum salmon escapements have been established as lower bounds of SEGs for each of the eight districts. Chum salmon escapement goals are based on multiple aerial surveys and a risk analysis that considers possible management error, needed management action or mistaken inaction taken in future years based on a precautionary reference point established using past observations of escapement (Evenson et al. 2008 and Bernard et al. 2009). There are two Sockeye salmon systems in PWS with escapement goals (Coghill and Eshamy River. Sockeye salmon escapement goals were based on weir counts and classic spawner-recruit analysis (Fair et al 2008 and 2011). Multiple aerial surveys are currently conducted on Pink and Chum salmon systems throughout PWS. These data are used to determine allowable fishing opportunity for each of the nine districts. Because there is strong synchrony in productivity between systems (caused by weather events during spawning or incubation and/or marine survival) and because the fishery is managed by District allows the ADFG to achieve escapement goals there is little risk to individual stocks. There has been a large hatchery program for Pink and Chum salmon in PWS since the early 1980's. There has been a concern about large hatchery production

PI 1.2.4		There is an adequate assessment of the stock status of the SMU
		"masking" wild stock abundance in catch statistics since inception of the program. Initially, estimates of hatchery contribution in the commercial fisheries were made using coded mico-wire tags. Currently, hatchery Pink and Chum salmon production is marked by placing distinctive bands on the otoliths on 100% of the fish released. Estimates of hatchery contribution in catches are made weekly by district and this development has eliminated the concern for hatchery production masking wild stock productivity. Studies have shown that the percentage of hatchery –origin fish in the wild stock escapement has been relatively low in most areas (Knudsen et al. 2015b). **Copper/Bering** - Quantitative escapement goals have been developed for Sockeye, Chinook, and Coho salmon. Escapement goals have been used to manage the fishery for 10 or more years. Three SEGs have been established – these include two goals for the Copper River system which effectively address component populations at a broad scale (Upper Copper River vs. Delta). Two SEGs have been established for major Coho salmon-producing systems (Copper River Delta and Bering River). A single lower Bound SEG is identified for the agggegrate run of Copper River salmon. Given that the large Copper River system supports a number of Chinook salmon populations, the single lower bound aggregate goal does not provide a high level of confidence that component populations are adequately protected. Therefore, this standard is not met. **Lower Cook Inlet** - The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Quantitative escapement goals have been developed for Sockeye, Pink and Chum salmon stocks (Munro & Volk 2012, Otis et al. 2010). **Upper Cook Inlet** – The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Quantitative escapement goals have been developed for 21 for Chinook, 10 for Sockeye, 3 for Coho and 1 for Chum salmon stocks. Quantitative reference points have not been developed for Pink salmon. However, fishing effort for these stocks is relatively low and ADF&G has determined that harvest rates are low compared to most commercial salmon fisheries and are unlikely to be a significant factor. **Bristol Bay** - The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Nine Sockeye salmon populations are assessed relative to goals including all major Sockeye salmon systems. Two Chinook salmon goals are assessed. Coho, Chum and Pink salmon are assessed in the Nushagak River relative to goals. **Yukon River** - The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Goals are identified and escapements assessed for 7 Chinook, 3 summer Chum 6 Fall Chum, and 1 Coho stocks. **Kuskokwim** - The fishery meets this level of performance. The assessment estimates

PI 1.2.4		There is an adequate assessment of the stock status of the SMU		
		stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Goals are identified and escapements assessed for 13 Chinook salmon stocks and the aggregate run, 4 Sockeye salmon stocks, and 3 Coho salmon stock. **Kotzebue** - The fishery does not meet this level of performance. Five Chum salmon escapement goals are identified but survey limitations due to poor weather limit assessment in many years. **Norton Sound** - The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Goals are identified and escapements assessed for 6 Chum salmon stocks, 3 Coho salmon stocks, 2 Chinook salmon stocks, and 2 Pink salmon stocks. **Kodiak** - The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Goals are identified and escapements assessed for 13 Sockeye salmon stocks, four Coho salmon stocks, two Pink salmon stocks, two Chum salmon stocks, and two Chinook salmon stocks. **Chignik** - The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. Goals are identified and escapements assessed for the Chinook salmon, Chum salmon, Pink salmon, and 2 Sockeye salmon stocks early and late runs). Quantitative reference points have not been developed for Chignik Coho salmon because fishing effort is low on this late returning species. **Peninsula/ Aleutian Is.** - The fishery meets this level of performance. The assessment estimates stock status and reference points with a high level of confidence appropriate to the SMU and its wild component populations. There are 14 escapement goals for Sockeye salmon, 5 for Chum salmon and 1 each for Coho, Pink, and Chinook salmon. Escapement goals are largely based on stock-recruitment relationships with consideration of Sockeye habitat conditions, including lake euphotic volume and zooplankton biomass (Wittiveen et al. 2009). Escapement goals were reviewed every three years. A number of historical goals have been dropped where survey information is unreliable and little fishing effort is occurring.		
C	Uncertainty in the assessment			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	Yes (all UoCs)	Yes (all UoCs)	No (all UoCs)
	Justification	**SG60**: All UoCs meet this level of performance. See SG80 **SG80**: All UoCs meet this level of performance. Escapement goal ranges consider data uncertainty. Extensive research into assess methods and goal development		

PI 1.2.4		There is an adequate assessment of the stock status of the SMU		
		methodologies. Managers recognize uncertainty in escapement monitoring and relationships between CPUE and actual abundance of salmon. **SG100**: The fisheries do not meet this high standard. Escapement goal ranges consider data uncertainty but do not generally incorporate uncertainties in a probabilistic way. Probabilistic methods have been applied in specific cases but this has not yet come into general practice. Notable examples include use of risk-based methods to identify sustainable escapement goal thresholds for Chum salmon in Prince William Sound escapement and application of Bayesian statistical analyses to identify escapement goals for Kenai and Kuskokwim Chinook salmon.		
D	Evaluation of assessment			
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			Yes (all UoCs)
	Justification	**SG100**: This standard is met for all UoCs. Escapement goal management has been used for decades and the stocks have remained robust. There is a sound theoretical basis for setting goals. The assessment process has been shown to be robust as witnessed by an extremely long time series of sustainable catch and escapements. ADF&G routinely considers various alternative strategies to develop and evaluate escapement goals (Munro & Volk 2012). ADF&G incorporates latest approaches for assessments and including genetic stock composition which is increasingly be applied to fisheries across the state.		
E	Peer review of assessment			
	Guide post		The assessment of SMU status, including the choice of indicator populations and methods for evaluating wild salmon in enhanced fisheries is subject to peer review.	The assessment, including design for using indicator populations and methods for evaluating wild salmon in enhanced fisheries, has been **internally and externally** peer reviewed.
	Met?		Yes (all UoCs)	No (all UoCs)
	Justification	**SG80**: All UoCs meet this level of performance. An extensive internal review process is followed for salmon assessments throughout ADF&G. This includes management and research staff at local, regional and statewide levels. Stock status is evaluated annually in area management reports. A more formal evaluation is conducted every three years when an escapement goal report is prepared by regional staff (typically not the fishery managers) to determine whether the spawning escapements were meeting the escapement goals. The escapement goal review is considered by the		

PI 1.2.4		There is an adequate assessment of the stock status of the SMU		
		Alaska BOF. The escapement goal review and the BOF review meets the intent of the MSC peer review requirement and so the fishery meets this level of performance. **SG100**: This standard is not met for any UoC. ADF&G periodically invites external review on selected topics, particularly for new methodologies or contentious issues. Examples include a 2005 review of Bristol Bay escapement goals by a team of external experts contracted by ADF&G. Outside consultants have addressed escapement goals for controversial fisheries with allocation concerns, such as the Kenai River Sockeye salmon runs. In the Yukon, stock status is also reviewed under the auspices of the Pacific Salmon Commission by the Yukon Panel, which involves Canadian management biologists. Related harvest management strategies underwent a review by external and internal experts. Similar reviews are conducted by other fishery management agencies for selected elements of Southeast Alaska Salmon fisheries, also under the Pacific Salmon Commission. However, assessments are not routinely subjected to external peer review as a general practice, particularly at a programmatic level.		
F	Representativeness of indicator populations			
	Guide post	Where indicator stocks are used as the primary source of information for making management decisions on SMUs, there is **some scientific basis** for the indicators selection.	Where indicator stocks are used as the primary source of information for making management decisions on SMUs, there is **some evidence of coherence** between the status of the indicator streams and the status of the other populations they represent within the management unit, including selection of indicator stocks with low productivity (i.e., those with a higher conservation risk) to match those of the representative SMU where applicable.	Where indicator stocks are used as the primary source of information for making management decisions on SMUs, the status of the indicator streams are **well correlated** with other populations they represent within the management unit, including stocks with lower productivity (i.e., those with a higher conservation risk).
	Met?	Yes (all UoCs)	Yes (all UoCs)	Yes (all UoCs except Kotzebue) No Kotzebue)
	Justification	**SG60**: All UoCs meet this level of performance. See SG80 **SG80**: All UoCs meet this level of performance. Where indicator stocks are used as the primary source of information for making management decisions on SMUs,		

PI 1.2.4		There is an adequate assessment of the stock status of the SMU
		there is some evidence of coherence between the status of the indicator streams and the status of the other populations they represent within the management unit SG100: **Southeast** - The UoC meets this level of performance. Reasonable numbers of monitored stocks of all species are dispersed throughout the SEAK region, and research has indicated that the productivity of salmon stocks within several hundred kilometres is correlated (Mueter et al. 2007). For Coho, Pink and Chum salmon, it is not clear that indicator streams are correlated with the full range of stocks; these species therefore do not meet this level of performance. **Yakutat** – The UoC meets this level of performance. Indicator stocks are not used as a source of information for making management decisions because the majority of tributaries for Pink and Coho salmon are monitored by aerial surveys. Sockeye and Chinook salmon escapement is monitored through weir counts. **Prince William Sound** - The UoC meets this level of performance. A subset of Pink and Chum Salmon streams within each District (currently 130) are surveyed to determine escapement. There is clear evidence from historic survey data, of a much larger number of streams, that the surveyed streams adequately reflect the productivity and migratory timing of the streams not surveyed in the District. **Copper/Bering Districts** - The UoC meets this level of performance. Indicator stocks are not used as a source of information for making management decisions because the individual stock components are monitored by aerial surveys, weir counts, and mark recapture evaluations. **Lower Cook Inlet** - The UoC meets this level of performance. Indicator stocks are usually not used as a source of information for making management decisions in LCI. The fishery exceeds this level of performance. **Upper Cook Inlet** – The UoC meets this level of performance. Indicator stocks are usually not used as a source of information for making management decisions except of the stocks with limited harvest rates. Escapement of Coho, Pink and Chum salmon have limited monitoring but data are acquired coincidental with monitoring escapements of Sockeye and Chinook salmon in addition to abundance in the catch. **Bristol Bay** - The UoC meets this level of performance. Indicator stocks are not used as a source of information for making management decisions because of the intense usage of tower and sonar counts and aerial surveys. **Yukon River** - The UoC meets this level of performance. The management system estimates total escapement (index) in the mainstem (not an indicator) using Pilot Station sonar and in some tributaries where counts can be readily made. Managers attempt to meet escapement goals for each of the monitored stocks distributed across much of the basin, plus they have management objectives for additional tributaries where formal goals are not established. Typically the escapement goals are achieved. The management approach and the pattern of meeting escapement goals for the monitored stocks provide evidence for this indicator that allows all Yukon fisheries to meet this level of performance.

PI 1.2.4		There is an adequate assessment of the stock status of the SMU		
		Kuskokwim – The UoC meets this level of performance. The Bethel test fishery is the key tool for managing the Kuskokwim River commercial fishery and this effort samples most salmon populations in the large river. Likewise, CPUE in commercial fisheries in Districts 4 and 5 represent most of the populations in those areas. Weir counts and aerial surveys provide some information on subcomponents. The overall management approach meets the intent of this PI and so the fishery meets this level of performance. **Kotzebue** - The UoC does not meet this level of performance. Key sections of tributaries are surveyed by air for Chum escapement but it is not known that these survey areas are well correlated with Chum in adjacent areas. **Norton Sound** - The UoC meets this level of performance. Indicator stocks are not used as a primary source of information for making management decisions because the majority of watersheds in Norton Sound are monitored. The fishery meets this level of performance. **Kodiak** - The UoC meets this level of performance. Indicator stocks are not used as a source of information for making management decisions because the majority of tributaries for Coho, Pink and Chum are monitored by aerial surveys. Most Sockeye, Chinook and some Coho salmon escapement is monitored through weir counts. **Chignik** – The UoC meets this level of performance. Indicator stocks are not used as a source of information for making management decisions because the majority of tributaries for Pink and Chum are monitored by aerial surveys. ADF&G published a report showing that escapements of monitored Pink and Chum salmon in the westward region were highly correlated during 1987-2007 (Finkle and Vining 2009). Sockeye, Chinook and Coho salmonescapement is monitored through weir counts. **Peninsula/ Aleutian Is.** – The UoC meets this level of performance. Indicator stocks are not used as a source of information for making management decisions because the majority of tributaries for Pink and Chum are monitored by aerial surveys. ADF&G published a report showing that escapements of monitored Pink and Chum salmon in the westward region were highly correlated during 1987¬2007 (Finkle & Vining 2009). Sockeye and Coho salmon escapement is monitored through weir counts while the Chum and Pink salmon fisheries use multiple stream escapement counts to regulate effort in fishing districts.		
G	Definition of Stock Management Units (SMUs)			
	Guide post	The majority of SMUs are defined with a clear rationale for conservation, fishery management and stock assessment requirements.	The SMUs are **well-defined** and include definitions of the major populations with a clear rationale for conservation, fishery management and stock assessment requirements.	There is an **unambiguous description** of each SMU that may include the geographic location, run timing, migration patterns, and/or genetics of component populations with a clear rationale for conservation, fishery

PI 1.2.4		There is an adequate assessment of the stock status of the SMU		
				management and stock assessment requirements.
	Met?	Yes (all UoCs)	Yes (all UoCs)	Yes (all UoCs)
	Justification	**SG60**: All UoCs meet this level of performance. See SG100 **SG80**: All UoCs meet this level of performance. See SG100 **SG100**: All UoCs meet this level of performance. Unambiguous descriptions of each SMU include the geographic location, run timing, migration patterns, and/or genetics of component populations with a clear rationale for conservation, fishery management and stock assessment requirements. Stocks are well defined in terms of timing and geographic range (nased on tagging or genetic stock identification, the geographic location (i.e. spawning areas) and timing of runs. The ADF&G genetics laboratory has pioneered development of Genetic Stock Identification (GSI) using sophisticated genetic tools which are increasingly being applied to fishery management across the state (Ackerman et al. 2011, Templin et al. 2011; Barclay et al. 2010; 2011). For instance, the WASSIP program has provided extensive documentation of the stock composition of catch and escapement throughout this region. The fishery meets this level of performance.		
References		Mueter et al. (2007), Munro & Volk (2012). Dann et al. (2011), Munro & Volk (2012), Templin et al. (2011b), Templin et al. (2011c). Ackerman (2010), Ackerman et al. (2011), Fair et al. (2011), Templin et al. (2008). Dann et al. (2011), Dann et al. (2012), Eggers et al. (2011), Munro & Volk (2012), Hammarstrom & Ford (2011). Munro & Volk (2012); Otis et al. (2010) Barclay et al. (2010), Barclay et al. (2011), Munro & Volk (2012), Willette et al. (2003), Shields & Dupois (2012). Dann et al. (2012b) ADF&G (2012a), ADF&G (2012b), Estensen et al. (2012), Munro & Volk (2012). Brannian et al. (2006), Menard (2012a), Menard et al. (2012), Munro & Volk (2012), Volk et al. (2009). Finkle & Vining (2009), Nemeth et al. (2010). Finkle & Vining (2009), Wittiveen et al. (2009).		

OVERALL PERFORMANCE INDICATOR SCORE:

UoC	a	b	c	d	e	f	g	Score
Southeast	100	100	80	100	80	100	100	95
Yakutat	100	100	80	100	80	100	100	95
Prince William Sound	100	100	80	100	80	100	100	95
Copper/Bering Districts	100	80	80	100	80	100	100	90
Lower Cook Inlet	100	100	80	100	80	100	100	95
Upper Cook Inlet	100	100	80	100	80	100	100	95

PI 1.2.4	There is an adequate assessment of the stock status of the SMU							
Bristol Bay	100	100	80	100	80	100	100	95
Yukon River	100	100	80	100	80	100	100	95
Kuskokwim	100	100	80	100	80	100	100	95
Kotzebue	100	80	80	100	80	100	80	90
Norton Sound	100	100	80	100	80	100	100	95
Kodiak	100	100	80	100	80	100	100	95
Chignik	100	100	80	100	80	100	100	95
Peninsula/ Aleutian Is.	100	100	80	100	80	100	100	95
CONDITION NUMBER (if relevant):								--

Evaluation table for PI 1.3.1 – Enhancement outcomes

<table>
<tr><td colspan="2">PI 1.3.1</td><td colspan="3">Enhancement activities do not negatively impact wild stock(s)</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">A</td><td colspan="4">Enhancement impacts</td></tr>
<tr><td>Guide post</td><td>It is likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks.</td><td>It is highly likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks.</td><td>There is a high degree of certainty that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks.</td></tr>
<tr><td>Met?</td><td>Yes (all UoCs)</td><td>No: Southeast Alaska, Prince William Sound, Kodiak, Lower Cook Inlet
Yes: Copper/Bering, Yakutat, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island</td><td>No: Southeast Alaska, Prince William Sound, Lower Cook Inlet, Kodiak
Yes: Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island</td></tr>
<tr><td>Justification</td><td colspan="3">Significant hatchery enhancement programs are currently opereated in Southeast Alaska, Copper/Bering, Prince William Sound, Lower Cook Inlet, and Kodiak. No hatchery enhancement occurs in Yakutat, Yukon, Kuskokwim, Kotzebue, Bristol Bay, Chignik, Peninsula/Aleutian Island. Small scale programs occur in Upper Cook Inlet and Norton Sound.

Southeast

<u>SG 60</u> – This standard is met for this UoC. The impact of enhancement activities on wild stocks of all five salmon species (i.e., Sockeye, Chinook, Coho, Pink and Chum) is assessed by regional planning teams composed of representatives from aquaculture associations and ADF&G staff. Enhancement levels of Sockeye, Chinook, Coho and Pink salmon are relatively modest in relation to wild numbers of these species. In 2016, returning hatchery-produced fish accounted for 11% of the Sockeye, 13% of the Chinook, 19% of the Coho, and 1% of the Pink salmon taken in the commercial common property harvest (Gray et al. 2017). The available information indicates that straying of these species is low outside of the immediate vicinity of hatcheries which are typically located separate from significant production ares. At these levels of production, it is considered that it is highly likely that enhancement activities do not have significant negative impacts on wild stocks. Chinook, Coho and Pink salmon meet this level of performance.</td></tr>
</table>

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		Sockeye salmon enhancement releases both fry and smolts. Although evidence of potential negative effects of hatchery enhancement in McDonald Lake have occurred in the past, the practice was discontinued (Heinl et al. 2011). Therefore, the team has concluded that Sockeye salmon also meet this performance level. Chum salmon hatchery production is significant in Southeast Alaska. In 2016, 81% of the common property harvest of Chum Salmon was comprised of hatchery-origin fish (Gray et al. 2017). An assessment of straying by hatchery-origin Chum salmon into wild production areas was completed by Piston & Heinl (2011a, 2012a, 2012b). Significant straying of Chum Salmon was documented into some wild streams, including from remote release sites, with averages exceeding 9% of the total escapement and with ranges >60% in individual streams. The presence of significant numbers of hatchery origin fish suggests that enhancement activities for this species may risk negative impacts on the local adaptation of wild stocks through introgression with the hatchery fish, which has a risk of decreasing the reproductive performance and diversity of wild stocks. In addition, there is a risk that such activities may impact wild rearing Chum salmon by competition. However, low incidences of stray hatchery fish were also documented in many areas. Further, rates of Chum salmon straying were not negatively correlated with with relative rates of recent escapements (where the recent escapements were compared relative to the pre-hatchery escapements). More recently a comprehensive, long-term study of hatchery straying and relative fitness of hatchery and wild Chum salmon was subsequently implemented in Southeast Alaska. A scientifically-rigorous study design was developed by a science panel composed of current and retired scientists from ADF&G, University of Alaska, aquaculture associations, and National Marine Fisheries Service. Panel members have broad experience in salmon enhancement, management, and wild and hatchery interactions. The study is addressing three objective questions: 1. What is the genetic stock structure of Pink and Chum salmon in each region? 2. What is the extent and annual variability in straying of hatchery Pink salmon in Prince William Sound (PWS) and Chum salmon in PWS and Southeast Alaska (SEAK)? 3. What is the impact on fitness (productivity) of wild Pink and Chum salmon stocks due to straying of hatchery Pink and Chum salmon? The study plan was completed in July of 2012, after funds were appropriated by the Alaska Legislature, ADF&G solicited proposals from entities interested in conducting a research program to address interaction of wild and hatchery Pink and Chum salmon in PWS and SEAK. Prince William Sound Science Center (PWSSC), in conjunction with Sitka Sound Science Center (SSSC), submitted the successful proposal and the contract was approved to conduct a portion of this project. Major elements of the study design were implemented beginning in 2013 including sampling and analysis of Chum salmon otoliths in representative natural production areas throughout southeast Alaska. Work on this project began in the summer of

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		2012 and study results are reported annually. The proportion of hatchery fish in wild stock streams was estimated using methods that closely follow those used by Piston & Heinl (2012). Nearly all of the hatchery produced Chum salmon returning to Southeast Alaska have been thermally marked, the exceptions being Chum salmon produced by the Tamgass hatchery near Metlakatla, AK. The proportion of fish of hatchery origin in a wild stock stream can be estimated by collecting otoliths from spawned-out fish present in the stream. The collected otoliths are then sent to the ADF&G Mark Lab in Juneau for reading and determination of hatchery or wild origin. Four streams were examined in 2012, while 32-33 streams were sampled in 2013 through-2015. Sampling was spread across the three subregions of Southeast Alaska with the majority of the effort being concentrated in the Northern Southeast Inside subregion. Otoliths were collected in each study stream 3 or 4 times during the spawning season. Sampling of natural production areas to estimate proportions of hatchery-origin spawners is now complete. Further research is ongoing on the relative fitness of hatchery and wild Chum salmon in selected streams. This study provided estimates of the incidence of hatchery-origin spawners in representative natural production areas of Chum salmon. Hatchery fractions in 32 SEAK streams were generally found to be low (15% or less) in the large majority of streams surveyed. This information indicates that it is likely that the Chum salmon enhancement activities in SEAK do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Chum salmon stocks in most significant natural production areas. **SG80** – This standard is not met pending completion and peer review of a report on the comprehensive hatchery-wild interaction study for Southeast Alaska Chum salmon. The previous assessment (IMM 2013) identified a condition calling for for a rigorous review of the hatchery study design. The action plan was revised during subsequent surveillance audits to provide for delivery of interim annual technical reports summarizing results of investigations including straying and genetic findings. As such, the surveillance team determined that fulfilling this milestone requires the completion of peer reviewed publications (wherein research methods will be peer reviewed, along with results) based on annual technical reports. Results of the hatchery interactions study for 2015 were published in November 2016 in an annual project report (Knudsen et al. 2016). Sampling of four streams occurred in 2017 in four northern southeast streams to assess relative fitness of hatchery and wild spawners (SSSC 2017). Manuscripts summarizing results for the first phase of the project are in preparation and are expected to be available in 2018. These manuscripts are expected to provide a complete description of the 2013-2015 PWS ocean and stream research including estimates of stream-specific and aggregate hatchery proportions of Chum Salmon in Southeast Alaska streams. **SG100** – This standard is not met based on failure to achieve SG80. **Yakutat** - There is no enhancement in Yakutat.

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		Prince William Sound **SG60** - Large-scale hatchery production programs occur in PWS for Pink and Chum Salmon. Because hatchery-origin fish may comprise 80% of the return of Pink and Chum Salmon to PWS, the 2013 re-assessment of Alaska Salmon fisheries (IMM 2013) concluded that the PWS UoC should remain under assessment pending further analysis of an ADF&G multi-year study relating to hatchery wild Salmon stock interactions and how outcomes might influence future management practices. Since that time, the AHRP has quantified the proportion of hatchery strays in stream escapements at the district PWS sound-wide levels (Knudsen et al. 2015a, 2015b). Those results provide a basis for evaluation of the potential impacts of enhancement activities of wild salmon by this assessment. This indicator was evaluated based on the CR2.0 guidance adapted for ocean-rearing Salmon species as described in Section 4.4 of this assessment. PWS hatcheries for Pink and Chum salmon are effectively managed as segregated programs which are maintained as reproductively distinct or genetically segregated from wild production. While hatchery broodstock were originally established from local wild populations and hatcheries generally operate to avoid genetic bottlenecks or selection, hatchery broodstock are now almost entirely hatchery-origin fish. This has the potential of unintentional or unnatural selection to cause hatchery and wild populations to diverge over time. Thus, the PWS hatcheries need to be evaluated based on operational guidelines established for segregated populations. Research and monitoring has demonstrated that hatchery-origin fish comprise a small percentage of the natural spawning escapement. SMU level pHOS averaged 10% for Pink Salmon and 3% for Chum salmon in PWS in 2013-2015 (Knudsen et al. 2015a, 2015b, 2016). Thus, Pink salmon meet the adapted SMU guidance for this species at the SG60 (<15%) and are approximately equivalent to SG80 level (<10%). Chum salmon meet the adapted SMU guidance for this species at both the SG60 and SG80 levels. pHOS averaged <1% for 20% of Pink salmon populations and <5% for 50% of populations (Knudsen et al. 2015b). Thus, the adapted population-level guidance for Pink Salmon is marginally met at the SG60 standard but not met at the SG80 level. pHOS averaged <1% for 30% of Chum salmon populations and <5% for 70% of populations (Knudsen et al. 2015b). This would meet the adapted standard for SG60 but not for SG80. We note that neither Pink nor Chum salmon would meet the more conservative SG60 guidance for acceptable pHOS at the population level for stream-rearing Salmon species. However, application of a standard that recognizes differences between stream-rearing and ocean rearing salmon like Pink and Chum salmon is justified according the CR2.0 guidance. Impacts of PWS Pink salmon on wild populations have also been subject to several inferential evaluations in the past. Hilborn and Eggers (2000) suggested that the hatchery program for Pink salmon in PWS replaced rather than augmented wild

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		production due to a decline in wild escapement associated with harvesting hatchery stocks and biological impacts of the hatchery fish on wild fish. However, Wertheimer et al. (2001) found that while countervailing trends in abundance of wild and hatchery fish appear to superficially support Hilborn and Eggers' arguments, a close review of the evidence does not support the conclusion. Current data do not lend support for either of the mechanisms for negative impacts proposed by Hilborn and Eggers. Wild escapements of Pink salmon have not been substantially reduced by harvest of hatchery Pink salmon and a limited incidence of hatchery straying into natural spawning areas does not support a hypothesis of significant effects on wild population fitness. High survival rates of hatchery-origin fish from release to adulthood suggest that intra-specific competition is not a significant limiting factor. CR2.0 guidance regarding percentages of hatchery-origin spawners in natural spawning areas presumes some level of reduction in wild diversity and fitness due to hatchery influence when there is no other information available. For Chum salmon in PWS, Jasper et. al. (2013) estimate genetic introgression from the hatchery population into wild stocks as a first step to directly measuring the impact of hatchery strays on wild populations. This study shows varying degrees of allele frequency shifts in four wild spawning stream populations between pre- and post-hatchery production time periods (over six generations), which means that there is indeed evidence of some genetic introgression. In this study, the proximity of a hatchery to the sampled stream and similar life histories (e.g. run timing) of the hatchery releases to the nearby wild spawners appeared to be major factors in the degree of introgression, and introgression rate was not necessarily correlated with stray rate. Understanding the impact of this introgression in terms of fitness of wild populations of Chum salmon still requires further research. The Alaska hatchery study includes evaluations of introgression effects which are expected to better inform this issue in the future. Even so, this additional information supports the pHOS modifications suggested for Pink and Chum salmon. We conclude that this fishery meets the SG60 level for Pink n and Chum salmon in PWS. Note that the score for this indicator was 60 for UoC's with substantial enhancement and 80-100 other UoC's in the statewide assessment (IMM 2013). **SG80** - pHOS averaged <1% for 20% of Pink salmon populations and 30% of Chum salmon populations (Knudsen et al. 2015a, 2015b, 2016). This does not meet the adapted population-level guidance of <1% for 50% of population at the SG80 level. Pink salmon from Prince William Sound hatcheries were documented in some Lower Cook Inlet streams (Hollowell et al. 2017) which suggests that straying isn't entirely a localized issue. Therefore, the SG80 standard is not achieved in the absence of more specific information on effects of hatchery straying on wild fitness of ocean-rearing salmon. **SG100** - This standard is not met based on failure to achieve SG80. **Copper/Bering -** Sockeye enhancement occurs in the Copper/Bering Districts at Gulkana Hatchery. Gulkana hatchery produces Sockeye salmon fry from spring-fed streamside incubators. Significant natural production also occurs in nearby spring

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		areas. Naturally-produced Sockeye salmon move downstream after emergence to rear in Paxson Lake. Hatchery-origin fish are released from the hatchery to supplement the Paxson Lake population. Hatchery fry are also outplanted upstream in Summit Lake and in nearby Crosswind Lake – neither of these lakes support significant wild Sockeye production due to a lack of spawning habitat. The donor stock for the Gulkana Hatchery is indigenous to the Gulkana River watershed, consistent with the State of Alaska Genetics Policy which is designed to minimize hatchery impacts on wild stocks. Roberson & Holder (1993) describe the initial egg takes as coming from aquifer springs located within 400m of the hatchery with additional gametes coming from fish collected at Gunn Creek on Summit Lake. The Gulkana Hatchery is an integrated hatchery program (Mobrand et al. 2005) where the hatchery broodstock is composed of individuals of both hatchery and naturally produced origins, at times approaching 40-50% naturally produced fish. All emergent fry since 2000 (1999 brood year) have been treated with strontium chloride to place distinctive marks on the otoliths of the fry. Sockeye salmon otoliths can then be examined at various life stages for presence or absence of marks created by strontium chloride to identify whether the fish is of hatchery origin. Condition 29 from the 2007 MSC assessment of the Alaska salmon fishery was to "Conduct a review of the Gulkana Sockeye hatchery program with emphasis on potential impacts to wild stocks." Results of a Gulkana review were not available at the time of the 2013 reassessment (IMM 2013). Therefore, the condition was carried over into the 2015 certification as a new condition (#4). Following review of new information provided during surveillance audits one and two, Condition 4 was closed after the second surveillance audit. **SG60** – The fishery meets this level of performance (see SG100). **SG80 -** The fishery meets this level of performance (see SG100). **SG100** – The fishery meets this level of performance. Assessments demonstrating no significant hatchery-wild interaction of Sockeye salmon provide a high degree of certainty that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks. A review of the Gulkana Hatchery was performed in 2012 by ADF&G (Stopha 2013) largely in response to the certification condition (Chaffee et al. 2007). This review determined that Prince William Sound Aquaculture Corporation was in compliance with its hatchery permit, annual management plans and other agreements with the ADF&G. The Assessment Team noted in Stopha (2013) that the current hatchery operator is functioning within strict compliance of State of Alaska policies and practices. A third-party project by an NGO assessed straying of Gulkana Hatchery fish into Upper Copper River tributaries in 2008 (Bidlack and Valentine 2009). In this work six known Sockeye salmon spawning sites, Swede Lake, Dickey Lake, Upper Fish Lake, lower Paxson Lake, Mentasta Lake, and Gunn Creek were opportunistically sampled.

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		Seventy or more readable otoliths were collected from all sites with the exception of Dickey Lake where only 14 readable otoliths were obtained. One-hundred percent of the spawners returning to the hatchery release site were of hatchery origin; no spawners observed in proximal spawning areas were of hatchery origin. No fish with strontium chloride marks were found in five of the locations with all of the otoliths obtained from Gunn Creek being marked. Gunn Creek is the release site for fish released into Summit Lake. There were no marked fish found out of 71 examined from Upper Fish Lake, the closest sampling site to the Gulkana Hatchery. The commercial, subsistence, and personal use fisheries for Sockeye salmon in the Copper River are also sampled for the presence and absence of otolith marked fish in order to estimate the contribution of Gulkana Hatchery fish to the fisheries. The Gulkana Hatchery contributed approximately 14% to the total upriver return of Sockeye salmon to the Copper River for the 2003 through 2013 seasons. Sockeye salmon escapement goals for the Copper River are evaluated every three years.. The contribution of Gulkana Hatchery fish to the escapement was taken into account when establishing the escapement goal. Established goals for wild Sockeye salmon in the Copper River basin are consistently achieved or exceeded with wild fish (PSPA 2016c). This includes delta-spawning population which is similarly timed with the Gulkana stock. More recent information is also available on the incidence of hatchery-origin fish in natural production areas of the Gulkana River basin based on analysis of historical coded wire tag recapture data (PSPA 2016c). This information corroborated previous otolith sampling results that showed a negligible contribution of hatchery-origin Sockeye to natural spawning areas outside the vicinity of the hatchery. Returns to Summit Lake and Crosswind Lake which are barren of natural production, were comprised entirely of hatchery fish. In addition, results of past sampling in the Copper River Delta, which stocks have the same run timing as the Gulkana hatchery stock, showed no hatchery strays were found there. Results are consistent with studies in other areas which demonstrate that Sockeye salmon home very strongly to natal systems and hatchery acclimation sites. A strong homing instinct is consistent with a genetic complex stock structure documented for Sockeye salmon. Patterns of inter-population genetic differences could not have been established or maintained if Sockeye salmon straying was significant. **Lower Cook Inlet** – Significant enhancement occurs in LCI with major Sockeye salmon programs and in the past, major Pink salmon programs. Hatchery enhanced fisheries have historically dominated production and harvest areas are terminal with closely monitored escapements. There are several systems with Sockeye salmon stocking and lake fertilization programs. Sockeye salmon fry plants are highly regulated using strict genetic and disease guidelines and fisheries are usually small and terminal. Limnology data are available on receiving lakes and usually have targeted systems with limited spawning capacity (CIRPT 2007). The Trail Lakes hatchery currently supports the Sockeye salmon fisheries. As the systems that are being enhanced were barren originally,

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		stock selection from other systems usually has followed advice of genetic laboratories. The curtailment of Tustumena brood stock as a gamete for Sockeye salmon hatchery operations has resulted in Hidden Lake gametes being used to support these systems, with apparently poor success. In addition to Sockeye and Pink salmon releases, CIAA also released an average of 583,000 Coho salmon over the last 10 years. Ship Creek Hatchery Complex (operated by ADF&G) has released an average of 748,000 Chinook salmon into LCI; where both of these species are primarily harvested by sport users. Hatchery programs that are currently or have in recent history supported the LCI fisheries were recently reviewed by ADF&G (Stopha 2012a, Stopha 2012b, Stopha 2013, Stopha & Musslewhite 2012; Hammarstrom & Ford 2011). The hatcheries were generally in compliance with the exception of the Port Graham. Operations at Port Graham were discontinued because of economic reasons but the program is being resurrected by the Cook Inlet Aquaculture Association. Assessments of straying by hatchery Pink salmon have been conducted in recent years. Significant levels of straying were documented in stream near hatchery release sites but the incidence was substantially lower in other areas. Notably, Pink salmon from Prince William Sound hatcheries were documented in some Lower Cook Inlet streams. Hollowell et al. (2017) report: A total of 1,187 Pink salmon otoliths were collected in 2016 from selected index streams in the Southern and Outer District, as well as the English Bay River. Otoliths were examined for thermal marks that would indicate hatchery origin. Of the 1,116 readable otoliths, 281 (25.2%) had hatchery marks with the majority of the marked otoliths (178) collected from Tutka Lagoon Creek, adjacent to TBLH. Overall, 66.9% of the hatchery-marked fish had marks indicating a Tutka Bay Lagoon Hatchery release, 14.2% had marks indicating they were released from the Port Graham SHA, and 18.9% had thermal marks from hatcheries in PWS. This was similar to findings in 2014 and 2015 when otoliths were collected from 7 index streams in the Southern District as well as the English Bay River. Hatchery marked salmon are anticipated to be found at high levels in streams located in SHAs or adjacent to hatcheries, and streams that are outside of SHAs should have reduced levels of marked fish. Excluding the Tutka Lagoon Creek and Port Graham River samples reduces the level of strayed LCI fish to 3.6% and the level of PWS strays to 5.9%. Additional information on hatchery returns and straying was presented by ADFG to the Alaska Board of Fisheries in 2019 (Otis and Hollowell 2019). Catch sampling of hatchery cost recovery fisheries in Lower Cook Inlet determined that over 95% of the harvest in these terminal fishing areas was comprised of hatchery-origin fish. Pink salmon index streams consistently met their escapement goals despite increased harvest effort on hatchery pink salmon. However, escapement to most wild index streams included marked hatchery fish. Levels of LCI hatchery fish in spawning escapements averaged from 0.4% to 7.8% in streams that were not in direct proximity to hatchery release sites. Hatchery fish comprised up to 91% of spawning escapement in streams adjacent to hatchery release sites. Prince William Sound

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		hatchery Pink Salmon were also found to stray into LCI streams in significant numbers. PWS fish contributed from 0.8 to 22.3% of the spawning escapement in LCI streams on average from 2014-2018. Current plans by Cook Inlet Aquaculture call for an increase in hatchery production in LCI as closed hatchery facilities are restored to function. **SG60** – The fishery meets this level of performance. Because these fisheries are harvested terminally, there is little risk to wild stocks. The fisheries generally are targeting a single stock and there are many subdistricts that are used for time and area closure to regulate escapements.Harvest management is precautionary and exploitation rates are generally low. Many of the enhancement activities have been curtailed in recent years and many of the available purse seine permits have not participated in the fishery. While straying of Pink salmon from hatcheries has been documented, it generally appears to be a localized issue and hatchery contributions are relatively low in natural production areas segregated from hatchery release sites. **SG80 -** The fishery does not meet this level of performance. Recent assessments of spawning escapement have identified an incidence of hatchery strays in many natural production areas including fish originating from both LCI and PWS hatchery programs. Additional assessments are needed to determine the significance and implications of observed straying levels. **SG100** – The fishery does not meet this level of performance due to the observed incidence of Pink salmon straying. **Upper Cook Inlet** - Enhancement activities are relatively limited in UCI with major Sockeye salmon programs in Tustumena Lake previously curtailed. A small Sockeye salmon hatchery program operates in Hidden Lake of the Kenai system but contributes a small percentage of the total run – Hidden Lake was not historically a significant Sockeye salmon producer due to the lack of spawning habitat. Limited Chinook salmon hatchery production occurs in the northern inlet primarily focused on terminal sport fisheries. Sockeye salmon fry plants are highly regulated using strict genetic and disease guidelines and fisheries are usually small and terminal. Limnology data are available on receiving lakes and usually have targeted systems with limited spawning capacity (CIRPT 2007, Shields & Dupuis 2012). **SG60** – This standard is met (see SG100). **SG80** – This standard is met (see SG100). **SG100** – This standard is met. The hatcheries underwent a recent review (Stopha 2012) and all hatcheries that are currently in operation have received good reviews in compliance with state policies and regulations designed to protect wild stocks. An assessment of straying from the Hidden Lake Sockeye program has previously determined the incidence to be insignificant outside the vicinity of the hatchery. Because of the intensity of the research associated with the enhancement activities and their limited impact on fisheries, the salmon hatcheries associated with stocking UCI systems are considered to have a high degree of certainty that they do not

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		impact wild salmon stocks negatively in this area. **Bristol Bay** - There is no enhancement in Bristol Bay. **Yukon River** - There are no enhancement (hatchery or lake fertilization) activities in the Alaska portion of the Yukon. A small Chinook hatchery exists in Canada that is not considered relevant to this assessment. **Kuskokwim** - There is no enhancement. **Kotzebue** - There is no enhancement. **Norton Sound** – Pilot studies are underway that plant small numbers of Coho, Chum and Chinook eggs into streams that have relatively few fish of these species. Current release levels are very low in relation to natural production. **SG60** – This standard is met (see SG100). **SG80** – This standard is met (see SG100). **SG100** – This standard is met. The assessment team concluded that it is highly likely that the small level of current stocking of eggs do not have significant negative impacts on wild stocks. **Kodiak -** Kodiak Regional Aquaculture Association (KRAA) operates the Kitoi Bay and Pillar Creek Hatcheries in the Kodiak area. The Kitoi Bay Hatchery produces Chum, Pink, Coho, and Sockeye salmon to enhance the common property salmon fisheries. The Pillar Creek Hatchery produces Sockeye salmon to enhance the common property fisheries as well as Coho salmon, Chinook salmon, and rainbow trout to enhance sport fishing opportunities on the Kodiak road system. Both hatcheries have been found to be operating in accordance with Alaska policies and prescribed practices (Musslewhite 2011a, 2011b). There is a marking requirement for late-run Sockeye salmon produced at Kitoi Bay Hatchery (Musslewhite 2011a, 2014 Annual Management Plan, Kitoi Bay Hatchery, Kodiak Regional Aquaculture Association, obtained from ADF&G, Juneau). Sockeye salmon are being marked at both hatcheries with the “dry” method. Marking of late-run Sockeye salmon began in 2012 and was followed in 2013 by 100% marking of late-run Sockeye salmon at both Pillar Creek and Kitoi Bay Hatcheries. Initial returns occurred in 2015. Historical information on hatchery contributions is also available from scale pattern analysis and a straying study conducted in Perenosa Bay (PSPA 2016d). **SG60** – This standard is met. Production from Kodiak hatcheries is small in relation to natural production and hatchery release sites have been strategically located to reduce likely straying or excessive harvests of wild stocks. Hatchery returns are concentrated in the vicinity of the hatchery release sites and concentrated fisheries occur on these sites. Managers have not identified significant concern about hatchery straying or compounding harvest management with the presence of hatchery stocks in areas where wild stock harvest predominate. **SG80** – This standard is not met. The previous assessment (IMM 2015) noted that Kodiak does not have a marking program for Pink salmon hatchery releases, an

PI 1.3.1		Enhancement activities do not negatively impact wild stock(s)
		activity essentially universally required in PWS and SEAK, the other regions that have very high production levels of hatchery fish, particularly of Chum and Pink salmon. Sockeye salmon meets this level of performance based on periodic evaluations of interceptions in the fishery by use of scale pattern analysis (Nelson and Swanton 1996; Foster 2010). These scales are quite unique and allow visual separation of Spiridon stocks from other migrating salmon. Also, Sockeye salmon have a high degree of fidelity to their natal areas (or areas imprinted as fry), so the team believed it is highly likely that Sockeye salmon stocks do not have negative impacts on wild stocks (IMM 2015). No evaluation of straying of Chum or Pink salmon has previously been undertaken in the Kodiak area. In addition, no sampling of the common property fisheries to determine the enhanced contribution is performed. Current estimates of the commercial harvest of hatchery-produced fish are based on catches in the vicinity of Kitoi Bay. For these species, it could not be concluded with high liklihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks. Therefore the team has introduced a condition for continued certification that required an analysis of the risks associated with Chinook, Coho, Pink and Chum salmon straying and uncertainty in stock identification in mixed stock fisheries. With respect to Condition 5, it was noted that hatchery stocks of all species do not comprise a major part of the harvests in the Kodiak UoC to date, and so the primary concern was related to straying into other systems at the current levels of release. Coho and Chinook salmon straying was addressed see 3rd surveillance report (MRAG Americas 2017). Chum salmon produced at Kitoi Bay Hatchery are now being thermally marked by making use of the difference in temperature between deep and shallow lake withdrawal water sources used for incubation. Marking of 100% of Chum salmon began in 2014. The first otolith-marked Chum salmon will return in 2016 but the marked age class will comprise a small portion of the total return. Marking was required by ADFG as a condition of approval for a requested increase in Chum salmon production at Kitoi Bay from 28 to 36 million eggs in 2014 (ADF&G 2014). More than 100 million Pink salmon fry are released each year, and none have been marked to date. Thermal otolith marking is not feasible with existing water systems because the difference in water temperature between incubation sources has diminished by the time the Pink salmon embryos reach the critical marking stage. The egg mass in each incubator is too large for effective dry marking for Pinks. The Kitoi Bay Hatchery was recently remodelled, and considerations were made for installing the equipment necessary for marking Pink salmon. At this time there is no marking requirement by ADF&G for Pink salmon at the Kitoi Bay Hatchery. A marking requirement could be implemented if the program sought to increase Pink salmon production. However, the KRAA Board of Directors have not committed to marking of Pink salmon at this time given costs relative to perceived value to management. Chinook and Coho salmon produced by Pillar Creek Hatchery are released for sport

PI 1.3.1	Enhancement activities do not negatively impact wild stock(s)
	rather than commercial fisheries, whereas numerous Coho salmon released from Kitoi Bay (~1.4 million) are largely for commercial purposes. Experimental marking of a portion of the Coho salmon production has been implemented at Pillar Creek Hatchery using the dry method. As of the fourth surveillance of the previous certification, a revised action plan called for KRAA to provide an update on plans for marking Pink and Coho salmon at Kitoi Hatchery and results of any new research findings regarding the impact of Kodiak hatchery Pink salmon on wild populations based on available data in the absence of marking. KRAA has continued to explore alternatives for thermal marking of Pink salmon. Further testing is being conducted of a salt water check as a potential alternative to thermal marking. This method was identified following 1-hour salt water treatment of eggs for fungus control. Application of this treatment was extended to 12 hours as a marking experiment of approximately 18-19 million of the current brood year production in the incubation stage. (10% of the scheduled 2018 release). The efficacy of this method will be assessed upon hatching. This effort was found by the surveillance team to satisfy progress toward completion of this condition. The action plan also reported that KRAA would sample the Kodiak fishery for Chum salmon and streams within a 50 km radius of Kitoi Hatchery as outlined in the PSPA report for year 2. In 2017, KRAA conducted limited sampling of Chum salmon in the fishery for otolith marks. However, no stream sampling was conducted. The condition associated with this PI is carried over into this reassessment. SG100 – This standard is not met due to failure to meet SG80. **Chignik** - No hatcheries operate in the Chignik UoC. **Peninsula/ Aleutian Is.** - There are no significant enhancement activities in the Peninsula/Aleutian Islands.
References	ADF&G (2012f), Heinl et al. (2011), Piston & Heinl (2011a), Piston & Heinl (2012a), Piston & Heinl (2012b), Sturdevant et al. (2012). ADF&G (2009a), MSC (2013a), Regnart (2010). CIRPT (2007); Stopha (2012a); (2012b); (2013); Stopha and Musslewhite 2012; Hammarstrom & Ford (2011) CIRPT (2007), Shields & Dupuis (2012), Stopha (2012). Brenner et al. (2012), Foster (2010), Musslewhite (2011a), Musslewhite (2011b), Nelson & Swanton (1996), Piston & Heinl (2012a), Piston & Heinl (2012b).

OVERALL PERFORMANCE INDICATOR SCORE:

UoC	a	Score
Southeast	60	60
Yakutat	100	100
Prince William Sound	60	60
Copper/Bering Districts	100	100
Lower Cook Inlet	60	60

PI 1.3.1	Enhancement activities do not negatively impact wild stock(s)	
Upper Cook Inlet	100	100
Bristol Bay	100	100
Yukon River	100	100
Kuskokwim	100	100
Kotzebue	100	100
Norton Sound	100	100
Kodiak	60	60
Chignik	100	100
Peninsula/ Aleutian Is.	100	100
CONDITION NUMBER (if relevant):		
Condition 1.	**(Southeast Alaska) Demonstrate a high likelihood the Chum salmon enhancement activities in SEAK do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Chum salmon stocks. (Carryover from 2013 full assessment; previous Condition 1).**	
Condition 5.	**(Kodiak) Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness of Pink Salmon. (Carryover from 2013 full assessment; previous Condition 5).**	
Condition PWS1.	**(Prince William Sound) Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness of Pink Salmon. (Carry over from 2015 scope extension assessment- previous condition PWS1).**	
Condition LCI1.	**(Lower Cook Inlet) Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness of Pink Salmon.**	

Evaluation table for PI 1.3.2 – Enhancement management

PI 1.3.2		**Effective enhancement and fishery strategies are in place to address effects of enhancement activities on wild stock(s).**		
Scoring Issue		SG 60	SG 80	SG 100
A	Management strategy in place			
	Guide post	**Practices and protocols** are in place to protect wild stocks from significant negative impacts of enhancement.	There is a **partial strategy** in place to protect wild stocks from significant negative impacts of enhancement.	There is a **comprehensive strategy** in place to protect wild stocks from significant negative impacts of enhancement.

PI 1.3.2		Effective enhancement and fishery strategies are in place to address effects of enhancement activities on wild stock(s).		
Scoring Issue		SG 60	SG 80	SG 100
	Met?	Yes (all UoCs)	Yes (all UoCs)	No: Southeast Alaska, Prince William Sound, Lower Cook Inlet, Kodiak Yes: Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island
	Justification	**SG60** – All UoCs meets this level of performance. Statwide practices and protocols are in place that are likely to be effective in protecting wild stocks from significant detrimental impacts of enhancement based on plausible argument. The list of practices, protocols and strategies includes: • Numerous policies, statutes and regulations that promote the protection of wild Salmon. • Establishment of hatcheries from local wild broodstock. • Operation of hatcheries with best management practices to avoid genetic bottlenecks and directional selection. • Release of hatchery fry after wild fry dispersal to reduce the potential for competition. • Siting of hatcheries in terminal areas which facilitate targeted harvest of returning adults. • In-season monitoring of hatchery-wild composition based on otolith sampling and fishery management to maximize harvest of hatchery-origin Salmon while protecting wild escapement. • Implementation of a research study to evaluate the effects of hatchery effects on natural population fitness. Related guidance is found in Salmon Regional Planning Plans, ADF&G Genetics Policy, the FRED Division Statute 1971, the PNP Hatchery Permitting Statute, the Regional Planning Statute 1976, the BOF Hatchery Management Policy, Fish Transport Regulations 1981, the PNP Regulations 1985, the Genetics Policy 1985, the Pathology Policy 1988, Wild and Enhanced Stock Statute 1992, Sockeye Salmon Culture Policy 1994, and the BOF Sustainable Salmon Policy 2000. The Policy for Management of Sustainable Salmon Fisheries (5AAC 39.222) requires that effects and interactions of introduced or enhanced salmon stocks on wild salmon stocks should be assessed; wild salmon stocks and fisheries on those stocks should be protected from adverse impacts from artificial propagation and enhancement efforts'. Also, that 'Plans and proposals for development or expansion of salmon fisheries and enhancement programs should effectively document		

PI 1.3.2	Effective enhancement and fishery strategies are in place to address effects of enhancement activities on wild stock(s).		
Scoring Issue	SG 60	SG 80	SG 100
	resource assessments, potential impacts, and other information needed to assure sustainable management of wild salmon stocks.' Policy for the Management of Mixed-Stock salmon fisheries (5AAC 39.220) accords the highest priority to the conservation of wild salmon stocks. The Regional Planning Team Review Regulation (5AAC 40.170) provides review criteria which must be considered and include provisions for the protection of the naturally occurring stocks from any adverse effects which may originate from a proposed hatchery. **SG80** - All UoCs meets this level of performance. A partial strategy for protecting wild stocks is defined in a range of policies, statutes and regulations promote the protection of wild Salmon. These include Salmon Regional Planning Plans, ADF&G Genetics Policy, the FRED Division Statute 1971, the PNP Hatchery Permitting Statute, the Regional Planning Statute 1976, the BOF Hatchery Management Policy, Fish Transport Regulations 1981, the PNP Regulations 1985, the Genetics Policy 1985, the Pathology Policy 1988, Wild and Enhanced Stock Statute 1992, Sockeye Salmon Culture Policy 1994, and the BOF Sustainable Salmon Policy 2000. The MSC guidance for this PI states that "A likelihood of minimizing the numbers and proportions of hatchery fish interbreeding with wild fish in natural spawning areas would be expected to be supported by the use and evaluation of proven artificial production and harvest management strategies. Common examples typically include: a) Ensuring release at sites and with strategies that are likely to maximize imprinting and homing, and b) Scaling hatchery release numbers to a level that is consistent with not exceeding hatchery stray benchmarks in concert with other strategies". The assessment team also notes that the efficient harvest of hatchery fish without over-harvesting the wild-component is another approach for reducing stray Salmon. Hatchery programs have recently been audited for consistency with statewide policies and management practices (e.g., Stopha 2013a, 2013b, 2013c, 2013d) and generally found to be in compliance; minor issues were addressed. **SG100** – This standard is meet for UoCs without significant hatchery programs (Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island). It is not met in Southeast Alaska, Prince William Sound, Lower Cook Inlet, Kodiak where we cannot conclude that the hatchery strategy is comprehensive based on outcome scores in PI 1.3.1.		
B	Management strategy evaluation		
Guide post	The practices and protocols in place are **considered likely** to be effective based on plausible argument.	There is **some objective basis for confidence** that the strategy is effective, based on evidence that the strategy is achieving the outcome metrics	There is **clear evidence** that the comprehensive strategy is successfully protecting wild stocks from significant detrimental impacts of enhancement.

PI 1.3.2		Effective enhancement and fishery strategies are in place to address effects of enhancement activities on wild stock(s).		
Scoring Issue		SG 60	SG 80	SG 100
			used to define the minimum detrimental impacts.	
	Met?	Yes (all UoCs)	Yes (all UoCs) except Prince William Sound and Lower Cook Inlet	No: Southeast Alaska, Prince William Sound, Lower Cook Inlet, Kodiak Yes: Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island
	Justification	All guideposts are met for UoCs without significant hatchery enhancement programs (Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island). Scores for the remaining UoCs are as follows: Southeast Alaska (SG60) The standard is met for this UoC (See SG80). (SG80) This standard is met for this UoC. Assessments of harvest and escapement demonstrate that practices and protocols provide an objective basis for confidence that the strategy is effective. Hatchery fish have been observed to concentrate near hatcheries and along migration pathways to hatcheries where harvest can be concentrated. Some straying occurs but high levels have not been observed. (SG100) This standard is not met for this UoC in the absence of additional information on the relative fitness of hatchery-origin fish spawning in natural production areas. Prince William Sound (SG60) The standard is met for this UoC. Assessments of harvest and escapement demonstrate that practices and protocols are likely to be effective. Hatchery fish have been observed to concentrate near hatcheries and along migration pathways to hatcheries where harvest can be concentrated. Some straying occurs but high levels have not been observed. (SG80) This standard is not met for this UoC. Monitoring of hatchery contributions to the fishery and escapements provide an objective basis that the hatchery strategy is at least partially effective. However, this information indicates that outcome metrics identified for hatchery contributions to wild populations is not consistent with the SG80 standard identified in PI 1.3.1. In addition, potentially significant numbers of Prince William Sound hatchery Pink Salmon have also been documented in spawning areas of the Lower Cook Inlet UoC. Therefore, this SG is not met in the absence of		

PI 1.3.2	Effective enhancement and fishery strategies are in place to address effects of enhancement activities on wild stock(s).		
Scoring Issue	SG 60	SG 80	SG 100
	additional information on the relative fitness of hatchery-origin fish spawning in natural production areas. (SG100) Not achieved based on SG80 scores. Lower Cook Inlet (SG60) The standard is met for this UoC. Assessments of harvest and escapement demonstrate that practices and protocols are likely to be effective. Hatchery fish have been observed to concentrate near hatcheries and along migration pathways to hatcheries where harvest can be concentrated. Some straying occurs but high levels have not been observed. (SG80) The standard is not met for this UoC. Monitoring of hatchery contributions to the fishery and escapements indicate that significant numbers of hatchery fish are found in many natural spawning areas following recent expansion of largescale hatchery production of Pink Salmon in LCI as well as straying from PWS hatcheries. (SG100) Not achieved based on SG80 scores. Kodiak (SG60) The standard is met for this UoC (See SG80). (SG80) This standard is met for this UoC. Assessments of harvest and escapement demonstrate that practices and protocols provide an objective basis for confidence that the strategy is effective. Hatchery fish have been observed to concentrate near hatcheries and along migration pathways to hatcheries where harvest can be concentrated. This assessment is consistent with the lower scale of hatchery enhancement on Kodiak relative to other areas such as Prince William Sound. (SG100) This standard is not met for this UoC in the absence of additional information on the straying rates and relative fitness of hatchery-origin fish spawning in natural production areas.		
References	Brunette & Piston (2011), Heinl et al. (2011), Piston & Heinl (2011a), Piston & Heinl (2012a). ADF&G (2009a). CIRPT (2007); Stopha (2012a); (2012b); (2013); Stopha and Musslewhite 2012; Hammarstrom & Ford (2011) CIRPT (2007), Shields & Dupois (2012).		

OVERALL PERFORMANCE INDICATOR SCORE:

UoC	a	b	Score
Southeast	80	80	80
Yakutat	100	100	100
Prince William Sound	80	60	70
Copper/Bering Districts	100	100	100
Lower Cook Inlet	80	60	70
Upper Cook Inlet	100	100	100

PI 1.3.2	Effective enhancement and fishery strategies are in place to address effects of enhancement activities on wild stock(s).		
Scoring Issue	SG 60	SG 80	SG 100
Bristol Bay	100	100	100
Yukon River	100	100	100
Kuskokwim	100	100	100
Kotzebue	100	100	100
Norton Sound	100	100	100
Kodiak	80	80	80
Chignik	100	100	100
Peninsula/ Aleutian Is.	100	100	100
CONDITION NUMBER (if relevant):			
Condition PWS2. **(Prince William Sound) Demonstrate an objective basis for confidence that the enhancement strategy is effective for protecting wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts. (Carryover from scope extension in 2015; previous condition PWS2)** **Condition LCI2. (Lower Cook Inlet) Demonstrate an objective basis for confidence that the enhancement strategy is effective for protecting wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.**			

Evaluation table for PI 1.3.3 – Enhancement information

<table>
<tr><td colspan="2">PI 1.3.3</td><td colspan="3">Relevant information is collected and assessments are adequate to determine the effect of enhancement activities on wild stock(s).</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">A</td><td colspan="4">Information adequacy</td></tr>
<tr><td>Guide post</td><td>Some relevant information is available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced), and hatchery broodstock.</td><td>Sufficient relevant qualitative and quantitative information is available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced) and hatchery broodstock.</td><td>A comprehensive range of relevant quantitative information is available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced) and hatchery broodstock.</td></tr>
<tr><td>Met?</td><td>Yes (all UoCs)</td><td>No: Kodiak
Yes: Southeast Alaska, Yakutat, Copper/Bering, Prince William Sound, Lower Cook Inlet, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island</td><td>No: Southeast Alaska, Prince William Sound, Lower Cook Inlet, Kodiak
Yes: Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island</td></tr>
<tr><td>Justification</td><td colspan="3">All guideposts are met for UoCs without significant hatchery enhancement programs (Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island).
Scores for the remaining UoCs (Southeast Alaska, Prince William Sound, Lower Cook Inlet, Kodiak) are as follows:
Southeast Alaska
SG60 – The fishery exceeds this level of performance, see below under SG80.
SG80 – This standard is met for this UoC. All salmon produced by SEAK PWS hatcheries are otolith marked. Analysis of otoliths sampled from the fishery harvest is the basis for annual estimates of hatchery contributions to the common property and cost recovery commercial harvests. Results of the ongoing hatchery evaluation study developed since 2013 provide the information on the contribution of enhanced fish to the wild escapement (Knudsen et al. 2015a, 2015b). This information was not available in the 2013 statewide assessment (IMM 2013). This information is sufficient to satisfy the SG80 level for this indicator.
SG100 - This standard is not met.</td></tr>
</table>

PI 1.3.3		Relevant information is collected and assessments are adequate to determine the effect of enhancement activities on wild stock(s).		
Scoring Issue		SG 60	SG 80	SG 100
		Prince William Sound **SG60** – The fishery exceeds this level of performance, see below under SG80. **SG80** – This standard is met for this UoC. All Pink and Chum salmon produced by PWS hatcheries are otolith marked. Analysis of otoliths sampled from the fishery harvest is the basis for annual estimates of hatchery contributions to the common property and cost recovery commercial harvests Stopha (2016). Results of the ongoing hatchery evaluation study developed since 2013 provide the information on the contribution of enhanced fish to the wild escapements of Pink and Chum salmon (Knudsen et al. 2015a, 2015b). This information was not available in the 2013 statewide assessment (IMM 2013). In addition, three years (2013, 2014, 2015) of hatchery contribution estimates to Pink and Chum salmon escapement have been documented by Knudsen et al. (2015a, 2015b). While there are differences in hatchery contributions to escapement among the three years, they are explained largely by environmental factors. This information is sufficient to satisfy the SG80 level for this indicator. **SG100**- This standard is not met. Lower Cook Inlet **SG60 –** The fishery exceeds this level of performance, see below under SG80. **SG80 –** This standard is met for this UoC. All salmon produced by LCI hatcheries are otolith marked. Analysis of otoliths sampled from the fishery harvest is the basis for annual estimates of hatchery contributions to the common property and cost recovery commercial harvests. Otolith sampling of Pink salmon in spawning grounds has been conducted in multiple years. This information is sufficient to satisfy the SG80 level for this indicator. **SG100 -** This standard is not met due to the level of otolith sampling information that is available. Kodiak **SG60 –** The fishery meets this level of performance based in information described in PI 1.3.1 **SG80**- This standard is not met due to insufficient relevant qualitative and quantitative information available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced) and hatchery broodstock as described in PI 1.3.1. **SG100**- Not achieved based on SG80 scores.		
B	Use of information in assessment			
	Guide post	The effect of enhancement activities on wild stock status, productivity and diversity	A **moderate-level analysis** of relevant information is conducted and used by decision	A **comprehensive analysis** of relevant information is conducted and routinely used by decision makers to

PI 1.3.3		Relevant information is collected and assessments are adequate to determine the effect of enhancement activities on wild stock(s).		
Scoring Issue		SG 60	SG 80	SG 100
		are taken into account qualitatively.	makers to quantitatively estimate the impact of enhancement activities on wild-stock status, productivity, and diversity.	determine, with a high degree of certainty, the quantitative impact of enhancement activities on wild-stock status, productivity, and diversity.
	Met?	Yes (all UoCs)	No: Prince William Sound, Kodiak, Lower Cook Inlet Yes: Southeast Alaska, Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island	No: Southeast Alaska, Prince William Sound, Kodiak, Lower Cook Inlet Yes: Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island
	Justification	All guideposts are met for UoCs without significant hatchery enhancement programs (Southeast Alaska, Yakutat, Copper/Bering, Upper Cook Inlet, Yukon, Kuskokwim, Kotzebue, Norton Sound, Bristol Bay, Chignik, Peninsula/Aleutian Island). Scores for the remaining UoCs (Prince William Sound, Lower Cook Inlet, Kodiak) are as follows: **(SG80)** This standard is not met for Prince William Sound, Lower Cook Inlet or Kodiak. While a variety of studies have examined the impacts of enhancement activities on Chinook and Coho salmon wild stock status, productivity and diversity in other areas, the assessment team is not aware of similar evaluations of Pink and Chum salmon. Undesirable effects of hatchery rearing through inadvertent selection or domestication have been hypothesized to be less for Pink and Chum salmon due to the shorter period of hatchery rearing than for Chinook and Coho salmon. However, direct evidence is not available for testing this hypothesis. Completion of the ongoing hatchery fitness study will likely be necessary to satisfy the SG80 scoring guidepost for this indicator. Additional information may also be required on hatchery practices to address a potential concern regarding the potential for divergence of hatchery stocks in the absence of continuing incorporation of natural origin broodstock (recognizing this is not feasible in a production scale program for Pink or Chum salmon). **(SG100)** Not achieved based on SG80 scores.		
References		ADF&G (2012f) ADF&G (2009a), Botz et al. (2012). Musslewhite (2011a), Musslewhite (2011b), Nelson & Swanton (1996). ADF&G (2012f), Knudsen et al. (2015a, 2015b)		

PI 1.3.3	Relevant information is collected and assessments are adequate to determine the effect of enhancement activities on wild stock(s).		
Scoring Issue	SG 60	SG 80	SG 100
OVERALL PERFORMANCE INDICATOR SCORE:			

UoC	a	b	Score
Southeast	80	80	80
Yakutat	100	100	100
Prince William Sound	80	60	70
Copper/Bering Districts	100	100	100
Lower Cook Inlet	80	60	70
Upper Cook Inlet	100	100	100
Bristol Bay	100	100	100
Yukon River	100	100	100
Kuskokwim	100	100	100
Kotzebue	100	100	100
Norton Sound	100	100	100
Kodiak	60	60	60
Chignik	100	100	100
Peninsula/ Aleutian Is.	100	100	100

CONDITION NUMBER (if relevant):

Condition 5.* **(Kodiak) Provide sufficient relevant qualitative and quantitative information is available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced) and hatchery broodstock (SG80a).**

(Kodiak) Provide estimates of the impacts of enhancement activities on wild stock status, productivity and diversity (SG80b).

***Carryover from previous 2013 assessment; Condition 5**

Conditions PWS3 **(Prince William Sound) Provide information on relative fitness of hatchery-origin Pink and Chum Salmon sufficient to evaluate the impacts of enhancement activities on wild stock status, productivity and diversity (Scoring Issue B).**

Conditions LCI3 **(Lower Cook Inlet) Provide information on relative fitness of hatchery-origin Pink and Chum Salmon sufficient to evaluate the impacts of enhancement activities on wild stock status, productivity and diversity (Scoring Issue B).**

Evaluation Table for PI 2.1.1 – Primary species outcome

PI 2.1.1		The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.		
Scoring Issue		SG 60	SG 80	SG 100
A	Main primary species stock status			
	Guide post	Main Primary species are **likely** to be above the PRI OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above PRI and are fluctuating around a level consistent with MSY.
	Met?	Yes for all UoA's	Yes for all UoA's	Yes for All UoA's
	Justification	There are no Main Primary Species in any of the UoA areas. As such, the fishery meets the SG100 for this scoring issue. With the exception of troll gear in Southeast and Yakutat UoA's, non-salmonids may not be retained and sold in the Alaska salmon fishery. Small quantities of other finfish may, though, be taken and retained for personal use. These fish, including steelhead (*Oncorhynchus mykiss*), that are retained for personal use must be recorded on the fish tickets. Within Alaska, very small quantities of steelhead retained for personal use (Harding & Coyle 2011). Test fishing and personal use/subsistence fisheries operating at similar times and places as commercial gear show that other finfish may be caught, but the quantities are considered negligible. **Southeast UoA -** The troll fishery in Southeast and Yakutat may retain Pacific halibut (if the operator has an NPFMC IFQ). Pacific halibut are managed jointly by the Pacific Halibut Commission (PHC) and the NPFMC. The PHC sets the annual guideline harvest level (GHL) and the NPFMC sets the implementation regulations. The 2016 assessment results indicate that the Pacific halibut stock declined for much of the decade prior to 2010, and has been relatively stable or increasing since then. Recruitment and size-at-age were the primary factors causing the decline during that period. The GHL for the Southeast Alaska Area in 2017 was set at 5,250,000 pounds (IPHC 2016). The troll fishery takes a very small portion of the GHL. The Pacific halibut fishery is certified as sustainable by		

PI 2.1.1		The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.
		MSC. The Pacific Salmon Treaty (Treaty) provides provisions for the management of British Columbia origin salmon caught in Southeast Alaska. Small quantities of Sockeye, Pink, Coho and Chum salmon that spawn in British Columbia are caught in southern portion of the region. In the previous assessment these catches were exempt from IPI requirements because they represented less than 2% of the total catch. While catches remain small, we note that the Sockeye, Chum and Pink salmon of BC origin are certified as sustainable by MSC and are not considered further in scoring. The Treaty does not establish specific harvest sharing arrangements for Canadian origin Coho Salmon caught in Alaska. English et al. (2012) estimated exploitation rates in Alaska fisheries of 4%, 4%, 37%, 14%, 5%, 14%, 8%, 8%, 3%, and 3% for fish originating from BC areas 2E, 2W, 3, 4, 5, 6, 7, 8, 9, and 10, respectively, during 2006-2010. However, no estimates of numbers harvested, were provided. Even lacking direct estimates of the harvest of BC Coho Salmon, we believe the catch to be very small based on the modest numbers caught and escaping to spawn in these areas (PSC-JNBTC 2017) in relation to the catches in Southeast and conclude that the catch of BC origin Coho Salmon is less than 2%. The catch of Chinook, Sockeye, and Coho Salmon spawning in the transboundary Stikine and Taku Rivers is covered under terms of the Treaty. These runs are actively managed by the parties to ensure escapement goals are achieved. These goals have been met is most years (PSC JTTC- 2017 and Munro and Volk 2017). The catches of these stocks are less than 2% of the total harvest. The catch of Chinook Salmon in Southeast is composed mostly (95%) of stocks originating in British Columbia, Oregon, Washington and the Columbia River. The primary stocks contributing to the Southeast fisheries (including the troll fishery that is licensed to also operate in the Yakutat) are from the west Coast of Vancouver Island, North and Central coast of BC, Fraser River. Oregon Coast, Upper Columbia River. The highest estimated harvest rates are for Upper Georgia Strait (20.6%), West Coast of Vancouver Is (17%) Oregon Coast (16%), and Upper Columbia River (14%). Escapements of stocks with goals accepted by the Pacific Salmon Commission's Joint Chinook Technical Committee have been mostly met in recent years (PSC-JCTC 2017). The catch of non-local Chinook Salmon is 1.7 % of the total harvest in the Southeast Unit of Assessment. **Yakutat -** The troll fishery in Southeast and Yakutat may retain Pacific halibut (if the operator has an NPFMC IFQ). Pacific halibut are managed jointly by the Pacific Halibut Commission (PHC) and the NPFMC. The PHC sets the annual guideline harvest level (GHL) and the NPFMC sets the implementation regulations. The 2016 assessment results indicate that the Pacific halibut stock

PI 2.1.1		The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.
		declined for much of the decade prior to 2010, and has been relatively stable or increasing since then. Recruitment and slineize-at-age were the primary factors causing the decline during that period. The GHL for the Southeast Alaska Area in 2017 was set at 5,250,000 pounds (IPHC 2016). The troll fishery takes a very small portion of the GHL. The Pacific halibut fishery is certified as sustainable by MSC. Chinook Salmon of BC, Oregon and Washington origin caught in the troll fishery were discussed in the Southeast U of A. The Alsek River is a Transboundary river and management is governed by terms of the Treaty. Over the long term the escapements have fluctuated around their goal, but in recent years the run has experienced a decline in productivity consistent with other Chinook salmon stocks in Alaska. Fisheries in both Alaska and Canada have been reduced during years of low returns (PSC- JTTC 2017). The available escapement data for Coho Salmon is limited in the Alsek River because the weir on the Klukshu River is normally removed long before the run is over. Available Coho Salmon escapemnt data do not show a pattern of decline and are higher than catches by both Alaskan and Canadian fisheries (PSC-JTTC 2017). The catch of Chinook and Coho salmon in the Alsek River set gillnet fishery for the period 2012 -2016 was 2,428 and 1,222 fish respectively (Zeiser and Hoffman 2017). Based on an average weight of 13.6 pounds for Chinook and 7.2 pounds for Coho, the total harvest was 33,021 lbs. and 8,798 lbs. The total harvest in Yakutat over this time period was 11,725,508 lbs. The catch of Chinook and Coho salmon in the Alsek River set net fishery comprised less than 0.3 and 0.1 percent respectively. The East River is the only consistent producer of Chum salmon in the Yakutat Area. CChum salmon are not targeted because transportation costs are high and prices are low. Chum Salmon are occasionally caught in Yakutat Bay. The total catch of Chum Salmon for the period 2012 -2016 was 42,767 lbs. and this represents 0.4% of the total catch. **Copper - Bering -** In the previous assessment (IMM 2013) Pink and Chum salmon represented 2.1 % of the overall catch and were classified as IPI species we therefore considered these stocks under P1 in this assessment. **Prince William Sound -** In the previous assessment (IMM 2013) Chinook and Coho represented 1% of the total catch and were classified as IPI species but were exempted from the IPI requirements. In recent years, there have been significant hatchery releases of Coho Salmon (1.4 – 2.9 million) and small releases of Chinook Salmon (0.2 – 0.35 million). For the period 2012 – 2016 the commercial catch of both Chinook and Coho Salmon accounted for only 0.45% of the total catch. **Lower Cook Inlet -** In the previous assessment (IMM 2013) Chinook and Coho salmon made up less than 0.1% of the total catch and were exempted from the IPI

PI 2.1.1		**The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.**
		requirements. In recent years there have been modest hatchery releases of Chinook Salmon (0.53 – 0.89 million) and modest releases of Coho Salmon (0.67 - 0.95 million). These releases primarily benefit recreational fisheries. For the period 2012-2016 Chinook and Coho salmon made up 0.4 percent of the total catch. **Upper Cook Inlet -** All species of Pacific Salmon in the Upper Cook Inlet UoA are evaluated as P1 species. **Bristol Bay -** In the previous assessment Coho Salmon were considered IPI species (IMM 2013) but were exempted from the IPI requirements because the catch averaged 0.2%. However, a review of Bristol Bay Annual Management reports (for example Elison et al. 2015) shows that directed fishing is allowed in the Nushagak District when escapement data warrants fishing, as such, we treat Coho Salmon under P1. **Yukon River -** In the previous assessment, Sockeye and Pink salmon we classified an IPI species (IMM 2013), but because catches were <0.1%, they were exempt from the IPI requirements. For the period 2012 -2016 there was no reported catch of either species in the Yukon. **Kuskokwim -** In the previous assessment Pink Salmon were classified as an IPI species, but exempted from IPI requirements because catches averaged 0.15 % (IMM 2013). For the period 2012-2016 there was no reported catch of Pink, Chinook, Sockeye or Chum salmon. **Kotzebue -** In the previous assessment, the catches of Sockeye, Chinook, Coho and Pink salmon were classified as IPI species but exempted for the IPI requirements because catches were 0.1 % of the catch. For the period 2012-2016 the only reported catch was for Chum Salmon which is evaluated under P1. **Norton Sound -** In the previous assessment there were no IPI species identified in Norton Sound (IMM 2013). During the period 2012 -2016 significant catches occurred for Pink, Chum, and Coho Salmon and these species are therefore treated under P1. There was no reported catch of Chinook Salmon. The catch of Sockeye Salmon was 0.5% and we therefore treat these fish as a Minor Primary species. **Kodiak -** In the previous assessment, there were no IPI species identified in the Kodiak Area. During the last several years there have been extensive regulations in plaace to avoid the harvest of Chinook Salmon for conservation reasons. The catch of Chinook Salmon for the period 2012 -2016 was 0.1% of the total landings. **Chignik -** All species in the Chignik UoA are assessed as P1 species. **Alaska Peninsula and Aleutians -** All species in the Alaska Peninsula /Aleutians Area are evaluated as P1 species.
B	Minor primary species stock status	

PI 2.1.1	The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.		
Guide post			Minor primary species are highly likely to be above the PRI OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species
Met?			Y for all UoA's

Justification

Minor primary species by UoA are given in the following table, where salmon species listed are either non-local or non-target stocks (i.e. those salmon stocks not assessed against P1):

Units	Primary Species (all minor)						
	Pacific halibut	Lingcod	Sockeye	Chinook	Coho	Pink	Chum
SEAK	x	x	X	x	x		
YAK	x	x	X	x	x		x
PWS				x	x		
C/B						x	x
LCI				x	x		
UCI							
BB							
YR							
KUSK							
KOTZ							
NS			X				
KOD							
CHIG							
P/A							

Southeast - English et al. (2012) estimated exploitation rates in Alaska fisheries of BC origin Coho Salmon to be 4%, 4%, 37%, 14%, 5%, 14%, 8%, 8%, 3%, and 3% for fish originating from BC areas 2E, 2W, 3, 4, 5, 6, 7, 8, 9, and 10, respectively, during 2006-2010. The MSC assessment of the British Columbia salmon fishery (Acoura Marine, 2017) classified Coho Salmon stocks originating from the North and Central coast as Main Primary Stocks. They concluded that these stocks were highly likely to be above PRI or for some weak runs in Areas 6 - 10, that there was an effective strategy in place to ensure that the BC fishery did not hinder rebuilding. The low harvest rates in the Southeast Alaska fishery do not hinder

PI 2.1.1		The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.
		recovery and rebuilding of Coho Stocks in Canada's areas 6 – 10. The catch of Chinook, Sockeye, and Coho Salmon spawning in the transboundary Stikine and Taku Rivers is covered under terms of the Treaty. These runs are actively managed by the parties to ensure escapement goals. These goals have been met is most years (PSC-JTTC 2017) and Munro and Volk (2017). The primary stocks of Chinook Salmon contributing to the Southeast (including the troll fishery that is licensed to also operate in the Yakutat UoA) are from the west Coast of Vancouver Island, North and Central coast of BC, Fraser River. Oregon Coast, Upper Columbia River. The highest estimated harvest rates are; Upper Georgia Strait (20.6%), West Coast of Vancouver Island (17%), Oregon Coast (16%), and Upper Columbia River (14%) (PSC-JCTC 2017b). Escapements of stocks with goals accepted by the Pacific Salmon Commission's Joint Chinook Technical Committee have been mostly met in recent years (PSC – JCTC 2017a). The contribution of ESA listed stocks is negligible, and the fisheries are not considered to hinder rebuilding (NPFC et al. 2018; PSC 2018). NOAA Fisheries has reviewed and approved the current Treaty Agreement for compliance with the Endangered Species Act. The Southeast UoA meets the SG 100 level for Minor Primary Species. **Yakutat -** The primary stocks of Chinook Salmon contributing to the troll fishery operating in the Yakutat UoA are from the west Coast of Vancouver Island, North and Central coast of BC, Fraser River. Oregon Coast, Upper Columbia River. The highest estimated harvest rates are; Upper Georgia Strait (20.6%), West Coast of Vancouver (17%), Oregon Coast (16%), and Upper Columbia River (14%) (PSC-JCTC 2017b). Escapements of stocks with goals accepted by the Pacific Salmon Commission's Joint Chinook Technical Committee have been mostly met in recent years (PSC – JCTC 2017a). The contribution of ESA listed stocks is negligible, and the fisheries are not considered to hinder rebuilding (NPFC et al. 2012) The Alsek River is a Transboundary river and management is governed by terms of the Treaty. Over the long term. the escapements of Chinook Salmon have fluctuated around their goal, but in recent years the run has experienced a decline in productivity consistent with other Chinook Salmon stocks in Alaska. Fisheries in both Alaska and Canada have been reduced during years of low returns (PSC - JTTC 2017). The available escapement data for Coho Salmon is limited in the Alsek River because the weir on the Klukshu River is normally removed long before the run is over. Available Coho Salmon escapement data do not show a pattern of decline and are higher than catches by both Alaskan and Canadian fisheries (PSC – JTTC 2017). Chum Salmon are not targeted in the Yakutat UoA because stocks are small and scattered, prices are low and in the East River which may be the "largest" stock, the cost of transporting the catches to buying stations (by air) is high. Changes in habitat in the East River have resulted in a decline in this stock over the last 10

PI 2.1.1			The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.

years (Zeiser et al. 2017). While a decline in abundance/productivity is likely occurring for East River Chum Salmon, the fishery is not likely to be hindering recovery or rebuilding.

The Yakutat UoA meets the SG 100 level.

Prince William Sound - Historically there was a low level (range <1,000 – 12,000) catch of Chinook Salmon in the Prince William Sound UoA (Byerly et al. 1999). The historic catch of Coho Salmon ranged from < 1,000 to 259,000 (Byerly et al. 1999). There are no Chinook or Coho Salmon stocks that are monitored for escapement in Prince William Sound. Whether some of the catches of these species are from stocks that spawn in Prince William Sound or perhaps from other UoA's is uncertain, but the adjoining Copper – Bering River UoA supports large populations of these species.

In recent years there have been significant hatchery releases of Coho Salmon (1.4 – 2.9 million) and small releases of Chinook Salmon (0.2 – 0.35 million). The releases of Coho Salmon occur form the Solomon Gulch Hatchery in Port Valdez and from the Wally Noerenberg Hatchery in the Western District. Some of the catches of Coho Salmon in the Eastern District Purse seine fisheries are likely from the Solomon Gulch Hatchery. Likewise, some of the catch in the Coghill District are likely from the Walley Noerenberg Hatchery (Russell et al. 2017).

While only catch data exists to determine stock status, the fact that there is no long- term trend of decline in catches (in areas outside the terminal areas) and that the habitat in the Prince William Sound is pristine, we conclude that it is not likely the stocks contributing these caches are below their PRI or that the fishery would hinder their recover if they were below their PRI.

We conclude that the Prince William Sound UoA meets the SG 100 level.

Lower Cook Inlet - Over the last five years, the catch of Chinook Salmon in the Lower Cook Inlet has ranged from 146 to 844, which is consistent with long term average catches. These catches occur in the Southern District set gill net and purse seine fishery (Hollowell et. al. 2015). There are significant releases of hatchery Chinook Salmon in the Southern District at Halibut Cove, Homer Spit and in Seldovia Harbor. There are two small (Deep Creek and Ninilchik) and one medium sized (Anchor River) Chinook Salmon stocks in Lower Cook Inlet that are monitored for escapement. There is no stock composition data available for the commercial catch. These catches may come from either the hatchery releases in the area or from Chinook Salmon stocks in the Lower or Upper Cook Inlet UoA's. Because these catches are at a low level and have been relatively stable over a long time period, and the habitat in Lower Cook Inlet is mostly pristine, it is unlikely that they are, or would be hindering recovery if one of the stocks contributing to this catch was below RPI.

The average annual catch of Coho Salmon in Lower Cook Inlet is 1,840 and most of the catch occurs in the Southern District purse seine and gill net fisheries

PI 2.1.1	The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.
	(Hollowell et. al. 2015). The average number of hatchery origin Coho Salmon being released is 190,000 in Seward lagoon, 534,000 at Bear Creek and 150,00 at Lowell Creek. There is no wild Coho Salmon stock that is monitored for escapement. Because most all Coho Salmon are released outside the area where the catch occurs it is not likely that the catch is mostly hatchery fish. Because these catches are at a low level, and have been relatively stable over a long time period, the habitat in the Lower Cook Inlet is mostly pristine, it is unlikely that they are, or would be hindering recovery if one of the stocks contributing to this catch was below RPI. We conclude that the SG 100 level is met for the Lower Cook Inlet UoA. **Norton Sound -** While river spawning Sockeye Salmon are found in small numbers throughout Norton Sound District, the two significant runs occur in Glacial Lake and Salmon Lake and are the northern most populations of any significance of Sockeye salmon in North America. Escapement goals for the two primary populations of Sockeye Salmon in Norton Sound have been met in most all years, (Munro and Volk 2017). The Norton Sound UoA meet the SG 100 level of performance. **Kodiak -** There are two Chinook Salmon stocks in the Kodiak UoA, the Ayakulik and Karluk rivers. These stocks have met their escapement goals a little less than 50% of the time in the last 11 years (Munro and Volk 2017). But the actual escapements show no pattern of steady decline, rather the escapements fluctuate around the goals. Because fishery managers have been taking significant steps to limit the incidental catches by the purse seine fisheries (Anderson et al. 2016), we conclude that the fishery is not hindering the recovery and rebuilding of these stocks, and therefore the Kodiak UoA meets the SG 100 level. **Remaining UoAs -** There ae no Minor Primary Species in the following UoA's: Copper – Bering Rivers, Upper Cook Inlet, Chignik, Alaska Peninsula/Aleutian Islands, Bristol Bay, Kuskokwim, Yukon, Kotzebue.
References	Acoura Marine. 2017. MSC sustainable fisheries certification, British Columbia salmon fishery (Sockeye salmon, Pink salmon and Chum salmon). Acoura Marine. https://fisheries.msc.org/en/fisheries/british-columbia-salmon/@@assess Anderson, T .J., J. Jackson, and B. A. Fuerst. 2016. Kodiak Management Area commercial salmon fishery annual management report, 2016. Alaska Department of Fish and Game, Fishery Management Report No. 16-42, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR16-42.pdf Byerly, M., B. Brooks, B. Simonson, H. Savikko and H. Geiger. Alaska commercial salmon catches, 1878 – 1997. Regional Information Report No. 5J99-05. Juneau. http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.1999.05.pdf Elison, T., P. Salomone, T. Sands, M. Jones, C. Brazil, G. Buck, F. West, T. Krieg, and T. Lemons. 2015. 2014 Bristol Bay area annual management report. Alaska Department of Fish and Game, Fishery Management Report No. 15-24, Anchorage.

PI 2.1.1	The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.
	http://www.adfg.alaska.gov/FedAidPDFs/FMR15-24.pdf English, K, T. Mochizuki and D. Robichaud. 2012. Review of North and Central Coast Salmon indicator streams and estimating escapement, catch and run size for each Salmon Conservation Unit. LGL Limited Environmental Research Associates. Sidney, BC.http://salmonwatersheds.ca/libraryfiles/lib_1.pdf Harding, R., & Coyle, C. (2011). Southeast Alaska Steelhead, Trout, and Dolly Varden Management. Alaska Department of Fish and Game Division of Sport Fish, Research and Technical Services. http://www.adfg.alaska.gov/FedAidPDFs/SP11-17.pdf Hollowell, G., E. O. Otis, and E. Ford. 2015. 2014 Lower Cook Inlet area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No 15-32, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR15-32.pdf Munro, A. R., and E. C. Volk. 2017. Summary of Pacific salmon escapement goals in Alaska with a review of escapements from 2008 to 2016. Alaska Department of Fish and Game, Fishery Manuscript Series No. 17-05, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS17-05.pdf North Pacific Fishery Management Council, National Marine Fisheries Service – Alaska Region and State of Alaska Department of Fish and Game. 2012. Fishery Management Plan for the salmon fisheries in the EEZ of Alaska. North PCIFIC Management Council, Anchorage. https://www.npfmc.org/wp-content/PDFdocuments/fmp/Salmon/SalmonFMPfinal1212.pdf Pacific Salmon Commission Joint Chinook Technical Committee(PSC-JCTC). 2017b. 2016 Exploitation rate analysis and model calibration supplement – data notebook. Report TC Chinook (17-1). Pacific Salmon Commission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/Chinook/ Pacific Salmon Commission Joint Chinook Technical Committee (PSC-JCTC). 2017a. Annual report of catch and escapement 2016. Report TC Chinook (17-2). Pacific Salmon Commission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/Chinook/ Pacific Salmon Commission Joint Northern Boundary Technical Committee (PSC-JNBTC). 2017. U.S./Canada Northern Boundary Area 2016 salmon fisheries management report and 2017 preliminary expectations. Report TCNB (17)-1 Pacific Salmon Commission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/northern-boundary/ Pacific Salmon Commission Joint Transboundary Technical Committee (PSC-JTTC). 2017. Final estimates of Transboundary River Salmon Production, harvest and

PI 2.1.1	**The U o A aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.**
	escapement and a review of joint enhancement activities in 2015. Pacific Salmon Commission Report (17)-2. PSC Vancouver B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/transboundary/ Russell, C. W., J. Botz, S. Haught, and S. Moffitt. 2017. 2016 Prince William Sound area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 17-37, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-37.pdf Zeiser, N. L., and R. A. Hoffman. 2017. Annual management report of the 2016 Yakutat Area commercial salmon fisheries. Alaska Department of Fish and Game, Fishery Management Report No. 17-36, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-36.pdf

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.1.1.A	2.1.1.B	Score
Southeast	100	100	100
Yakutat	100	100	100
P W S	100	100	100
Copper-Bering	100	100	100
L Cook Inlet	100	100	100
U Cook Inlet	100	100	100
Bristol Bay	100	100	100
Kuskokwim	100	100	100
Yukon	100	100	100
Norton	100	100	100
Kotzebue	100	100	100
Kodiak	100	100	100
Chignik	100	100	100
Ak. Peninsula	100	100	100

CONDITION NUMBER (if relevant):

Evaluation Table for PI 2.1.2 – Primary species management

PI 2.1.2		**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
Scoring Issue		SG 60	SG 80	SG 100
A	**Management strategy in place**			
	Guide post	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the point where recruitment would be impaired.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the point where recruitment would be impaired.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	Yes	Yes	Yes for all UoAs except PWS and LCI
	Justification	There are no Main Primary Species thus the SG80 is automatically met for this scoring issue because no strategy is necessary for their management. Regarding minor primary species, by regulation, non-salmonids may not be retained or sold in the Alaska salmon fishery except for the troll fishery in Southeast and Yakutat. Very small quantities of Steelhead are caught in the commercial fisheries (Harding and Cole 2011) and may be retained for personal use but must reported on fish tickets. The use of gear designed to be fished off the bottom, that must meet specific criteria (e.g. mesh sizes, length, depth, etc.), the tight control of areas that can be fished and at times when the target species are known to be present all constitute a strategy to maximize the catch of the target species while minimizing the incidental catch of other species. **Southeast -** Minor primary species include lingcod, pacific halibut, non-local Chinook Salmon, Transboundary river Chinook, Coho and Sockeye Salmon, and British Columbia origin Sockeye, Pink, Chum and Coho salmon. In all cases the caches of these non-local stocks are governed by terms of the Pacific Salmon Treaty. Regarding lingcod and pacific halibut, Lincod are conservatively managed by the State, while pacific halibut are managaged as target stocks by the NPFMC and IPHC. There is a full strategy in place to manage the impact of the troll fishery on these stocks as they are given catch allocation which are very small in relation to the overall catch in the targeted fisheries (see section 3.4.2 for further details). The Chinook Salmon Annex (Article XV, Annex IV Chapter 3) establishes an		

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.
		abundance-based approach to coast-wide management that addresses both conservation and harvest sharing among the Parties. The Treaty also provides for Joint Chinook Salmon Technical Committee, a protocol for data sharing, a method for resolution of technical disputes, and Panels to advise the Commissioners. Furthermore, both a Northern and Southern fund have been established to assist the management agencies in conducting stock assessment and research. The Northern Boundary Area Annex (Annex IV, Chapter 2) establishes an abundance-based approach to managing Canadian origin Sockeye Salmon caught in Southeast Alaska, the catch of Alaska origin Pink Salmon caught in British Columbia and the catch of Portland Canal Chum Salmon by both Parties. In addition, where the Parties decided to not place specific limits on either Party's catch of fish originating in the waters of the other Party, Article IV requires that neither Party may redirect its fisheries to intentionally increase interceptions of the other Party's stocks. The Treaty also provides for Joint Northern Boundary Area Technical Committee, a protocol for data sharing, a method for resolution of technical disputes, and Panels to advise the Commissioners. Furthermore, a Northern Fund has been established to assist the management agencies in conducting stock assessment and research. The Transboundary Annex (Article XV, Annex IV, Chapter 1) establishes abundance-based management approaches to the management of Sockeye, Chinook and Coho salmon originating from the Transboundary Taku and Stikine Rivers. The Treaty also provides for Joint Transboundary Technical Committee, a protocol for data sharing, a method for resolution of technical disputes, and Panels to advise the Commissioners. In addition, where the Parties decided to not place specific limits on either Party's catch of fish originating in the waters of the other Party, Article IV requires that neither Party may redirect its fisheries to intentionally increase interceptions of the other Party's stocks. Furthermore, a Northern fund has been established to assist the management agencies in conducting stock assessment, research and enhancement. The provisions of the Treaty, their implementation by Alaska and state regulations provide for a clear strategy for managing the minor non-local stocks caught in the Southeast UoA. The Southeast UoA meets the SG 100 level. **Yakutat -** The Chinook Salmon Annex (Article XV, Annex IV Chapter 3) establishes an abundance-based approach to coast-wide management that addresses both conservation and harvest sharing among the Parties. The Treaty also provides for Joint Chinook Salmon Technical Committee, a protocol for data sharing, a method for resolution of technical disputes, and Panels to advise the

PI 2.1.2	There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.
	Commissioners. Furthermore, both a Northern and Southern fund have been established to assist the management agencies in conducting stock assessment and research. The Transboundary Annex (Article XV, Annex IV, Chapter 1) establishes abundance-based management approaches to the management of Sockeye, and Chinook Salmon originating from the Transboundary Alsek River. The Treaty also provides for Joint Transboundary Technical Committee, a protocol for data sharing, a method for resolution of technical disputes, and Panels to advise the Commissioners. In addition, where the Parties decided to not place specific limits on either Party's catch of fish originating in the waters of the other Party, Article IV requires that neither Party may redirect its fisheries to intentionally increase interceptions of the other Party's stocks. Furthermore, a Northern fund has been established to assist the management agencies in conducting stock assessment, research and enhancement. The provisions of the Pacific Salmon Treaty, their implementation by Alaska as well as state regulations provide for a clear strategy for managing the minor non-local stocks caught in the Yakutat UoA. The primary producer of Chum Salmon is the East River and while surplus production may exist in some years, the cost of transporting fish (by air) relative to low price that is offered fishers make it uneconomical for fishermen to target surpluses when they exist. Lack of targeting means that catches are low in comparison to annual run sizes and management action to limit harvest is not needed, but tools are available to manage the fishery if cost and price changes motivate fishers to participate in a fishery when surplus exist. We conclude that a strategy exists but is not implemented because there is no need under current economic conditions. The Yakutat UoA meets the SG 100 level. **Prince William Sound** - The catches of Chinook and Coho salmon (except for those in near terminal areas around hatcheries) appears to be purely incidental to the catches of the more abundant Pink and Chum salmon. The fact that catches of these species simply fluctuates each year and have for decades without any clear pattern or trend coupled with the pristine nature of the habitat indicates that allowing the incidental catch of these species to occur while harvesting surplus Pink and Chum Salmon represents a represents a partial strategy, because it is passive and not deliberately designed to manage impact to these two species. We conclude that the SG 80 level is met. **Lower Cook Inlet** - The catch of Chinook and Coho Salmon that are not of hatchery origin appears to be purely incidental to the catches of target species. The fact that catches of these species simply fluctuates each year and have for

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
		decades without any clear pattern or trend coupled with the pristine nature of the habitat indicates that allowing the incidental catch of these species to occur while harvesting surplus Pink and Chum salmon represents a partial strategy, because it is passive and not deliberately designed to manage impact to these two species. We conclude that the SG 80 level is met. **Kodiak -** There is a clear strategy evident for managing the catch of Chinook Salmon from the local stocks, that including establishing escapement goals, and regulating the fishery by time, area, and by imposing non-retention and non-sale provisions in a effort to meet escapement goals, (Anderson et al. 2016). The Kodiak UoA meets the SG 100 Level. **Norton Sound -** There is a clear strategy in place for managing the Sockeye Salmon catches in Norton Sound that involves establishing escapement goals and managing the time and area allowed for fishing so as to achieve those goals. The SG 100 level is met. **Others -** There ae no Minor Primary Species in the following UoA's: Copper – Bering Rivers, Upper Cook Inlet, Chignik, Alaska Peninsula/Aleutian Islands, Bristol Bay, Kuskokwim, Yukon, Kotzebue,		
B	**Management strategy evaluation**			
	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Yes for all UoA's	Yes for all UoA's	Yes for all UoA's except Prince William Sound and Lower Cook Inlet.
	Justification	Years of implementing the regulation prohibiting the sale of non-salmon (other than from the Southeast Region where retention of groundfish is permitted in the troll fishery) coupled with the gear types used and locations where fishing is permitted , coupled with no evidence of sales occurring demonstrates the effectiveness of this strategy. For the Southeast, Yakutat, Kodiak and Norton Sound UoA's there is clear evidence from years of implementation that the management strategy of regulating harvests to achieve escapement objectives for minor primary species is, and has worked. Furthermore, the expression of escapement goals as ranges provides a means to evaluate varying levels of escapement and the fact that goals are reviewed on a three-year cycle provides the mechanism formal re-evaluation. This		

<table>
<tr><th colspan="2">PI 2.1.2</th><th colspan="3">There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.</th></tr>
<tr><td></td><td></td><td colspan="3">process constitutes a working approach to testing and evaluating the management strategy.

In the Prince William Sound and Lower Cook Inlet, the catch of Chinook and Coho salmon appear to be simply incidental to targeted caches of more abundant Pink and Chum Salmon The fact that catches of these species simply fluctuate without and pattern or trend provides some objective evidence that allowing the these non-targeted catch to occur while harvesting surplus Pink and Chum Salmon is succeeding in not significantly impacting the co-mingled stocksm therefore this can be considered as a parial strategy which is working with some objective basis of confidence.</td></tr>
<tr><td rowspan="4">C</td><td colspan="4">Management strategy implementation</td></tr>
<tr><td>Guide post</td><td></td><td>There is some evidence that the measures/partial strategy is being implemented successfully.</td><td>There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).</td></tr>
<tr><td>Met?</td><td></td><td>Yes for al UoA’s</td><td>Yes for all UoA’s except Prince William Sound and Lower Cook Inlet</td></tr>
<tr><td>Justification</td><td colspan="3">In Southeast and Yakutat there is clear evidence that the strategies outlined in the Pacific Salmon Treaty for managing Chinook Salmon stocks, Transboundary stocks of the Stikine, Taku and Alsek rivers and stocks in the Northern Boundary Area have been successful in meeting the twin goals of conservation and harvest sharing.

There is a strategy in place for managing the Chum Salmon run into the East River in Yakutat, but economic factors have not required its implementation in recent years, but successful implementation of similar strategies to manage to achieve escapements throughout the UoA makes it clear that if, and when implemented it will work successfully.

There is clear evidence that that the management strategy to regulate harvest to achieve escapements goals works for Chinook Salmon in Kodiak and for Sockeye Salmon in Norton Sound.

There is some evidence that the partial strategy to manage the incidental catches of Chinook and Coho salmon in Prince William Sound and Lower Cook Inlet is being implemented successfully (see rationale under scoring issue C.</td></tr>
<tr><td rowspan="2">D</td><td colspan="4">Shark finning</td></tr>
<tr><td>Guide</td><td>It is likely that shark</td><td>It is highly likely that</td><td>There is a high degree of</td></tr>
</table>

<table>
<tr><td colspan="2">PI 2.1.2</td><td colspan="3">There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.</td></tr>
<tr><td rowspan="3"></td><td>post</td><td>finning is not taking place.</td><td>shark finning is not taking place.</td><td>certainty that shark finning is not taking place.</td></tr>
<tr><td>Met?</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Justification</td><td colspan="3">There ae no sharks taken</td></tr>
<tr><td rowspan="4">E</td><td colspan="4">Review of alternative measures</td></tr>
<tr><td>Guide post</td><td>There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.</td><td>There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.</td><td>There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>No for all UoA’s</td></tr>
<tr><td>Justification</td><td colspan="3">There are no Main Primary Species hence the SG80 is met.
There are minimal catches of unwanted species in all UoA’s. The catches are so low as not garner the attention of management and as such there is no review of alternative measures. None of the UoA’s meet the SG 100 level.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">Anderson, T .J., J. Jackson, and B. A. Fuerst. 2016. Kodiak Management Area commercial salmon fishery annual management report, 2016. Alaska Department of Fish and Game, Fishery Management Report No. 16-42, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR16-42.pdf

Harding, R., & Coyle, C. (2011). Southeast Alaska Steelhead, Trout, and Dolly Varden Management. Alaska Department of Fish and Game Division of Sport Fish, Research and Technical Services. http://www.adfg.alaska.gov/FedAidPDFs/SP11-17.pdf</td></tr>
</table>

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	Maj/Minor	2.1.2.A	2.1.2.B	2.1.2.C	2.1.2.D	2.1.2.E	Score
Southeast	Minor	100	100	100	N/A	80	95
Yakutat	Minor	100	100	100	N/A	80	95
P. W. Sound	Minor	80	80	80	N/A	80	80
Copper-Bering	None	100	100	100	N/A	80	95
L. Cook Inlet	Minor	80	80	80	N/A	80	80
U. Cook Inlet	None	100	100	100	N/A	80	95

PI 2.1.2	There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.						
Bristol Bay	None	100	100	100	N/A	80	95
Kuskokwim	None	100	100	100	N/A	80	95
Yukon	None	100	100	100	N/A	80	95
Kotzebue	None	100	100	100	N/A	80	95
Norton Sound	Minor	100	100	100	N/A	80	95
Kodiak	Minor	100	100	100	N/A	80	95
Chignik	None	100	100	100	N/A	80	95
Ak. Penn.	None	100	100	100	N/A	80	95
CONDITION NUMBER (if relevant):							

Evaluation Table for PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
A	Information adequacy for assessment of impact on main primary species			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR **If RBF is used to score PI 2.1.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR **If RBF is used to score PI 2.1.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	Yes for all UoA's	Yes for all UoA's	Yes for all UoA's
	Justification	There are no Main Primary Species and quantitative information regarding quantities of primary species caught by the fisheries in all units is adequate to assess with a high degree of certainty that this is the case. The SG100 is met for this scoring issue for all UoAs.		
B	Information adequacy for assessment of impact on minor primary species			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			Yes except for the Prince William Sound and Lower Cook Inlet UoA's
	Justification	**Southeast -** There is substantial information available on the status of the Chinook Salmon stocks and the impact of the fishery (PSC – JCTC 2017). There is substantial information available on the status of the Chinook Salmon, Sockeye Salmon and Coho Salmon stocks of the Transboundary Stikine and Taku rivers and the impact of the fishery (PSC – JTTC 2017). There is substantial information available on the status of BC origin Chum Salmon,		

<table>
<tr><td colspan="2">PI 2.1.3</td><td colspan="3">Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species</td></tr>
<tr><td></td><td></td><td colspan="3">Sockeye Salmon and Pink Salmon stocks in the Northern Boundary area and of the impact of the fishery (PSC – JBTC 2017).

There is some quantitative information available on the Coho Salmon Stocks of BC origin (English et al. 2012, Blyth-Skyrme 2017)

There is substantive quantitative information available on the impact of the southeast troll fishery on both lingcod (Olson et. al 2017) and pacific halibut (IPHC 2018) and also see section 3.4.2.

The Southeast UoA meets the SG 100 level.

Yakutat - There is substantial information available on the status of the Chinook Salmon, Sockeye Salmon and Coho Salmon stocks of the Transboundary Alsek River and the impact of the fishery (PSC – JTTC 2017).

There is substantial information available on the status of the Chinook Salmon stocks and the impact of the fishery (PSC – JCTC 2017).

There is some quantitative information available on the Chum Salmon Stocks (Hagerman et al. 2017).

There is substantive quantitative information available on the impact of the troll fishery operating in Yakutat on pacific halibut (See Section 3.4.2) (IPHC 2018).

The Yakutat UoA meets the SG 100 level.

Prince William Sound - There is only catch data for wild Chinook and Coho salmon stocks in Prince William Sound. We conclude that this is insufficient to understand the impact on the wild stocks (Russell et al. 2017). The Prince William Sound UoA does not meet SG 100 level.

Lower Cook Inlet - There is only catch data for wild Chinook and Coho salmon stocks in Lower Cook Inlet (Hollowell et al. 2016). We conclude that this is insufficient to understand the impact on the wild stocks. The Lower Cook Inlet UoA does not meet SG 100 level.

Kodiak - There is substantial information available on the Chinook Salmon stocks in Kodiak and the impact of the fishery on those stocks (Anderson et al. 2016). The Kodiak UoA meets the SG 100 level.

Norton Sound - There is substantial information available on the Sockeye Salmon Stocks in Norton Sound and the impact of the fishery on those stocks (Menard et al. 2017). The Norton Sound UoA meets the SG 100 level.

There ae no Minor Primary Species in the following ’s: Copper – Bering Rivers, Upper Cook Inlet, Chignik, Alaska Peninsula/Aleutian Islands, Bristol Bay, Kuskokwim, Yukon, Kotzebue and they therefore meet the SG 100 level.</td></tr>
<tr><td>C</td><td colspan="4">Information adequacy for management strategy</td></tr>
<tr><td></td><td>Guide post</td><td>Information is adequate to support measures to manage main primary</td><td>Information is adequate to support a partial strategy to manage main</td><td>Information is adequate to support a strategy to manage all primary</td></tr>
</table>

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
		species.	Primary species.	species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective.
	Met?	Yes for all UoA's	Yes for all UoA's	Yes except for the Yakutat, Prince William Sound and Lower Cook Inlet UoA's.
	Justification	There are no Main Primary Species. **Southeast** Lingcod are conservatively managed by the State of Alaska (ADFG 2015, ADFG 2018). State Management of Lingcod includes establishment of Guideline Harvest Levels (GHL) by area, setting open and closed seasons to protect spawning females and nest guarding males, a size limit to ensure that individuals have the opportunity to spawn at least once, closed areas, the ability to establish by-catch limits, and an allocation guideline by gear type and area. For 2018, the GHL is set at 859,000 pounds and the troll fishery share is 55,690 pounds or 6.5 %. In two inside waters of Southeast the troll fishery allocation was eliminated to provide for a robust sport fishery, but little troll effort occurs in these areas. There is no conservation concern for Lingcod in Southeast and Yakutat. There is substantial information available on the status of the Chinook Salmon stocks and impact of the fishery on the stocks that is adequate to manage the fishery and evaluate the strategy with respect to meeting its objectives with a high degree of certainty (PSC – JCTC 2017). There is substantial information available on the status of the Chinook Salmon, Sockeye Salmon and Coho Salmon stocks of the Transboundary Stikine and Taku rivers and the impact of the fishery on the stocks that is adequate to manage the fishery and evaluate the strategy with respect to meeting its objectives with a high degree of certainty (PSC – JTTC 2017). There is substantial information available on the status of BC origin Chum Salmon, Sockeye Salmon and Pink Salmon stocks in the Northern Boundary area and on the impact of the fishery on the stocks that is adequate to manage the fishery and evaluate the strategy with respect to meeting its objectives with a high degree of certainty (PSC – JBTC 2017). There is some quantitative information available on the status of Coho Salmon Stocks of BC origin and the impact of the fisheries on the stocks that is adequate to manage the fishery and evaluate the strategy with respect to meeting its		

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species
		objectives with a high degree of certainty (English et al. 2012), and (Blyth-Skyrme et al. 2017). The Southeast UoA meets the SG 100 level. **Yakutat -** There is substantial information available on the status of the Chinook Salmon, Sockeye Salmon and Coho Salmon stocks of the Transboundary Alsek River and the impact of the fishery that is adequate to manage the fishery and evaluate the strategy with respect to meeting its objectives with a high degree of certainty (PSC - JTTC 2017). There is substantial information available on the status of the Chinook Salmon stocks and the impact of the fishery that is adequate to manage the fishery and evaluate the strategy with respect to meeting its objectives with a high degree of certainty (PSC -JCTC 2017). There is some quantitative information available on the Chum Salmon stocks and while current catches appear to be incidental, (Hagerman et al. 2017) and fisheries are not targeting Chum Salmon for economic reasons, it cannot be said that the information is sufficient to evaluate the strategy of managing the stock for an escapement goal l because escapements are not being reported. The Yakutat UoA does not meet the SG 100 level. **Prince William Sound -** There is only catch data for wild Chinook and Coho salmon stocks in Prince William Sound. We conclude that this is insufficient to understand the impact on the wild stocks (Russell et al. 2017). There is insufficient information to whether or not the strategy is meeting any stock-based objective. The Prince William Sound UoA does not meet SG 100 level. **Lower Cook Inlet -** There is only catch data for wild Chinook and Coho salmon stocks in Lower Cook Inlet (Hollowell et al. 2016). We conclude that this is insufficient to understand the impact on the wild stocks. There is insufficient information to whether or not the strategy is meeting any stock-based objective. The Lower Cook Inlet UoA does not meet SG 100 level. **Kodiak -** There is substantial information available on the Chinook Salmon stocks in Kodiak and the impact of the fishery on those stocks that is adequate to manage the fishery and evaluate the strategy with respect to meeting its objectives with a high degree of certainty (Anderson et al. 2016). The Kodiak UoA meets the SG 100 level. **Norton Sound -** There is substantial information available on the Sockeye Salmon Stocks in Norton Sound and the impact of the fishery on those stocks that is adequate to manage the fishery and evaluate the strategy with respect to meeting its objectives with a high degree of certainty (Menard et al. 2017). The Norton Sound UoA meets the SG 100 level. There ae no Minor Primary Species in the following UoA's: Copper – Bering Rivers, Upper Cook Inlet, Chignik, Alaska Peninsula/Aleutian Islands, Bristol Bay,

PI 2.1.3		**Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species**
		Kuskokwim.
References		ADFG. 2015. 2015 -2016 Statewide Groundfish Commercial Fishing Regulations. Juneau. https://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/2015-2016_statewide_commercial_groundfish.pdf ADFG. 2018. 2018 Eastern Gulf of Alaska Area Lingcod allocation announcement. ADFG. Sitka Ak. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/884415479.pdf Anderson, T.J., J. Jackson, and B. A. Fuerst. 2016. Kodiak Management Area commercial salmon fishery annual management report, 2016. Alaska Department of Fish and Game, Fishery Management Report No. 16-42, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR16-42.pdf Blyth-Skyrme, R., A. Cass, G. Ruggerone and J. Seeb. 2017. MSC sustainable fisheries certification; British Columbia salmon sishery. Acoura Marine Ltd. https://fisheries.msc.org/en/fisheries/british-columbia-salmon/@@assess English, K., T. Mochizuki and D. Robichaud. 2012. Review of North and Central Coast Salmon indicator streams and estimating escapement, catch and run size for each Salmon Conservation Unit. LGL Limited Environmental Research Associates. Sidney, BC. http://salmonwatersheds.ca/libraryfiles/lib_1.pdf International Pacific Halibut Commission. 2018. International Pacific Halibut Commission Annual Report. IPHC Seattle. https://www.iphc.int/uploads/pdf/ar/iphc-2017-annual-report.pdf Hagerman, G., R. Ehresmann, and L. Shaul. 2017. Annual management report for the 2017 Southeast Alaska/Yakutat salmon troll fisheries. Alaska Department of Fish and Game, Fishery Management Report No. 18-02, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR18-02.pdf Hollowell, G., E. O. Otis, and E. Ford. 2016. 2015 Lower Cook Inlet area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 16-19, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR16-19.pdf Menard, J., J. Soong, S. Kent, L. Harlan, and J. Leon. 2017. 2015 Annual management report Norton Sound, Port Clarence, and Arctic, Kotzebue Areas. Alaska Department of Fish and Game, Fishery Management Report No. 17-15, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-15.pdf Olson, A., J. Stahl, A. Baldwin, M.Vaughn, and K. Carroll. Annual Management Report for the Southjeast Alaska and Yakutat Gropundfish Fisheries, 2017. Fih. Mgmt. Rpt. No 17-54. ADFG. Juneau. http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/20

PI 2.1.3	Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species
	17-2018/se/WR12_FMR17-54.pdf Pacific Salmon Commission Joint Chinook Technical Committee (PSC-JCTC). 2017. Annual report of catch and escapement 2016. Report TC Chinook (17-2). Pacific Salmon Commission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/Chinook/ Pacific Salmon Commission Joint Northern Boundary Technical Committee (PSC-JNBTC). 2017. U.S./Canada Northern Boundary Area 2016 salmon fisheries management report and 2017 preliminary expectations. Report TCNB (17)-1 Pacific Salmon Commission. Vancouver, B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/northern-boundary/ Pacific Salmon Commission Joint Transboundary Technical Committee (PSC-JTTC). 2017. Final estimates of Transboundary River Salmon Production, harvest and escapement and a review of joint enhancement activities in 2015. Pacific Salmon Commission Report (17)-2. PSC Vancouver B.C. http://www.psc.org/publications/technical-reports/technical-committee-reports/transboundary/ Russell, C. W., J. Botz, S. Haught, and S. Moffitt. 2017. 2016 Prince William Sound area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 17-37, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-37.pdf

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	Maj/Minor	2.1.3.A	2.1.3.B	2.1.3.C	Score
Southeast	Minor	100	100	100	100
Yakutat	Minor	100	100	80	95
P. W. Sound	Minor	100	80	80	85
Copper-Bering	None	100	100	100	100
L. Cook Inlet	Minor	100	80	80	85
U. Cook Inlet	None	100	100	100	100
Bristol Bay	None	100	100	100	100
Kuskokwim	None	100	100	100	100
Yukon	None	100	100	100	100
Kotzebue	None	100	100	100	100
Norton Sound	Minor	100	100	100	100
Kodiak	Minor	100	100	100	100
Chignik	None	100	100	100	100
Ak. Penn.	None	100	100	100	100

CONDITION NUMBER (if relevant):

Evaluation Table for PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.		
Scoring Issue		SG 60	SG 80	SG 100
A	Main secondary species stock status			
	Guide post	Main Secondary species are **likely** to be within biologically based limits. OR If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are **considerable**, there is either **evidence of recovery** or a, **demonstrably effective strategy in place between those MSC UoAs that also have considerable catches of the species**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are within biologically based limits.
	Met?	Yes for all UoA's	Yes for all UoA's	Yes for all UoA's
	Justification	Data from test fisheries that use the same gear as is used in the commercial fisheries (Table 20) show that catches of non-salmonid species are very low indicating that no by-catch for the UoA would meet or exceed 5%. Marine species such as pollock, starry flounder, yellowfin sole and sculpins were observed in the Kodiak, Alaska Peninsula/Aleutian Islands and/or Norton Sound		

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.		
		UoA's. Freshwater species including sheefish, whitefish and cisco were observed in either the Yukon or Kotzebue UoA's. Dolly Varden, which can be anadromous, were observed in the Southeast and Kotzebue UoA's. In all cases, the quantities taken are considered negligible. None of these species is considered particularly vulnerable. There are no Main Secondary Species, hence the SG100 is met for this Scoring Issue for all UoAs.		
B	**Minor secondary species stock status**			
	Guide post			Minor secondary species are highly likely to be above biologically based limits OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species.
	Met?			Yes for all UoA's
	Justification	**Southeast and Yakutat Minor Species -** There were seven rockfish species harvested that are members of the demersal rockfish management assemblage, they are: • Canary rockfish (S. pinniger), • Copper rockfish (S. caurinus), • Quillback rockfish (S, maliger), • Redband rockfish (S. proriger). • Rosethorn rockfish (S. helvomaculatus), • Tiger rockfish (S. nigrocinctus), • Yelloweye rockfish (S. ruberrimur). There were four rockfish species harvested in the slope management assemblage, they are: • Black rockfish (S. melanops) • Bocaccio (S. paucispinis). • Redstripe (S. proriger) • Silvergray rockfish (S. brevispinis) There were four rockfish species harvested in the pelagic shelf management		

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.
		assemblage, they are: • Dusky rockfish (S. variabilis) • Widow rockfish (S. entomelas) • Yellowtail rockfish (S. flavidus) The catch of rockfish is managed by both the North Pacific Fishery Management Council (NPFMC) and the State of Alaska. In general, the state quota is based upon the Federal guideline harvest level (ADFG 2015). State regulations also provide for apportioning the guideline harvest level between areas, establishing closed areas, trip limits and accounting for by-catch mortality in the allowable harvest. Within the demersal shelf rockfish complex, the troll fishery's largest catch was for Yelloweye rockfish followed by Canary rockfish. NOAA stock assessments show that Yelloweye rockfish account for a large portion of the biomass. Because of their longevity NOAA recommended that fishing mortality for the demersal shelf complex be set to 0.02. The estimated biomass for 2018 of Yelloweye rockfish in the Southeast Outside Subdistrict of the Gulf of Alaska is11,508 tons and this represents an increase over the previous year. NOAA has recommended a TAC for all DSR of 250 tons of which 230 tons would be Yelloweye (Olson et al. 2017). In addition to NOAA's work, ADFG conducts an annual stock assessment for the demersal shelf complex using a habitat- based method. The density of Yelloweye rockfish, the primary target of the DSR complex, is estimated from a survey using an un-manned submersible, and rockfish habitat is estimated using sonar and fishing data. These data show that stock is healthy and that the troll fishery catch represents a minor portion of the TAC of the complex. Within the slope assemblage Black and Silvergray account for almost all the catch. Management of Black rockfish was delegated to the state of Alaska in 2008. Management includes establishment of Guideline Harvest Levels (by area), allowable gear, closed areas, allocations among user groups, requirements for full retention, by-catch allowances, maintaining logbooks when participating in the directed fishery, and requires deducting by-catch mortality from the GHL. For 2018 the GHL in the Southeast was set at 325,000 pounds (ADFG 2018 b). The only data available for stock assessment is catch and logbooks. However, because the directed fisheries are small and effort has been declining in recent years, there is no conservation concern. http://www.adfg.alaska.gov/index.cfm?adfg=blackrockfish.main Within the Pelagic Shelf Assemblage, Dusky rockfish represent most of the catch. NOAA recommend Allowable Biological Catch (ABC) of Dusky Rockfish in the Gulf of Alaska. For 2018 the ABC is 3,975 tons. At this level the estimated exploitation rate will be 20%. Within Southeast and Yakutat, the ABC is 77 tons.

PI 2.2.1	The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit.
	The stock is not subject to overfishing, is not currently overfished nor is it approaching a condition of being overfished (Fenske et al. 2017). The troll fishery catch represents a minor portion of the ABC. The Southeast UoA meets the SG 100 scoring level. There are no Minor Secondary Species in the remaining UoA's other than negligible quantities, so these species are not considered in scoring. All remaining UoA's meet the SG 100 scoring level.
References	ADFG. 2018b. 2018 Southeast Alaska directed Black Rockfish fishery announcement. ADFG Sitka, Ak http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/884634797.pdf Fenske, K, C. Lunsford, P-J Hulson, D. Hanselman and K. Shotwell. Assessment of Dusky Rockfish stock in the Gulf of Alaska. NOAA. REFM Doc. https://www.afsc.noaa.gov/REFM/Docs/2017/GOAdusky.pdf Olson, A. J. Stahl, B. Williams, M. Jaenicke and S. Meyer. 2017. Assessment of demersal shelf rockfish stock complex in the Southeast Outside Subdistrict of the Gulf of Alaska. NOAA REFM Doc. Seattle. https://www.afsc.noaa.gov/REFM/Docs/2017/GOAdsr.pdf

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	Major/Minor	2.2.1A	2.2.1.B	Score
Southeast	Minor	100	100	100
Yakutat	Minor	100	100	100
P.W.S.	Minor	100	100	100
Copper-Bering	Minor	100	100	100
L. Cook Inlet	Minor	100	100	100
U. Cook Inlet	Minor	100	100	100
Bristol Bay	Minor	100	100	100
Kuskokwim	Minor	100	100	100
Yukon	Minor	100	100	100
Norton Sound	Minor	100	100	100
Kotzebue	Minor	100	100	100
Kodiak	Minor	100	100	100
Chignik	Minor	100	100	100
Ak Peninsula	Minor	100	100	100

CONDITION NUMBER (if relevant):

Evaluation Table for PI 2.2.2 – Secondary species management

<table>
<tr><td colspan="2">PI 2.2.2</td><td colspan="3">There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">A</td><td colspan="4">Management strategy in place</td></tr>
<tr><td>Guide post</td><td>There are measures in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.</td><td>There is a partial strategy in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.</td><td>There is a strategy in place for the UoA for managing main and minor secondary species.</td></tr>
<tr><td>Met?</td><td>Yes for all UoA’s</td><td>Yes for all UoA’s</td><td>No for all UoA’s</td></tr>
<tr><td>Justification</td><td colspan="3">There are no Main Secondary Species.

There are clear strategies in place to manage and rockfish taken in the Southeast and Yakutat UoA.

Non-sale provisions coupled with the highly selective gear and fishing during times and places of peak abundance of targeted salmon populations serves as a partial strategy for minimizing unwanted by-catch in all UoA’s. However, it cannot said that these elements represent a complete strategy, as such the SG 100 level is not met for any UoA.</td></tr>
<tr><td rowspan="4">B</td><td colspan="4">Management strategy evaluation</td></tr>
<tr><td>Guide post</td><td>The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).</td><td>There is some objective basis for confidence that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.</td><td>Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td></td><td colspan="3">Testing, as a function of implementing the strategy of non-sale regulations, using highly selective gear, and fishing at times and places of high salmon abundance over many decades and test fishing provides a high degree of confidence that this partial strategy of avoiding unwanted catch is working.</td></tr>
</table>

PI 2.2.2		**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
		Testing as a function of implementing the management strategies in place for rockfish over a number of years provides evidence that they are working to conserve these resources in Southeast and Yakutat. The SG level of performance is met for all UoA's		
C	**Management strategy implementation**			
	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully** and is **achieving its objective as set out in scoring issue (a).**
	Met?		Yes	Yes
	Justification	As previously outlined the partial strategy of implementing non-sale regulations, using highly selective gear, and fishing at times and places of high salmon abundance over many decades provides a high degree of confidence that this partial strategy is working. The longtime series of on-the grounds observations by Area Management staff and enforcement officers and the occasional placement of on-board observers has shown that the strategy is being successfully implemented and is achieving it objectives. Al UoA meet the SG 100 level of performance for the negligible quantities of unwanted catch. Permitting the sale of rockfish provides clear incentive to land these fish and provide an accounting of mortality, when coupled with the small quantities taken of the total allowable catch for these species these factors provides clear evidence that the strategy is being implemented successfully and is achieving its objectives in the Southeast and Yakutat UoA's meet the SG 100 level for these species.		
D	**Shark finning**			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	There are no sharks taken as such this element is not scored		
E	**Review of alternative measures to minimise mortality of unwanted catch**			
	Justific	There is a review of the potential effectiveness	There is a **regular** review of the potential	There is a **biennial** review of the potential

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
ation	and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.
Met?	Yes	Yes	No
Guide post	There are no Main Secondary Species in any UoA as such the SG 60 and SG 80 levels are considered to be met. There are negligible quantities of unwanted by-catch, and the amount does not garner the attention of management. However, there is no biennial review of potential measures to further reduce this negligible quantity of unwanted by-catch and as such the SG 100 level is not met.		
References			

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	Major/Minor	2.2.2.A	2.2.2.B	2.2.2C	2.2.2.E	Score
Southeast	Minor	80	100	100	80	90
Yakutat	Minor	80	100	100	80	90
P.W.S.	Minor	80	100	100	80	90
Copper-Bering	Minor	80	100	100	80	90
L. Cook Inlet	Minor	80	100	100	80	90
U. Cook Inlet	Minor	80	100	100	80	90
Bristol Bay	Minor	80	100	100	80	90
Kuskokwim	Minor	80	100	100	80	90
Yukon	Minor	80	100	100	80	90
Norton Sound	Minor	80	100	100	80	90
Kotzebue	Minor	80	100	100	80	90
Kodiak	Minor	80	100	100	80	90
Chignik	Minor	80	100	100	80	90
Ak Peninsula	Minor	80	100	100	80	90

CONDITION NUMBER (if relevant):

Evaluation Table for PI 2.2.3 – Secondary species information

PI 2.2.3	**Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.**			
Scoring Issue		SG 60	SG 80	SG 100
A	**Information adequacy for assessment of impacts on main secondary species**			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	Yes for alll UoA's	Yes for all UoA's	Yes for all UoA's
	Justification	There are no Main Secondary Species as such the SG level 100 is met.		
B	**Information adequacy for assessment of impacts on minor secondary species**			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			Yes for all UoA;s
	Justification	These is substantial information available to estimate the impact of the troll fishery on rockfish in the Southeast and Yakutat UoA's. There is no Minor Secondary Species in any other UoA. The SG 100 level is met for all UoA's.		
C	**Information adequacy for management strategy**			
	Guide	Information is adequate	Information is adequate	Information is adequate

<table>
<tr><td colspan="2">PI 2.2.3</td><td colspan="3">Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.</td></tr>
<tr><td></td><td>post</td><td>to support measures to manage main secondary species.</td><td>to support a partial strategy to manage main secondary species.</td><td>to support a strategy to manage all secondary species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.</td></tr>
<tr><td></td><td>Met?</td><td>Yes for all UoA’s</td><td>Yes for all UoA’s</td><td>No for all UoA’s</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">There are no main Secondary Species as such the SG 60 and SG 80 levels are met.
There is adequate information available to manage rockfish with a high degree of certainty that the measures taken are achieving their objectives.
While information is available to evaluate the management strategy for minimizing the by-catch of unwanted species, it cannot be said that this information is adequate to do so with a high degree of certainty. As such the SG 100 level is not achieved in any UoA.</td></tr>
<tr><td colspan="2">References</td><td colspan="3"></td></tr>
<tr><td colspan="5">OVERALL PERFORMANCE INDICATOR SCORE:</td></tr>
</table>

UoA	Major/Minor	2.2.3.A	2.2.3.B	2.2.3.C	Score
Southeast	Minor	100	100	80	95
Yakutat	Minor	100	100	80	95
P W S	Minor	100	100	80	95
Copper-Bering	Minor	100	100	80	95
L. Cook Inlet	Minor	100	100	80	95
U Cook Inlet	Minor	100	100	80	95
Bristol Bay	Minor	100	100	80	95
Kuskokwim	Minor	100	100	80	95
Yukon	Minor	100	100	80	95
Norton Sound	Minor	100	100	80	95
Kotzebue	Minor	100	100	80	95
Kodiak	Minor	100	100	80	95
Chignik	Minor	100	100	80	95
Ak. Peninsula	Minor	100	100	80	95

CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.3.1 – ETP species outcome

PI 2.3.1		**The UoA meets national and international requirements for the protection of ETP species** **The UoA and associated enhancement activities do not hinder recovery of ETP species**		
Scoring Issue		SG 60	SG 80	SG 100
A	Effects of the UoA on population/stocks within national or international limits, where applicable			
	Guide post	Where national and international requirements set limits for ETP species, the effects of the UoA and associated enhancement activities on the population/stock are known and likely to be within these limits.	Where national and/ or international requirements set limits for ETP species, the **combined effects of the MSC UoAs and associated enhancement activities** on the population/stock are known and **highly likely** to be within these limits.	Where national and/ or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** and associated enhancement activities are within these limits.
	Met?	Not Relevant	Not Relevant	Not Relevant
	Justification	There are no limits set for any ETP species, as such this clause is not relevant		
B	Direct effects			
	Guide post	Known direct effects of the UoA including enhancement activities are **likely to not hinder recovery** of ETP species.	Direct effects of the UoA including enhancement activities are **highly likely to not hinder recovery** of ETP species.	There is a **high degree of confidence** that there are no **significant detrimental direct effects** of the UoA including enhancement activities on ETP species.
	Met?	Yes for All UoA's	Yes for all UoA's	No for all UoA's
	Justification	In addition to our emphasis on species listed under the Endangered Species Act, we also consider marine mammals and migratory birds because they covered by the Marine Mammal Protection Act (MMPA) and the Migratory Birds Act (MBA). By-catch of birds and marine mammals was the subject of a Condition of Certification during the first MSC certification in 2000. The condition required collection of by-catch data in test fisheries as a means to identify whether by-catch was a significant conservation issue. As reported by ADF&G and presented in the 2007 recertification report (Chaffee et al. 2007), no by-catch of birds or marine mammals was observed in ADF&G test fisheries in Southeast Alaska, Upper Cook Inlet, Bristol Bay, Kuskokwim, Yukon, Norton Sound, North Alaskan Peninsula,		

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA and associated enhancement activities do not hinder recovery of ETP species
		Shumagin Islands, and Kodiak during 2002, 2003, and/or 2004. Since that time, additional monitoring of bird by-catch has occurred in specific areas of Alaska. This monitoring showed that species including pelagic cormorants, red-faced cormorants, harlequin ducks, pigeon guillemots, marbled murrelets, common murres, thick- billed murres, horned puffins, tufted puffins, sooty shearwaters, Kittlitz's murrelets, Arctic loon, white-winged scoters, red-throated loon, gulls, long-tailed duck and other species may be taken in relatively small numbers across the fishery. It is noted that the “expanded” take of Kittlitz's murrelets, an ESA candidate species, was 0 in 2002 and 18.1 in 2005 (Kodiak), 0 in 2007 and 14 in 2008 (Yakutat), and 0 in LCI and UCI. Blejwas & Wright (2012) examined spatial and temporal overlap of Kittlitz's murrelets with gillnets in PWS, Cook Inlet, Kodiak, and Yakutat and concluded that most Kittlitz's murrelets were found in areas where there was no fishing. In areas of overlap, they concluded “the total number of birds exposed to gillnets in any of the overlap areas is small”. Non of these species are listed under the ESA. NMFS classifies commercial salmon fisheries with respect to by-catch of marine mammals. Under the 2017 letter of determination (Federal Register / Vol. 82, No. 8 / Thursday, January 12, 2017) no Alaska salmon gear-area combination is listed as a Category I fishery (i.e., frequent incidental mortality or serious injury of marine mammals). A number are classified as Category II (i.e., occasional incidental mortality or serious injury of marine mammals). Other gear-area combinations are classified as Category III (i.e., remote likelihood of/no known incidental mortality or serious injury of marine mammals) or last simply not categorized. NMFS has estimated total annual by-catch of marine mammals in some fisheries and determined that the Potential Biological Removal (PBR) taken in Alaska salmon fisheries is relatively low (typically <5% of the PBR). Based on the impacts of the individual Alaska salmon fisheries, NMFS has not found a need to imposed any constraints such as would be required in a Take Reduction Program, nor the need to impose observer coverage. There are eleven species listed under the ESA that may be found in waters off Alaska. Bird Species include the Steller eider, Spectacled eider, and Short tailed Albatross. The Steller’s eider is found only in Southwest Alaska (Yukon, Kuskokwim, Alaska Peninsula and Bristol Bay U of A’s. Spectacled eiders are found central Bering Sea south of St. Lawrence Island, where they remain in large flocks until March or April. When molting they can be found in Norton Sound U of A. They are not found in any other UofA. The Short-tailed albatross is found throughout the Bering Sea and Gulf of Alaska. They are typically found off shore waters but may be found in waters where the fisheries of the Alaska Peninsula, Kodiak, Copper – Bering and

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA and associated enhancement activities do not hinder recovery of ETP species
		Southeastern (troll) and Yakutat (troll) fisheries operate. The available data does not show significant numbers of encounters or associated mortality of these ESA listed bird species in the U of A's where found. As such the USFWS does not require any Alaska salmon fishery to have an incidental take permit, nor do the recovery plans require or recommend any action in the salmon fisheries where these birds are found. Seven marine mammal species are ESA listed and some may be encounter in one or more Alaskan salmon fishery U of A's. The eastern DPS of sea otters can be found in the Alaska Peninsula U of A. Observer data indicates that there is a very low encounter rate and very low subsequent mortality rate because the otters either free themselves of the fishermen disentangle them. There is some evidence of human caused mortality by shooting. The Western DPS of Steller sea Lyons can be found in the Alaska Peninsula, Chignik, Bristol Bay, Cook Inlet, Kodiak and PWS U of A's. NOAA categorizes the Kodiak set net, Alaska Peninsula set net and Cook Inlet set net fisheries as having occasional encounters and causing occasional mortality, but NOAA has not placed any restrictions, permits or take limits on the salmon fisheries in these U of A's. Encounters with marine debris is an issue for Steller sea Lyons. The most common encounters with fishing gear are for flashers and bait used by recreational and commercial troll fisheries. However, commercial trolling is not permitted within the range of the Western DPS. Another primary form of encounter is with packing bands and large rubber bands typically found on bait boxes used by longline and crab fisheries. Last, there is an occasional encounter with lost net gear but the fishery (e.g. trawl, seine, gillnet) from where the nets originated was not specified. There are five species of whales that may be found off the coast of Alaska, bowhead whales, fin whales, sei whales, sperm whales, and bearded seals). Because bearded seals are closely associated with sea ice, particularly pack ice, their seasonal distribution and movements are linked to seasonal changes in ice conditions. To remain associated with their preferred ice habitat, bearded seals generally move north in late spring and summer as the ice melts and retreats and then south in the fall as sea ice forms. As such they are not likely found in any U of A during the summer fishing season. Bowhead whales can be found off Alaska in the Bering, Chukchi, and Beaufort seas. They spend the winter near the southern limit of the pack ice and move north as the sea ice breaks up and recedes during spring as such, they ae not likely in any U of A during the summer fishing season. Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes. They are less common in the tropics. They occur

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA and associated enhancement activities do not hinder recovery of ETP species
		year-round in a wide range of locations, but the density of individuals in any one area changes seasonally. Most migrate from the Arctic and Antarctic feeding areas in the summer to tropical breeding and calving areas in the winter. The location of winter breeding grounds is not known. Fin whales travel in the open seas, away from the coast, so they are difficult to track. As such they are not likely to be found in any U of A where salmon fishing occurs. Sei whales have a wide distribution and live in subtropical, temperate, and subpolar waters around the world. They prefer temperate waters in the mid-latitudes, and can be found in the Atlantic, Indian, and Pacific Oceans. During the summer, they are commonly found in the Gulf of Maine, and on Georges Bank and Stellwagen Bank off the U.S. coast in the western North Atlantic. The movement patterns of sei whales are not well known, but they are typically observed in deeper waters far from the coastline and as such it is unlikely that sei whales are found in any salmon Alaskan U of A. Sperm whales inhabit all of the world's oceans and spend most of their time in deep waters, where they forage at great depths for food. Because of their off-shore distribution, they are unlikely to enter any Alaskan U of A where fishing occurs. Because there are so few, if any encounters with these whales and the bearded seal, NOAA does not consider the Alaska Salmon fisheries as encountering these species, does not require any incidental take permits nor set any restrictions on Alaska salmon fishing operations. Three are four ESU's of ESA listed Chinook Salmon that are harvested in the troll fishery of the Yakutat and Southeast U of A's and in the gillnet and seine fisheries of Southeast Alaska. As discussed earlier, the catch of fish from these ESU's are small, and the harvest rates are low and have been decreasing since the Pacific Salmon Treaty was signed in 1985. NOAA Fisheries has certified that the catches in these fisheries are not hindering recovery. In summary, an ESA listed species may be encountered in the following U of A's; Norton Sound, Bristol Bay, Alaska Peninsula, Chignik, Kodiak, Lower and Upper Cook Inlet, Prince William Sound, Copper Bering, Yakutat and Southeast. There is sufficient information to conclude that direct effects for all UoA's where ESA species may be found are highly likely to not hinder recovery. There is no data to conclude that enhancement activities have any measurable negative effect on ETP species. However, these data are insufficient to conclude that there is a high degree of confidence that there are no significant detrimental effects. As such the SG 80 level but not the SG 100 level is attainted for all UoA's. In the remaining U of A's there is sufficient information to conclude that there is a high degree of confidence that there are no significant detrimental direct effects of the UofA including enhancement activities on these ETP species.

<table>
<tr><td colspan="2">PI 2.3.1</td><td colspan="3">The UoA meets national and international requirements for the protection of ETP species
The UoA and associated enhancement activities do not hinder recovery of ETP species</td></tr>
<tr><td rowspan="4">C</td><td colspan="4">Indirect</td></tr>
<tr><td>Guide post</td><td></td><td>Indirect effects have been considered for the UoA including enhancement activities and are thought to be highly likely to not create unacceptable impacts.</td><td>There is a high degree of confidence that there are no significant detrimental indirect effects of the UoA including enhancement activities on ETP species.</td></tr>
<tr><td>Met?</td><td></td><td>Yes for all UoA’s</td><td>No for all UoA’s</td></tr>
<tr><td>Justification</td><td colspan="3">There are no ETP species in the Kotzebue of A’a and no enhancement, as such this U of A’s score 100.

Of the remaining U of A’s three bird species (the Steller eider, spectacled eider, and short tailed albatross) may be found in one or more U of A (see above), as well as two marine mammals, the eastern DPS of sea otter and western DPS of Steller sea Lyons (also see locations above). There are no enhancement activities within the Yakutat, Bristol Bay, Norton Sound, Chignik and Alaska Peninsula U of A’s.

Purse seines and set nets may drag on the bottom when in use but any impacts are likely temporary and the IMM (2013) was not aware of any evidence or suggestions that this would, in any case, cause detrimental indirect effects on ETP species. ESA listed birds, sea otter or Steller sea Lyons may temporary avoid some areas where fishing occurs but such temporary avoidance is unlikely to produce significant detrimental indirect effects. Ghost fishing of lost salmon gear is rare because purse seins and gill nets are seldom lost because all commercial fishing gear must be attended when operating. The occasional loss of salmon troll gear, predominately lead weights, is also rare but would have little to no impact on ESA listed species in Southeast and Yakutat because the weights would simply lie on the substrate at significant depth.

Escapement goals are set at levels consistent with supporting upstream communities and species dependent on healthy salmon runs, and harvest is managed, and curtailed if needed, to ensure escapement to the greatest degree possible. Because management is set to achieve a maximum sustained yield, there should be no adverse impacts on oceanic predators of salmon. . We conclude that it is highly likely that all UoA’swhere ESA listed species may be found do not create unacceptable impacts on ETP species and therefore meet the SG 80 level of performance. We cannot conclude however that there is a high degree of</td></tr>
</table>

PI 2.3.1	The UoA meets national and international requirements for the protection of ETP species The UoA and associated enhancement activities do not hinder recovery of ETP species
	confidence that there are no significant indirect effects by the UoA's, as such the SG 100 level is not met.
References	Blejwas, K. M., and S. K. Wright. 2012. By-catch of Kittlitz's murrelet (Brachyramphus brevirostris) in commercial salmon gillnet fisheries in the Gulf of Alaska: A qualitative risk assessment. Alaska Department of Fish and Game, Wildlife Research Report ADF&G/DWC/WRR-2012-8, Juneau. http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/research_pdfs/wrr_2012_8.pdf Chaffee, C., Ruggerone, G., Beamesderfer, R. & L.W. Botsford. (2007). The commercial Alaska salmon fisheries managed by the ADF&G; A 5-year re-assessment based on the Marine Stewardship Council program. Scientific Certification Systems, Inc., Emeryville, California. 350 pp. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments IMM (Intertek Moody Marine). 2013. Alaska Salmon Fishery Final Determination Report. October 2013. Marine Stewardship Council. London UK. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.3.1.A	2.3.1.B	2.3.1.C	Score
Southeast	N/R	80	80	80
Yakutat	N/R	80	80	80
P W S	N/R	80	80	80
Copper-Bering	N/R	80	80	80
L Cook Inlet	N/R	80	80	80
U. Cook Inlet	N/R	80	80	80
Bristol Bay	N/R	80	80	80
Kuskokwim	N/R	80	80	80
Yukon	N/R	80	80	80
Norton Sound	N/R	80	80	80
Kotzebue	N/R	100	100	100
Kodiak	N/R	80	80	80
Chignik	N/R	80	80	80
Ak. Peninsula	N/R	80	80	80

CONDITION NUMBER (if relevant):	
Recommendation 1: For the marine gill net fisheries of Cook Inlet, Kodiak, the AK Penninsula, Bristol Bay and AYK (Yukon, Kuskokwim and Kotzebue), certainty could be increased if the earlier observation of test fisheries were repeated, or an equivalent study to update verification of the degree of interaction between these fisheries and seabirds were conducted.	

PI 2.3.1	**The UoA meets national and international requirements for the protection of ETP species** **The UoA and associated enhancement activities do not hinder recovery of ETP species**	

Evaluation Table for PI 2.3.2 – ETP species management strategy

<table>
<tr><td colspan="2">PI 2.3.2</td><td colspan="3">The UoA and associated enhancement activities have in place precautionary management strategies designed to:
• meet national and international requirements
• ensure the UoA does not hinder recovery of ETP species
Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">A</td><td colspan="4">Management strategy in place (national and international requirements)</td></tr>
<tr><td>Guide post</td><td>There are measures in place that minimise the UoA-related mortality of ETP species due to the UoA including enhancement activities, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.</td><td>There is a strategy in place for managing the UoA and enhancement activities' impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.</td><td>There is a comprehensive strategy in place for managing the UoA and enhancement activities' impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.</td></tr>
<tr><td>Met?</td><td>Not Relevant</td><td>Not Relevant</td><td>Not Relevant</td></tr>
<tr><td>Justification</td><td colspan="3">There are no requirement (e.g. a Take Reduction Plan) set for ETP species in any Alaska salmon fishery, as such this clause is not relevant.</td></tr>
<tr><td rowspan="4">B</td><td colspan="4">Management strategy in place (alternative)</td></tr>
<tr><td>Guide post</td><td>There are measures in place that are expected to ensure the UoA including enhancement activities do not hinder the recovery of ETP species.</td><td>There is a strategy in place that is expected to ensure the UoA including enhancement activities do not hinder the recovery of ETP species.</td><td>There is a comprehensive strategy in place for managing ETP species, to ensure the UoA including enhancement activities do not hinder the recovery of ETP species.</td></tr>
<tr><td>Met?</td><td>Yes for all UoA's</td><td>Yes for all UoA's</td><td>No for all UoA;s</td></tr>
<tr><td>Justification</td><td colspan="3">There are no ETP species in the Kotzebue of A and no enhancement, as such this U of A gets a score 100.

Fishery regulations prohibit the deliberate take of ETP species in Alaska Salmon fisheries. Fishing is also prohibited near Stellar sea Lyon rookeries and haul-out areas. NOAA's marine mammal observer program has an outreach component that educates fishermen with regard to marine mammals and birds, although the outreach program does not engage every fishery each year. This strategy is consistent with the observed level of ETP by-catch, is a strategy that is expected to</td></tr>
</table>

PI 2.3.2		The UoA and associated enhancement activities have in place precautionary management strategies designed to: • meet national and international requirements • ensure the UoA does not hinder recovery of ETP species Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.		
		ensure that the UoA's do not hinder recovery of ETP species. The fishery meets the SG 80 level of performance the operational strategy that the Alaska Salmon fishery maintains cannot be considered to be comprehensive because of the lack of an ongoing observer program. This prevents the fishery from meeting the monitoring requirement of a comprehensive strategy, we therefore conclude that the SG 100 level of performance is not met.		
C	Management strategy evaluation			
	Guide post	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is an **objective basis for confidence** that the measures/strategy will work, based on information directly about the fishery and/or the species involved.	The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a **quantitative analysis supports high confidence** that the strategy will work.
	Met?	Yes for all UoA's	Yes for all UoA's	No for all UoA;s
	Justification	There are no ETP species in the Kotzebue UofA and no enhancement in this U of A as such this U of A's gets a score of 100. The available data regarding encounters and mortality from the Alaska Marine Mammal Observer Program and test fisheries for Steller sea Lyons provides an objective basis for confidence that encounters and mortality with the Western DPS of Steller sea Lyons is low. . Data on self-reporting of encounters with marine mammals also indicates very low incidence. Fishing is prohibited around rookeries and haul-outs for the Western DPS Steller sea Lyons and this greatly reduces the chance for encounters. The primary interaction of Steller sea Lyons and salmon gear is with troll gear, and this gear is prohibited within the range of the listed western DPS and as such sea Lyons with such troll gear as flashers is not observed in this DPS. These data sets provide an objective basis for confidence that for Western DPS Steller sea Lyons in the Alaska Peninsula, Chignik, Bristol Bay Kodiak Cook Inlet and PWS U of A's the strategy of prohibiting the take of marine mammals, the self-reporting of encounters, the exclusion of troll gear and closure of areas around rookeries works to avoid encounters and mortalities is working. Observer data indicates very low mortality rate of the eastern DPS of Sea otters (found in the Alaska Peninsula U of A) because the primary encounter is with gill nets and otters either free themselves of the gillnet or fishermen disentangle		

<table>
<tr><td>PI 2.3.2</td><td colspan="4">The UoA and associated enhancement activities have in place precautionary management strategies designed to:
• meet national and international requirements
• ensure the UoA does not hinder recovery of ETP species
Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.</td></tr>
<tr><td></td><td></td><td colspan="3">them. Also, there is a very low incidence of self-reporting of encounters with eastern DPS sea otters. These data provide an objective basis that the prohibition of taking sea otters is working.

Test fish data in Southeast Alaska, Upper Cook Inlet, Bristol Bay, Kuskokwim, Yukon, Norton Sound, North Alaskan Peninsula, Shumagin Islands, and Kodiak during 2002, 2003, and/or 2004 show no encounters with spectacled eiders, Steller eiders or albatross. Likewise, observer data collected in Kodiak, Yakutat, PWS, LCI, UCI, and Southeast U of A's also show no encounters with spectacled eiders, Steller eiders or albatross,

These data sets provide an objective basis for determining that the minimal strategies employed (primarily prohibiting take in designated near shore fishing waters) is working. Because not all fisheries in every UofA have been sampled, and the data sets are limited to a few years we concluded that all the remaining UoA's meet the SG 80 of performance but not the SG 100 level.</td></tr>
<tr><td>D</td><td colspan="4">Management strategy implementation</td></tr>
<tr><td></td><td>Guide post</td><td></td><td>There is some evidence that the measures/strategy is being implemented successfully.</td><td>There is clear evidence that the strategy/comprehensive strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a) or (b).</td></tr>
<tr><td></td><td>Met?</td><td></td><td>Yes for all UoA's</td><td>No for all UoA's</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">Quantitative information on the by-catch of ETP species is available from the fisheries, but not all area-gear combinations have been sampled, and the data are limited to one or two years only. There is therefore considered to be evidence that the strategy is being implemented successfully, but a higher level of sampling would be required for the fishery to meet the SG100 level of performance.</td></tr>
<tr><td>E</td><td colspan="4">Review of alternative measures to minimize mortality of ETP species</td></tr>
<tr><td></td><td>Guide post</td><td>There is a review of the potential effectiveness and practicality of alternative measures to</td><td>There is a regular review of the potential effectiveness and practicality of alternative</td><td>There is a biennial review of the potential effectiveness and practicality of alternative</td></tr>
</table>

PI 2.3.2		The UoA and associated enhancement activities have in place precautionary management strategies designed to: • meet national and international requirements • ensure the UoA does not hinder recovery of ETP species Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.		
		minimise UoA-related mortality of ETP species.	measures to minimise UoA and enhancement related mortality of ETP species and they are implemented as appropriate.	measures to minimise UoA and enhancement related mortality ETP species, and they are implemented, as appropriate.
	Met?	Yes for all UoA's	Yes for all UoA's	No for all UoA's
	Justification	The Marine Mammal Protection act requires that the National Marine Fisheries Service (NMFS) publish a list of Fisheries (LOF) each year. The annual LOF reflects new information on interactions between commercial fisheries and marine mammals. NMFS must classify each commercial fishery on the LOF into one of three categories under the MMPA based upon the level of mortality and serious injury of marine mammals that occurs incidental to each fishery. The classification of a fishery on the LOF determines whether participants in that fishery are subject to certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan (TRP) requirements. Because the level of mortality is not high enough in any of the Alaska salmon fisheries to require a Take Reduction Program, there has not been a need to conduct a annual review of alternative measures to minimize ETP related mortality. There have measures put in place to eliminate contact of fishing gear with Steller Sea Lion by closing areas around rookeries and these will likely continue. The Endangers Species Act requires a review every five years on the status of a listed species and impacts . This review constitutes a "Regular Review" and as such the SG 80 level is met but not the SG 100 level because the review is not biennial.		
References				

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.3.2.A	2.3.2.B	2.3.2.C	2.3.2.D	2.3.2.E	Score
Southeast	N/R	80	80	80	80	80
Yakutat	N/R	80	80	80	80	80
P W S	N/R	80	80	80	80	80
Copper-Bering	N/R	80	80	80	80	80
L Cook Inlet	N/R	80	80	80	80	80
U. Cook Inlet	N/R	80	80	80	80	80
Bristol Bay	N/R	80	80	80	80	80
Kuskokwim	N/R	80	80	80	80	80
Yukon	N/R	80	80	80	80	80
Norton Sound	N/R	80	80	80	80	80

PI 2.3.2	The UoA and associated enhancement activities have in place precautionary management strategies designed to: • meet national and international requirements • ensure the UoA does not hinder recovery of ETP species Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.					
Kotzebue	**N/R**	**100**	**100**	**100**	**100**	**100**
Kodiak	**N/R**	**80**	**80**	**80**	**80**	**80**
Chignik	**N/R**	**80**	**80**	**80**	**80**	**80**
Ak. Peninsula	**N/R**	**80**	**80**	**80**	**80**	**80**
CONDITION NUMBER (if relevant):						

Evaluation Table for PI 2.3.3 – ETP species information

PI 2.3.3		Relevant information is collected to support the management of UoA and enhancement activities impacts on ETP species, including: • Information for the development of the management strategy; • Information to assess the effectiveness of the management strategy; and • Information to determine the outcome status of ETP species.		
Scoring Issue		SG 60	SG 80	SG 100
A	Information adequacy for assessment of impacts			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA and associated enhancement on ETP species. OR if RBF is used to score PI 2.3.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA and associated enhancement may be a threat to protection and recovery of the ETP species. OR if RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is **available to assess with a high degree of certainty** the magnitude of UoA- and associated enhancement related impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Yes for all UoA's	Yes for all UoA's	No for all UoA's
	Justification	Sufficient data are available from test fishing (e.g., Chaffee 2005), and observations of several fisheries (Wynne *et al.* 1991, Wynne *et al.* 1992, Manly 2006, Manly 2007, Manly 2009) to quantitatively estimate take of ETP species. Although the observer program has not operated in all areas of Alaska, the sampling effort is consistent with the observed relatively low level of impact of the fishery on ETP species. NMFS has calculated the percentage of species PBR taken in some of the fisheries and found it to be typically low such that no fishery is considered to cause more than occasional incidental mortality or serious injury of marine mammals (NMFS 2012). The fishery meets the SG 80 level of performance. However, quantitative information is not available to assess with a high degree of certainty the magnitude of any UoA and associated enhancement related impacts, mortalities and injuries and the consequences for the status of ETP species, therefore the SG 100 level of performance is not met.		
B	Information adequacy for management strategy			
	Guide	Information is adequate	Information is adequate	Information is adequate

<table>
<tr><td colspan="2">PI 2.3.3</td><td colspan="3">Relevant information is collected to support the management of UoA and enhancement activities impacts on ETP species, including:
• Information for the development of the management strategy;
• Information to assess the effectiveness of the management strategy; and
• Information to determine the outcome status of ETP species.</td></tr>
<tr><td></td><td>post</td><td>to support measures to manage the impacts on ETP species.</td><td>to measure trends and support a strategy to manage impacts on ETP species.</td><td>to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.</td></tr>
<tr><td></td><td>Met?</td><td>(Y/N)</td><td>(Y/N)</td><td>(Y/N)</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">The available information is sufficient to support the existing strategy to manage the impacts of the Alaska salmon fisheries on ETP species. The use of on-board observer programs to estimate impacts thru time is subject to funding relative to the importance of whether or not gaining additional information is warranted considering the low levels of impact observed. However, other sources of information are available. The Marine Mammal Protection Act requires all Commercial fishermen to report injuries or mortalities to the NMFS. ADFG routinely conducts test fisheries throughout the state and ADFG staff and enforcement officers are routinely present on the fishing grounds to observe operations. These sources of information are considered adequate to monitor for any significant trend in encounters with ETP species given the observed low levels of contact. The SG 80 but not the SG 100 level is met.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">Chaffee, C., Ruggerone, G., Beamesderfer, R. & L.W. Botsford. (2007). The commercial Alaska salmon fisheries managed by the ADF&G; A 5-year re-assessment based on the Marine Stewardship Council program. Scientific Certification Systems, Inc., Emeryville, California. 350 pp. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments

Manly, B. 2006. Incidental catch and interactions of marine mammals and birds in the Cook Inlet salmon driftnet and setnet fisheries, 1999-2000. Western EcoSystems Technology. Cheyenne Wy. https://alaskafisheries.noaa.gov/sites/default/files/1999-2000cookinlet.pdf

Manly, B. 2007. Incidental take and interactions of marine mammals and birds in the Kodiak Island salmon set gillnet fishery, 2002 and 2005. Western EcoSystems Technology. Cheyenne Wy. https://alaskafisheries.noaa.gov/sites/default/files/kodiakreport02_05.pdf

Manly, B. 2009. Incidental Take and Interactions of Marine Mammals and Birds in the Yakutat Salmon Setnet Fishery, 2007 and 2008. Western EcoSystems Technology. Cheyenne Wy.</td></tr>
</table>

PI 2.3.3	**Relevant information is collected to support the management of UoA and enhancement activities impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**
	https://alaskafisheries.noaa.gov/sites/default/files/yakutat07-08.pdf Wynne, K. Hicks, D. And N. Munro. 1990. Salmon gillnet fisheries observer programs in Prince William Sound and South Unimak Alaska. Saltwater Inc, Anchorage. https://alaskafisheries.noaa.gov/sites/default/files/1990pws.pdf Wynne, K. D. Hicks and N. Munro. 1992. 1991 marine mammal observer program for the salmon driftnet fishery of Prince William Sound, Alaska. Final Report, May 1, 1992. Saltwater, Inc, Anchorage. 61pp. https://alaskafisheries.noaa.gov/sites/default/files/1991pws.pdf

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.3.3.A	2.3.3.B	Score
Southeast	80	80	80
Yakutat	80	80	80
P W S	80	80	80
Copper-Bering	80	80	80
L Cook Inlet	80	80	80
U. Cook Inlet	80	80	80
Bristol Bay	80	80	80
Kuskokwim	80	80	80
Yukon	80	80	80
Norton Sound	80	80	80
Kotzebue	80	80	80
Kodiak	80	80	80
Chignik	80	80	80
Ak. Peninsula	80	80	80

CONDITION NUMBER (if relevant):

Recommendation 1: For the marine gill net fisheries of Cook Inlet, Kodiak, the AK Penninsula, Bristol Bay and AYK (Yukon, Kuskokwim and Kotzebue), scores pertaining to information quality could be increased if the earlier observation of test fisheries were repeated, or an equivalent study to update verification of the degree of interaction between these fisheries and seabirds were conducted.

Evaluation Table for PI 2.4.1 – Habitats outcome

PI 2.4.1		**The UoA and its associated enhancement activities do not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.**		
Scoring Issue		SG 60	SG 80	SG 100
A	Commonly encountered habitat status			
	Guide post	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	Yes, for all A's	Yes, for all A's	Yes, for all A's
	Justification	The MSC defines "commonly encountered habitat" as habitat that regularly comes in contact with the gear used in the UoA. Salmon fishing gear in Alaska includes troll, drift gillnets, set gillnets, fish wheels, purse seines and on rare occasion in the Yukon River, beach seines and dip nets. Gears other than set gillnets and beach seines are designed to be operated at the surface without bottom contact as such they typically do not regularly come in contact with habitat. Beach seines operate only in the Yukon U of A and are fished in-river. Operation of beach seines requires a substrate that is fine, or medium, the geomorphology is flat or low relief and there is typically no fauna or flora expect perhaps some insects. Where set drift gillnet fisheries operate in-river (throughout the AYK region and Yakutat) the only suitable sites include areas where the substrate is fine, or medium, the geomorphology is flat or low relief and there is typically no fauna or flora except perhaps some insects. When drift gill netting fisheries take great care to not encounter the bottom because it can snag their gear. Where set gillnets operate in marine waters, (all U of A's except Southeast) suitable sites include areas where the substratum is fine to medium, the geomorphology is flat to low and the biota may include small burrowing species or none at all. Where drift gill nets operate in marine waters, (all U of A's) they may fish in the water column above all types of substratum, geomorphology and biota. However, contact with the bottom in areas other than where the geomorphology is fine to medium, the substrate is flat to low and the biota is small/ erect or burrowing, absent or sea grass is avoided with great care because it may snag the net causing loss of fishing time to free the gear, and/or gear damage.		

<table>
<tr><td colspan="2">PI 2.4.1</td><td colspan="3">The UoA and its associated enhancement activities do not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.</td></tr>
<tr><td></td><td></td><td colspan="3">All commercial fishing gear is required to be attended (Alaska Administrative Codes 5AAC 39.280) and very strong incentives exist to retrieve any gear that beaks away because of it is expensive to replace. All commercial fishing gear must be marked so that it can be traced back to the owner. During decades of the-the-grounds observation of fishing activities by ADFG biologists they have not observed any significant impacts on the habitat from salmon fishing gear (ADFG staff comment during site visit 2017) nor were they aware of any significant gear loss that could result in ghost fishing. We conclude that these gear types do not significantly disrupt benthic habitat, as such, it is highly unlikely to reduce habitat structure or function to a point where there would be serious or irreversible harm. In its FMP for salmon NOAA concluded that gear used has little to no impact on marine environments (NPFMC et al. 2012). Per MSC guidance “serious or irreversible harm” is a reduction in habitat structure and function such that the habitat would be unable to recover at least 80% of its structure and function within 5-20 years if fishing on the habitat were to cease entirely. We see no data or other evidence that the limited on-bottom contact that salmon gear has on the habitat would cause “serious or irreversible harm.

Data on the possible impacts of enhancement activities on habitat are identified through permitting (e.g. construction permits and subsequently by operational permits specific to water quality and discharges), and the impacts are regulated and monitored. Identified impacts are considered to be negligible at the regional or bioregional scale.

Because the gear used in these fisheries does not commonly encounter benthic habitats, except for localized contact that have minimal impact, and the permitting process for enhancement activities we conclude that all UoA’s meet the SG100 level of performance.</td></tr>
<tr><td rowspan="4">B</td><td colspan="4">VME habitat status</td></tr>
<tr><td>Guide post</td><td>The UoA is unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.</td><td>The UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.</td><td>There is evidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.</td></tr>
<tr><td></td><td>Yes for All UoA’s</td><td>Yes for All UoA’s</td><td>Yes for All UoA’s</td></tr>
<tr><td>Justific ation</td><td colspan="3">MSC guidance states that only Vulnerable Marine Ecosystems (VME) as defined by relevant management authorities are to be considered under P2.4.1. In the United</td></tr>
</table>

<table>
<tr><td colspan="2">PI 2.4.1</td><td colspan="3">The UoA and its associated enhancement activities do not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.</td></tr>
<tr><td></td><td></td><td colspan="3">States there are no explicit VME designations. NOAA fisheries does, however identify five habitat types for consideration by the Regional Management Councils when implementing fishery management plans. The five classifications are 1) coastal wetlands, 2) corals, 3) essential fish habitat, 4) rivers: hydropower and fish passage, and 5) Cape Fear Partnership (http://www.habitat.noaa.gov/protection/). If an area is designated under the program, it requires the relevant Management Council to apply appropriate fishery regulations, such as area or gear restrictions when developing a management plan. Within this context, the Council also has the authority to establish Habitat Areas of Particular Concern. The designation of a HAPC is similar to a MSC VME. The NPFMC has designated three areas as HAPC: 1) the Alaska Seamount Habitat Protection Areas,2) the Bowers Ridge Habitat Conservation Zone, and 3) the GOA Coral Habitat Protection Area. Maps how that these areas are either outside the areas that can be fished by state authorized salmon fisheries, or too deep to be encounter salmon fishing gear https://www.npfmc.org/wp-ontent/PDFdocuments/fmp/Salmon/SalmonFMP114.pdf

The Alaska Legislature has designated 32 special areas as state game refuges, critical habitat areas, and wildlife sanctuaries, which are managed by ADF&G. ADF&G develops management plans to guide the approval of activities in these arras so that they are conducted in a manner compatible with the purpose for each special area. There are a few of these special areas that include marine areas. Our review of the these marine areas concluded that these areas are not comparable to VME. http://www.adfg.alaska.gov/index.cfm?adfg=conservationareas.locator

We conclude that only the North Pacific Fishery Management Council's Habitat Areas of Particular Concern qualify for VMEs. Because these areas are either outside the area that can be fished by state authorized salmon fisheries, or too deep to be encounter salmon fishing gear. We conclude that all UoA meet the SG100 level of performance.</td></tr>
<tr><td rowspan="2">C</td><td colspan="4">Minor habitat status</td></tr>
<tr><td>Guide post</td><td></td><td></td><td>There is evidence that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.</td></tr>
</table>

PI 2.4.1		The UoA and its associated enhancement activities do not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.		
	Met?			Yes for all UoA's
	Justification	As described under 2.4.1 a, gear used in the Alaska salmon fishery does not commonly encounter benthic habitats, except for extremely small localized areas. The evidence of this conclusion is the extensive on-the-grounds observation of operational use of this gear for decades by ADFG management biologist. Also, as described in 2.4.1.a the evidence for enhancement activities comes from the constant on-the-grounds observations of aquaculture staff to ensure compliance with permit conditions. We conclude that all UoA's meet the SG100 level of performance.		
D	Impacts due to enhancement activities associated with the UoA			
	Guide post	The enhancement activities are **unlikely** to have adverse impacts on habitat.	The enhancement activities are **highly unlikely** to have adverse impacts on habitat.	There is a **high degree of certainty** that the enhancement activities do not have adverse impacts on habitat.
	Met?	Yes for all UoA's	Yes for all UoA's	Yes for al UoA
	Justification	Enhancement activities do not occur in the Norton Sound, Kotzebue, Yukon, Kuskokwim, Bristol Bay, North Alaska Peninsula, South Alaska Peninsula, Chignik or Yakutat UoA's. Enhancement activities are undertaken in the Kodiak, Lower and Upper Cook Inlet, Prince William Sound, Copper Bering and Southeast UoA's. Activities, (including enhancement) in waterways that contain anadromous fish are subject to strict regulation in Alaska. The Anadromous Fish Act (AS 16.05.871-.901) requires that an individual or government agency provide prior notification and obtain permit approval from ADF&G before altering or affecting "the natural flow or bed" of a specified waterbody, or fish stream. All activities within or across a specified anadromous waterbody require approval, including construction; road crossings; gravel removal; water withdrawals; the use of vehicles or equipment in the waterway; stream realignment or diversion; bank stabilization; blasting; and the placement, excavation, deposition, or removal of any material. The location of specified anadromous waterbodies is contained in the "Catalog of Waters Important for the Spawning Rearing or Migration of Anadromous Fishes." The Anadromous Waters Catalog is updated annually, and adopted into regulation (5 AAC 95.011) after public review; it is the legal record of known anadromous fish streams in the state. The Fishway (or Fish Passage Act AS 16.05.841), requires that an individual or government agency notify and obtain authorization from the Alaska Department of Fish and Game, Division of Habitat for activities within or across a stream used by fish if it is determined that such uses or activities could		

PI 2.4.1	**The UoA and its associated enhancement activities do not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.**
	represent an impediment to the efficient passage of resident or anadromous fish. Enhancement activities in Alaska are undertaken in sites designed to minimize impacts on local stocks and habitats. All activities and potential impacts on the habitat (e.g. water quantity and quality) stream habitat such physical alteration, and any local fish stocks are identified in the permit application and review process. Any significant impacts identified during the review process are addressed by imposing conditions on the construction and operational through permits. We conclude that there is a high degree of certainty that enhancement activities do not have adverse impacts on habitat for those UoA's with enhancement activities. And are scored at the SG 100 level. A default score of 100 is given to those UoA's without enhancement activities.
References	Acoura Marine Ltd. 2017. MSC sustainable fisheries certification: British Columbia salmon fishery. Edinburgh, Scotland. https://fisheries.msc.org/en/fisheries/british-columbia-salmon/@@assessments IMM (Intertek Moody Marine). 2013. Alaska Salmon Fishery Final Determination Report. October 2013. Marine Stewardship Council. London UK. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments MRAG Americas. 2016. Alaska Salmon – Prince William Sound scope extension assessment. Marine Stewardship Council. London UK https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments North Pacific Management Council, National Marine Fisheries Service and Alaska Department of Fish and Game. 2012. Fishery management plan for the salmon fisheries in the EEZ off Alaska. NPFMC, Anchorage. https://www.npfmc.org/wp-content/PDFdocuments/fmp/Salmon/SalmonFMP114.pdf

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.4.1.A	2.4.1.B	2.4.1.C	2.4.1.D	Score
Southeast	100	100	100	100	100
Yakutat	100	100	100	100	100
P W S	100	100	100	100	100
Copper-Bering	100	100	100	100	100
L Cook Inlet	100	100	100	100	100
U Cook Inlet	100	100	100	100	100
Bristol Bay	100	100	100	100	100
Kuskokwim	100	100	100	100	100
Yukon	100	100	100	100	100

PI 2.4.1	**The UoA and its associated enhancement activities do not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates.**				
Norton Sound	100	100	100	100	100
Kotzebue	100	100	100	100	100
Kodiak	100	100	100	100	100
Chignik	100	100	100	100	100
Ak Peninsula	100	100	100	100	100
CONDITION NUMBER (if relevant):					

Evaluation Table for PI 2.4.2 - Habitats management

<table>
<tr><td colspan="2">PI 2.4.2</td><td colspan="3">There is a strategy in place that is designed to ensure the UoA and associated enhancement activities do not pose a risk of serious or irreversible harm to the habitats</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">a</td><td colspan="4">Management strategy in place</td></tr>
<tr><td>Guide post</td><td>There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.</td><td>There is a partial strategy in place if necessary that is expected to achieve the Habitat Outcome 80 level of performance or above.</td><td>There is a strategy in place for managing the impact of all MSC UoAs/non-MSC fisheries UoA and associated enhancement activities on habitats.</td></tr>
<tr><td>Met?</td><td>Yes for All UoA's</td><td>Yes for All UoA's</td><td>No for All UoA's</td></tr>
<tr><td>Justification</td><td colspan="3">There is a partial strategy in place composed of the several measures that work together to manage the impact of salmon fishing gear on the habitat. The measures include:
• Strict definition of the types of gear that may be used.
• The allowable gear (except for set nets and beach seines) is designed to operate in open water with no contact with the bottom.
• A requirement that all gear must be attended while fishing.
• Fishing is allowed only in specific times and areas to target salmon.
• Federal regulations that prohibit anchoring in HPAC areas.
• There is a comprehensive strategy in place for managing the impacts of enhancement activities including statutes to regulate impacts to anadromous waters and permits are required for the construction and operation of enhancement activities.
We conclude that all UoA's meet the SG 80 level of performance. No UoA meet the SG 100 level because the strategy does not include sufficient habitat specific measures except for enhancement activities.</td></tr>
<tr><td rowspan="3">b</td><td colspan="4">Management strategy evaluation</td></tr>
<tr><td>Guide post</td><td>The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/ enhancement activities/habitats).</td><td>There is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA, enhancement activities and/or habitats involved.</td><td>Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA, enhancement activities and/or habitats involved.</td></tr>
<tr><td>Met?</td><td>Yes for All UoA's</td><td>Yes for All UoA's</td><td>No for All UoA's</td></tr>
</table>

<table>
<tr><td colspan="2">PI 2.4.2</td><td colspan="3">There is a strategy in place that is designed to ensure the UoA and associated enhancement activities do not pose a risk of serious or irreversible harm to the habitats</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">We are confident that the measures outlined in 2.4.2 a above, the testimony of ADFG staff (see 2.4.1a) and the permitting process for enhancement activities (see 4.1.d) constitute objective evidence the measures do work together so as to not pose a risk of serious or irreversible harm to habitat. We are unaware of any testing that has been done to validate this strategy and therefore the UoA's do not meet the SG 100 level of performance.</td></tr>
<tr><td>c</td><td colspan="4">Management strategy implementation</td></tr>
<tr><td></td><td>Guide post</td><td></td><td>There is some quantitative evidence that the measures/partial strategy is being implemented successfully.</td><td>There is clear quantitative evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).</td></tr>
<tr><td></td><td>Met?</td><td></td><td>Yes for All UoA's</td><td>No for All UoA's</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">Evidence that the partial strategy (outlined in 2.4.2.a) for managing habitat impacts is being successfully implemented includes:
The Alaska Department of Public Safety, is charged with enforcing statutes and regulations regarding allowable gear, time and area restrictions for harvest and actively oversees conduct of Alaska's commercial salmon fishery.
Area Management Biologists are on the scene to observe the prosecution of the fishery by air and by sea and are deputized to enforce fisheries laws and regulations.
Compliance with regulations and statutes that may affect habitat (gear, time and area) is high. For example, in 2015, during the salmon season, there were 6,216 contacts with commercial fisheries participants, 393 warning given to these contacts and 384 citations issues. The majority of the violations were for licensing requirements, and fishing in closed areas or during times closed to fishing and these violations generally relate to achieving an unfair share of the available harvest.
Every hatchery in Alaska operates under a permit with specific conditions designed, among other things to protect habitat.
The North Pacific Fishery Management Council has the authority to identify specific areas based on available data to designate HAPC and has designated three areas.
The state has identified habitat areas of special concern and taken steps it deems necessary to protect habitat in these areas.
We conclude that there is some quantitative evidence that the partial strategy is</td></tr>
</table>

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA and associated enhancement activities do not pose a risk of serious or irreversible harm to the habitats		
		being implemented successfully, and therefore the SG 80 level is met. We could not conclude that the was "clear quantitative evidence" that the partial strategy is being implemented successfully, and therefore the SG 100 level is not met.		
d	**Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs**			
	Guide post	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is some **quantitative evidence** that the UoA and associated enhancement activities comply with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA and associated enhancement activities comply with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	Not relevant for All UoA's	Not relevant for All UoA's	Not relevant for All UoA's
	Justification	A stated in 2.4.1b, all HAPC areas in Alaska are either outside waters that can be fished by state authorized salmon fisheries or the protected areas are too deep to be disturbed by salmon fishing gear. We therefore concluded that this sub-clause is not relevant.		
References				

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.4.2.A	2.4.2.B	2.4.2.C	2.4.2.D	Score
Southeast	80	80	80	N/R	80
Yakutat	80	80	80	N/R	80
P W S	80	80	80	N/R	80
Copper-Bering	80	80	80	N/R	80
L Cook Inlet	80	80	80	N/R	80
U Cook Inlet	80	80	80	N/R	80
Bristol Bay	80	80	80	N/R	80
Kuskokwim	80	80	80	N/R	80
Yukon	80	80	80	N/R	80
Norton	80	80	80	N/R	80
Kotzebue	80	80	80	N/R	80
Kodiak	80	80	80	N/R	80
Chignik	80	80	80	N/R	80
Ak Peninsula	80	80	80	N/R	80

PI 2.4.2	There is a strategy in place that is designed to ensure the UoA and associated enhancement activities do not pose a risk of serious or irreversible harm to the habitats
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.4.3 – Habitats information

PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and associated enhancement activities and the effectiveness of the strategy to manage impacts on the habitat.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guide post	The types and distribution of the main habitats are **broadly understood**. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	Yes for All UoA's	Yes for All UoA's	No for All UoA's
		Main habitats as described under MSC version 2.0 are those gear types that regularly encounter habitats and VME's that comes in contact with the gear used in the UoA. As noted in 2.4.1 there are no commonly encountered habitats (except in limited times and extremally limited areas) by salmon fishing gear because it is designed to operate off the bottom. The main types of habitat encountered by enhancement activities are well known. We therefore conclude that SG80 scoring level is reached. We could not rate any UoA as meeting the SG 100 level because the distribution of habitat types, while known in off-shore waters (NMFS 2005) is not as thoroughly documented for near shore waters.		
b	Information adequacy for assessment of impacts			
	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use and enhancement activities on the main habitats, including spatial overlap of habitat with fishing	Information is adequate to allow for identification of the main impacts of the UoA and enhancement activities on the main habitats, and there is reliable information on the	The physical impacts of the gear and enhancement activities on all habitats have been quantified fully.

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and associated enhancement activities and the effectiveness of the strategy to manage impacts on the habitat.		
		gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	spatial extent of interaction and on the timing and location of use of the fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	
	Met?	Yes for All UoA's	Yes for All UoA's	No for All UoA's
		As noted previously, while there are no commonly encountered habitats, the salmon fisheries of Alaska are typically focused in very localized areas and over short periods and area management staff are extremely knowledgeable and aware of habitats and their vulnerability in areas where commercial fishing may be authorized at a level of detail relevant to the scale and intensity of the fishery and to the extent needed to minimize any potential impacts of the fishery on habitats. Sufficient observations are available to characterize the nature of impacts of salmon fishing gear on habitats (IMM, 2013) and on habitats in proximity to enhancement activities. We conclude that the SG 80 scoring level is met. Because the information is not fully quantified, the SG 100 level is not met		
c	Monitoring			
	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in habitat distributions over time are measured.
	Met?		Yes for All UoA's	No for All UoA's
	Justification	As noted previously, there are no commonly encountered habitats. Regardless, the salmon fisheries in Alaska are intensively monitored by area management staff and this is adequate to detect any increased risk to habitats. The constant presence of enhancement staff at their facilities is sufficient to detect any increased risk to local habitats. The SG 80 level is met. Because the assessment team is not aware of any effort to measure changes in habitat types over time, the SG 100 level is not met.		

PI 2.4.3	**Information is adequate to determine the risk posed to the habitat by the UoA and associated enhancement activities and the effectiveness of the strategy to manage impacts on the habitat.**
References	IMM (Intertek Moody Marine). 2013. Alaska Salmon Fishery Final Determination Report. October 2013. Marine Stewardship Council. London UK. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments NMFS. 2005. Final environmental impact statement for essential fish habitat identification and conservation in Alaska, Appendix G Non-fishing impacts to essential fish habitat and recommended conservation measures. https://alaskafisheries.noaa.gov/habitat/efh-eis2005

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.4.3.A	2.4.3.B	2.4.3.C	Score
Southeast	80	80	80	80
Yakutat	80	80	80	80
P W S	80	80	80	80
Copper-Bering	80	80	80	80
L Cook Inlet	80	80	80	80
U Cook Inlet	80	80	80	80
Bristol Bay	80	80	80	80
Kuskokwim	80	80	80	80
Yukon	80	80	80	80
Norton	80	80	80	80
Kotzebue	80	80	80	80
Kodiak	80	80	80	80
Chignik	80	80	80	80
Ak Peninsula	80	80	80	80

CONDITION NUMBER (if relevant):

Evaluation Table for PI 2.5.1 – Ecosystem outcome

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Ecosystem status			
	Guide post	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Yes for All UoA's	Yes for All UoA's	Yes for All UoA's
	Justification	Pacific salmon play an important role in the oceanic and terrestrial ecosystems especially in terms of predator prey relationships and as a nutrient source in terrestrial ecosystems (Cederholm et al. 1999). A key factor in the management of Alaska's salmon fishery is assuring that escapement goals are met, even when run sizes as too small to provide harvest opportunities, In addition, Alaska's Sustainable Management Policy (5 AAC 39.222) states "salmon fisheries shall be managed to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning " This approach to management demonstrates that the fisheries in all UoA's are unlikely to disrupt key nutrient cycling functions. Because escapement goals subsume freshwater predation it is also highly unlikely that the fishery would disrupt key predator prey interactions of adults in freshwater. Any potential effects of the fisheries in relation to oceanic predator – prey relationships is difficult to clarify with any certainty. While it is obvious that commercial fisheries remove salmon that may serve as prey of marine mammals, whether that occurs in times and places and in quantities that have measurable impacts is not known (see for example NOAA 2014). Furthermore, management of these fisheries to maximize the sustainable yield to the extent that yield is known, is a positive step to providing large numbers of adults that can serve as prey. While removal of adult fish may reduce prey availability, it may also increase the availability of forage fish which could increase food sources for marine mammals and birds. While some uncertainty may exist regarding the scale of potential relationships, the management systems and long-term history of the fisheries without any measurable serious effects makes it possible for us to conclude that the fisheries		

<table>
<tr><td colspan="2">PI 2.5.1</td><td colspan="3">The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function</td></tr>
<tr><td></td><td></td><td colspan="3">are highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
In 2013, the assessment team concluded (IMM 2013) that” the long time period over which the Alaska salmon fishery has operated without serious or irreversible harm provides evidence to support the view that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function. The fishery meets this level of performance. We concur with that conclusion and assign a score of 100 to all UoA’s.</td></tr>
<tr><td rowspan="4">b</td><td colspan="4">Impacts due to enhancement</td></tr>
<tr><td>Guide post</td><td>Enhancement activities are unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.</td><td>Enhancement activities are highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.</td><td>There is evidence that the enhancement activities are highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.</td></tr>
<tr><td>Met?</td><td>Yes for All UoA’s</td><td>Yes for All UoA’s</td><td>Yes for Norton Sound, Kotzebue, Yukon, Kuskokwim, Bristol Bay, North Peninsula, South Peninsula, Chignik, or Yakutat UoA’s
No for Kodiak, Upper Cook Inlet, Lower Cook Inlet, Prince William Sound, Copper Bering or Southeast UoA’s</td></tr>
<tr><td>Justification</td><td colspan="3">There is no enhancement in the Norton Sound, Kotzebue, Yukon, Kuskokwim, Bristol Bay, North Peninsula, South Peninsula, Chignik, or Yakutat UoA’s and as such they meet the SG 100 scoring guidance level.
In 2013, the Assessment Team stated (IMM 2013) that there was “no evidence of adverse impacts on non-salmonid finfish or other aquatic populations” and therefore the SG 80 scoring level was met.
In our Scope Extension Report for Prince William Sound (MRSAG 2017) we identified a concern regarding possible impacts of Pink Salmon hatchery enhancement on herring abundance, but deferred a conclusion on the veracity of that concern as it related s to scoring PI 2.5.1 until this full assessment.
The concern in Prince William Sound originated when Deriso et al. (2008)</td></tr>
</table>

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		corelated a decline in adult herring abundance to the increase in hatchery Pink Salmon releases. The modeling exercise indicated that the correlation could account for a 20 percent reduction in adult herring biomass, but offered no explanation for a mechanism to explain the correlation. Subsequently, Pearson et al. (2012) reviewed several feeding studies and in particular the studies by Sturdevant et al. (1999 a and 1999 b) to suggest that competition between juvenile Pink Salmon and herring was the mechanism. Subsequently Sturdevant (2012) disagreed with that hypothesis stating among other things: "Cooney et al. (2001) confirmed that juvenile Pink salmon and herring exploit very different portions of the annual production cycle. This is related to both spatial and temporal use of PWS by these juvenile fish. Herring use more of the water column, remain in the sound to overwinter, and are much more abundant than Pinks. Juvenile Pinks are mostly gone by June (e.g., Willette 1999; Mortensen et al. 2000) and relatively few remain in the sound in late July when Sturdevant et al. (1999b) examined trophic relationships of Pinks and herring from allopatric and sympatric collections. We showed that diet overlap is generally low for allopatric Pink and herring as well as for sympatric Pink and herring caught in the same specific hauls (Sturdevant et al. 1999b). The occasional high diet overlap values Pearson et al. (2012) quoted are from Sturdevant et al. 1999a, which pools across a broad range of hauls and locations is not a strong a comparison. Even in May and June, when zooplankton resources are peaking (Cooney et al. 2001b), and abundance of out-migrating juvenile Pink salmon is higher than in later summer, diet overlap between herring and Pink salmon was usually below 50% (Sturdevant et al. 1999a). This means that most of their prey is not shared. As Purcell and Sturdevant (2001) reported, herring were among a group of crustacean-eating fish and jellyfish, whereas Pink salmon were among the larvacean-eating group." Compounding the discussion of possible causes for a decline in the adult herring stock in Prince William Sound is that other factors were in play at the same time, including: • the decline also closely followed the Exon Valdez oil spill which severely disrupted the PWS ecosystem. • The herring declines were not limited to PWS. • Consistently high survivals of Pink Salmon in PWS suggests that density-related competition during juvenile rearing may not be a significant limiting factor in their population dynamics. We would expect that if densities are so great as to deplete food availability in nearshore rearing habitats, that this effect would be evident in reduced survival of Pink Salmon as well as herring.

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		• Finally, if herring recruitment is related to spawning stock size, current spawning levels may not be adequate to produce large year classes. Recently, Moran and Stranley (2017) have shown that humpback whale (*Megaptera novaeangliae*) predation is a significant source of mortality on Pacific herring (*Clupea pallasii*) in Prince William Sound. Using mark–recapture models they estimated a population of 461 (95% C.I. 402-547) humpback whales forage in Prince William Sound during at least part of the year. The seasonal movement of these whales into the Sound was determined to be largely driven by the movements of adult herring. Whale numbers increase in the spring with the spawn, decline during the summer, then peak in the fall and winter as herring move into the sound to overwinter. Their lowest estimate of consumption represents 12-34% of the pre-spawning biomass of herring being removed by whales. We conclude that there is no convincing evidence that competition between Pink Salmon and herring exists at a level that would rise to a concern that it is highly likely to disrupt key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. A recent analysis of Pink Salmon, Chum Salmon and Sockeye Salmon catch and escapement data in the North Pacific for the years 1925 to 2015 by Ruggerone and Irvine (2018) shows that following an initial peak average biomass (adults and juveniles) during the period 1934–1943 of about 3,000 thousand metric tons, abundances fell to about 2,000 thousand metric tons until the 1977 regime shift benefited each species and that biomass is now averaging about 4,000 thousand metric tons. In recent years (1990 -2015) they estimate that 60% of the Chum Salmon biomass is of hatchery origin, 15% of the Pink Salmon biomass is of hatchery origin and 5% of the Sockeye Salmon biomass is of hatchery origin. Alaska produced about 68% of the hatchery Pink Salmon and 95% of the hatchery Sockeye Salmon, while Japan produced about 75% of the hatchery Chum Salmon. Because the overall abundance of Pacific Salmon is high, it may be reasonable conclude that the overall health of the ecosystem that supports these species is healthy. While this may be true, it is also true that evidence exists to demonstrate ecosystem level effects of this higher abundance which is in part related to hatchery production both in Alaska and Asia. Possible adverse effects of increased abundance caused in part by enhancement activities include: 1) Exacerbate competition for food at sea. For example, alternating years of high abundance of Pink Salmon in the Southern Bering Sea alters the biomass of zooplankton and in turn phytoplankton (Batten et. al 2018). Such competition can lead to reduced growth, delayed age at maturation and reduced survival. 2) Can alter food webs resulting in higher mortality and reduced growth. For example, an observed decline in the size at age and abundance of Chinook and Coho Salmon in Alaska has been hypothesized to be caused by

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		alterations in the food web caused by abundant Pink Salmon and a higher mortality during late marine rearing (Shaul and Geiger 2016). Likewise a correlation has been found between the abundance of Pink Salmon in recent odd years to survival of Southern Hemishere Searwaters that rear in the North Pacific and Bering Sea (Springer et al. 2018). The Southern Resident Killer Whales (SRKW) typically spend May thru October in the Salish Sea. While the winter/spring migration pattern is poorly known, it is thought that these whales are likely along the outer coast between Northern California north to Southeast Alaska. NOAA estimates the minimum historical population size of SRKW in the eastern North Pacific was about 140 animals. Following a live-capture fishery in the 1960s for use in marine mammal parks, 71 animals remained in 1974. Although there was some growth in the population in the 1970s and 1980s, with a peak of 98 animals in 1995, the population experienced a decline of almost 20 percent in the late 1990s, leaving 80 whales in 2001. The population census at the end of 2016 counted only 78 whales, and several deaths in 2017 brought the total of this struggling population to 76. In 2003, NOAA Fisheries began a research and conservation program with congressional funding to address the dwindling population. Southern Residents were listed as endangered in 2005 under the ESA and a recovery plan was completed in 2008. NOAA's Recovery plan for southern resident killer whales identifies five Initiatives. <u>Supporting Salmon Restoration Efforts:</u> Chinook salmon stocks are currently lower than historic levels, and in the summer months Chinook Salmon are a major component of their diet. We provide additional data on the importance of salmon later in this section. <u>Reducing Contaminants</u>: Killer whales are especially vulnerable to chemical contaminants because they are at the top of the food chain. To address this, NOAA partnered with others to help prevent contamination in SPKW habitat. They have also worked with others to develop a plan to fill gaps in research and monitoring. NOAA's Damage Assessment, Remediation, and Restoration Program, which cleans up existing contamination, also has several active projects in the Pacific Northwest and California. <u>Preventing Oil Spills and Improving Response Preparation</u>: Southern Resident killer whales are at risk of harm in the event of an oil spill. To reduce the risk of a spill, Washington's Department of Ecology created a program to minimize the effect of a potential spill on Southern Residents and NOAA developed oil spill response guidelines to minimize impacts. Last, a contingency plan was developed that includes methods to discourage killer whales from swimming into spilled oil. <u>Minimizing Impacts from Human-Caused Sound:</u> Ocean noise threatens killer whale populations by interrupting their normal behavior. In 2011, NOAA Fisheries adopted regulations that prohibit vessels from approaching killer whales in inland waters of Washington State within 200 yards. They also encourage land-based

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		whale watching as a way to enjoy viewing without any impacts. <u>Coordinating with Canadian Agencies, and U.S. Federal and State Partners:</u> Because SRKW range from California to Alaska, recovery of their population requires cooperation across state and national borders. NOAA is coordinating with Fisheries and Oceans Canada, the Washington Department of Fish and Wildlife, the Center for Whale Research, and other partners to conduct research and implement recovery actions. <u>Links between Salmon stocks and the Southern Resident Killer Whales</u> Hanson et al. (2010) studied prey selection from 2004 to 2008 in the SRKW's summer range of San Juan Islands, Washington and the western Strait of Juan de Fuca, British Columbia. They followed whales in a small boat, and collected fish scales and tissue remains from predation events, and feces, using a fine mesh net. They used visual fish scale analysis and molecular genetic methods to identify the species consumed. Chinook Salmon, although not as common as other species of salmon was by far the most frequent prey item. They used genetic identification methods to estimate the spawning region of origin of the Chinook Salmon. They estimated that from 80 to 90% were from stocks in the Fraser River, and from 6 to 14% were from Puget Sound with stocks along the West Coast of Vancouver Island accounting for up to 9%. They also showed a seasonal pattern, with Coho Salmon becoming very important in the fall. Ford et al. (2016) also used genetic method to identify prey in this group of whales using samples collected from 2006 to 2011. They too found that Chinook Salmon were the dominate prey species in the early summer, and that Coho Salmon made up about 49% of the samples in late summer. They found that Sockeye Salmon made up 18% in some samples. Ayres et al. (2012) used a combination of fecal thyroid (T3) and glucocorticoid (GC) hormone measures to assess the importance of food availability and vessel induced stress treats on the health of SRKW. Among other things, they believed that early spring salmon runs consumed by these whales prior to arrival in the Salish Sea may be especially important to these recovery efforts and that future studies should aim to better identify these early spring food sources. Based on two fecal samples they hypothesized that Upper Columbia River Spring Chinook may be an important food item. NOAA established an independent panel composed of Canadian and U. S. scientist to evaluate the effects of salmon fisheries on the population dynamics of SRKW (Hilborn et al. 2012). They evaluated the 2010 Biological Opinion and presentations at two workshops to examine thec chain of logic for how Chinook Salmon fisheries affect SRKW. The logic can be described as follows: • SRKW depend upon Chinook Salmon as a critical food resource. This is supported by summer diet information. • SRKW are occasionally in poor condition, which may indicate nutritional stress. Poor condition is supported by photogrammetry and observations of the "peanut-head" syndrome. • Individuals who have been identified as being in poor condition have a

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		higher probability of dying than individuals who have not been so identified. • SRKW fecundity, death rates and rates of population increase have shown statistical correlations with some indices of Chinook Salmon abundance. • Reducing Chinook salmon harvesting would increase the availability of Chinook Salmon to SRKW. • Models using the coefficients of the statistical models (from item 4 above) suggest that there would be a slightly larger SRKW population on average if more Chinook Salmon were available to SRKW. The core of the analysis in the Biological Opinion is the statistical correlation between indices of Chinook Salmon abundance and rates of increase in the SRKW population. The rest of the logic provides a mechanistic explanation for why that correlation could be causative. The Independent Panel reported the following key points with regard to the SRKW dependence on Chinook Salmon and on the role of fisheries: 1. The evidence for strong reliance on Chinook Salmon in the summer is convincing, but it is also clear that SRKW will switch to alternative, more abundant chum salmon when Chinook Salmon of suitable size and quality are not readily available in the fall. 2. Photographic evidence supports the assertion that poor condition, which is linked to mortality, and by implication to fecundity, may reflect nutritional stress. However, unless a large fraction of the population experienced poor condition in a particular year, and there was ancillary information suggesting a shortage of prey in that same year, malnutrition remains only one of several possible causes of poor condition. 3. The maximum long-term increases in abundance of Chinook Salmon that might theoretically be available to SRKW would be achieved by eliminating all ocean fishing (typically at least 20% increase in ocean abundance of age-4 and age-5 hatchery and wild fish due to elimination of ocean fishery interception of immature fish) and by maximizing recruitment through manipulation of freshwater exploitation rates to maximize recruitment (6-9% increase in recruitments of wild fish; no impact on hatchery fish). The best potential for increased Chinook Salmon abundance is restoration of freshwater habitat, reducing downstream migration mortality and a change in ocean conditions. 4. The panel sees many potential reasons why not all foregone Chinook Salmon catch would be available to SRKW, and is therefore skeptical that reduced Chinook Salmon harvesting would have a large impact on the abundance of Chinook Salmon available to SRKW. 5. The statistical analysis by NOAA and DFO scientists are excellent, but the Panel believes considerable caution is warranted in interpreting the correlative results as confirming a linear causal relationship between Chinook Salmon abundance and SRKW vital rates.

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		6. The Panel is not confident that understanding of the interaction between Chinook Salmon fisheries, other predators and SRKW vital rates, is sufficient to expect the model predictions of increased SRKWs to be accurate. The Panel expects the model predictions to overestimate the impact of reductions in Chinook Salmon catch on SRKW. In 2018, NOAA Fisheries and Washington Department of Fish and Wildlife (WDFW) (NOAA and WDFW 2018) developed a theoretical model to help identify Chinook Salmon stocks that are believed to be most important to Southern Resident killer whales. This was done to assist in helping identify which stocks should be prioritized for taking action to increase abundance. The framework used three factors: 1. The presence of a Chinook Salmon stock in the diet of the whales. A threshold of greater than or equal to 5% in a sample resulted in a score of 1, otherwise a 0 was scored. Samples were collected primarily in the late spring – summer in the Salish Sea. The threshold used resulted in a large number of Chinook Salmon stocks south of Central British Columbia to Central California being included with the same weight. We note that the diet studies previously mentioned have shown a dominance of Fraser River Chinook fall stocks, Southern Puget Sound fall and West Coast of Vancouver Island fall stocks. 2. Stocks consumed during times of potential reduced body condition and increased diet diversity received a score of 1, otherwise a zero was scored. This factor resulted in prioritizing essentially all the same stocks listed under factor 1 except for Fraser River Summer and West Coast Vancouver Island stocks. 3. Last a score of 0 to 3 was awarded based on the estimated overlap in the distribution of a Chinook Salmon stock and the SRKW as follows. For each space/time area strata, if more than 25% of the Chinook stock was estimated to be distributed in that area, the area received a score of 2. For areas that were estimated to contain between 5% and 25% of the Chinook stock, the area received a core of 1. If an area was estimated to contains less than 5% of the Chinook stock, it received a score of 0. These scores for each area were then multiplied by an importance weight for each area. The final score for the Chinook stock/population is the sum of the products of the scores and weight for each area normalized such that the highest possible score of a given stock is equal to 3. The seven space/time combinations included in Factor 3 and their associated weights were: a. WA coast in Winter/Spring; weight = 0.5 b. WA coast in Summer/Fall; weight = 0.5 c. Salish Sea in Winter/Spring; weight = 0.5 d. Salish Sea in Summer/Fall; weight = 0.5

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		e. OR / N.CA coast in Winter/Spring; weight = 0.25 f. CA coast in Winter/Spring; weight = 0.25 g. West Coast of Vancouver Island in Winter/Spring; weight = 0.5 The final score for each Chinook population was calculated by adding up the three individual scores. The Chinook Salmon populations with the highest total scores were considered the highest priority to increase abundance to benefit SRKW. This exercise resulted in scores ranging from 0.75 to 5 for 28 of the potential 31 coastwide stock/stock groups. The top 8 stocks groups had scores between 4 and 5, and their order of importance are: Northern Puget Sound Fall, Southern Puget Sound Fall, Lower Columbia Fall, Lower Georgian Strait Fall and Upper Columbia and Snake River Fall, Fraser River Spring, Lower Columbia Spring and Mid-Columbia Fall Bright stocks. While Chinook Salmon are clearly an important component in the diet of SRKW a recent study by Ruggerone et a. (2019) revealed a synchronized biennial pattern of birth and mortality of these whales. From 1998-2017, the mortality of newborn and older SRKW was 3.6 times higher (61 versus 17 whales) and successful births 50% lower (16 versus 32 whales) in even years than in odd years as the population decreased from 92 to only 76 whales. The percent mortality was 3.1 times higher in even years during the recent 20 yr. period of population decline than during an earlier 22 yr. period (1976-1997) of population increase and relative high abundance, whereas mortality in recent odd years was 43% lower. They determined that recognized potential mechanisms of decline (low abundance of a key prey species, Chinook Salmon, toxic contaminants, and ship noise) cannot explain this biennial pattern. They presented evidence that the causal mechanism is indirectly linked to Pink Salmon, which exhibit a unique and extreme biennial pattern of abundance. In summary, diet studies suggest that during the summer months Fraser River Chinook Salmon are currently the most important prey in the diet of the SRKW with Sockeye Salmon and Southern Puget Sound Fall Chinook also being represented occasionally. That during the early fall, Coho Salmon also become an important component of their diet. Based on Ayres (2012) work, the condition of the whales in early spring upon entering the Salish Sea being perhaps the key pivotal factor in determining population health. Based on two samples they suggest that Upper Columbia River Spring Chinook may be an important component in the diet during this time of year. The work of Ruggerone et al. (2019) implicates a possible critical role that Pink Salmon may play. The theoretical exercise of NOAA and WDFW suggest a range of predominantly fall runs from Puget Sound, Georgia Strait and the Columbia River plus Lower Columbia and Fraser River Springs are important stock. Last the work of Hilborn et al. (2012) is "skeptical that reduced Chinook salmon harvesting would have a large impact on the abundance of Chinook salmon available to SRKW". Based on these finding we concluded that establishing a direct link between the conduct of the Southeast

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		Alaska troll fishery (as managed under the Pacific Salmon Treaty) that harvests of Chinook from a wide variety of stocks (see PSC CTC 2018) several of which NOAA and WDFW 's model considered important are not harvested in Southeast Alaska (e.g. Puget Sound Fall, Lower Georgia Strait Fall, Lower Columbia River Fall) and neither an increase in the SRKW population or an increase in the current status of some ESA listed Chinook stocks specifically to benefit the SRKW is not warranted. We also note that there is ongoing research on ocean carry capacity (see for example NPAFC 2016) and the North Pacific Anadromous Fish Commission maintains an active international program to conduct long term monitoring of key oceanographic features in the Pacific Ocean to gain a better understanding of factors effecting ocean productivity. Studi es (e.g. Kaeriyma 2003) have shown that ocean production to be linked to long term trends in climatic factors and other studies have shown s decrease in salmon size at age is related to both density dependence and climatic factors (Kyla et al. 2017) We also note that the abundance of Pacific salmon returning to wild stocks and hatcheries around the Pacific rim because of both good escapements, numbers of hatchery fish released and high survival of juveniles. We conclude that while hatchery fish likely contribute to density dependent changes in size at age, this concern does not rise to a level where ecosystem structure or function has likely been disrupted to a point where there is serious or irreversible harm. In the Southeast, Kodiak, Copper River, Cook Inlet Uof A's enhancement activities have included lake fertilization and/or release of Sockeye Salmon into barren lakes. These activities have resulted in changes to the local lake ecosystems. Lake enrichment (see for example Schrof and Honnald 2003 and Piston 2003) activities have focused on adding phosphorous to boost primary and hence secondary production in order to provide sufficient food for rearing juveniles. The limnology associated with these projects has been extensively evaluated. Studies have shown increases in both primary and secondary production as a result of adding nutrients. Piston (2003) also reported that in the year following the last application of phosphorous that the levels of several key nutrients, along with primary production, declined in to the low levels observed prior to fertilization. The introduction of Sockeye Salmon into lakes with barriers to anadromous fish also produces changes to the local ecosystem. The addition of a new species that feeds on copepods can cause competition for food among comingled species. The addition may also provide a new food sources for some species. Because there is no access to these lakes for returning adults, these effects would be expected to cease if outplanting was discontinued. While we recognize that fishery enhancement activities that add nutrients and or introduce a new species to a barren lake results in biological characterictics and process that are clearly different than existed prior to the activity, we do not consider these changes to be serious. We would expect these changes to not be permanent if the activity was

PI 2.5.1		The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
		discontinued. We conclude that enhancement activities are highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm but that the evidence is not strong enough to warrant a SG score of 100 for those UoA's with enhancement activities. Those UoA's without enhancement activities warrant a SG level of 100.
References		4 AAC 39.222. Policy for the management of sustainable salmon fisheries. http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2016-2017/jointcommittee/5aac39.pdf Ayres KL, Booth RK, Hempelmann JA, Koski KL, Emmons CK, Baird RW, et al. 2012. Distinguishing the Impacts of Inadequate Prey and Vessel Traffic on an Endangered Killer Whale (*Orcinus orca*) Population. PLoS ONE 7(6): e36842. https://doi.org/10.1371/journal.pone.0036842 Cederholm, C.J., M.D. Kuntz, T. Mutota, and S. Atuhiro. 1999. Pacific Salmon carcasses: essential contributions of nutrients and energy for aquatic ecosystems. Fisheries, Vol. 24,pp 6-15. Cooney, R. T., J. R. Allen, M. A. Bishop, D. L. Eslinger, T. Kline, B. L. Norcross, et al. 2001a. Ecosystem controls of juvenile Pink salmon (*Oncorhynchus gorbuscha*) and Pacific herring (*Clupea pallasi*) populations in Prince William Sound, Alaska. Fish. Oceanog. 10(Suppl. 1):1-13. Cooney, R. T., K. O. Coyle, E. Stockmar, and C. Stark. 2001b. Seasonality in surface-layer net zooplankton in Prince William Sound, Alaska. Fish. Oceanog. 10 (Suppl.): 97-109. Deriso, R. B., M. N. Maunder, and W. H. Pearson. 2008. Incorporating covariates into fisheries stock assessment models with application to Pacific herring. Ecol. Applic. 18(5):1270-1286. Ford, M. J., J. Hempelmann, M. B. Hanson, K. L. Ayres, R. W. Baird, C. K. Emmons, J. I. Lundin, G. S. Schorr, S. K. Wasser, and L. K. Park. 2016. Estimation of a killer whale (Orcinus orca) population's diet using sequencing analysis of DNA from feces. PLoS ONE. 11(1):e0144956. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4703337/ Hanson, M. B., R. W. Baird, J. K. B. Ford, J. Hempelmann-Halos, D. M. Van Doornik, J. R. Candy, C. K. Emmons, G. S. Schorr, B. Gisborne, K. L. Ayres, S. K. Wasser, K. C. Balcomb, K. Balcomb-Bartok, J. G. Sneva, and M. J. Ford. 2010. Species and stock identification of prey consumed by endangered southern resident killer whales in their summer range. Endang.Spec. Res. 11: 69-82. http://www.cascadiaresearch.org/files/Hansonetal2010ESR.pdf Hilborn, R., S.P. Cox, F.M.D. Gulland, D.G. Hankin, N.T. Hobbs, D.E. Schindler, and

PI 2.5.1	**The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function**
	A.W. Trites. 2012. The Effects of Salmon Fisheries on Southern Resident Killer Whales: Final Report of the Independent Science Panel. Prepared with the assistance of D.R. Marmorek and A.W. Hall, ESSA Technologies Ltd., Vancouver, B.C. for National Marine Fisheries Service (Seattle. WA) and Fisheries and Oceans Canada (Vancouver. BC). xv + 61 pp. + Appendices. https://www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/killer_whales/recovery/kw-effects_of_salmon_fisheries_on_srkw-final-rpt.pdf IMM (Intertek Moody Marine). 2013. Alaska salmon fishery final determination report. October 2013. Marine Stewardship Council. London UK. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessments J. R. Moran, and J. M. Straley. 2017. Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound. Restoration Project Final Report (Restoration Project: 16120114-N), National Marine Fisheries Service, Juneau, Alaska. Kaeiyama, M. and R. Edpalina . 2003. Evaluation of carry capacity of Pacific salmon in the North Pacific Ocean for ecosystem-based sustainable conservation. [in} Leber, K.M., S. Kotada, H.L. Blankenship, and T. S. Vasand editors . Stock enhancement and sea ranching: Developments, pitfalls and opportunities. Blackwell Publishing. Ames Iowa. Kyla, J., I, Cote, J. Irvine, and J. Rynolds. 2017. Changes in body size of Canadian Pacific salmon over six decades . Canadian Journal of Fisheries and Aquatic Sciences, 2017, 74(2): 191-201. https://doi.org/10.1139/cjfas-2015-0600 MRSAG. 2017. MSC final report and determination *for* Alaska salmon- Prince William Sound scope extension assessment. Marine Stewardship Council. London UK. https://fisheries.msc.org/en/fisheries/alaska-salmon/@@assessme Mortensen, D., A. Wertheimer, S. Taylor, and J. Landingham. 2000. The relationship between early marine growth of Pink salmon, *Oncorhynchus gorbuscha*, and marine water temperature, secondary production, and survival to adulthood. Fish. Bull. US 98:319-335. NOAA. 2014. Endangered species act section 7 consultation biological opinion: Authorization of the Alaska groundfish fishery under the proposed revised Steller Sea Lion protection measures. NOAA. Juneau. Ak. https://alaskafisheries.noaa.gov/sites/default/files/final0414.pdf Piston. A. 2003. Limnological and Fisheries Investigations at Virginias Lake, Southeast Alaska. 2003. ADFG RIR. No. 1J04-7. Juneau http://www.adfg.alaska.gov/FedAidPDFs/RIR.1J.2004.17.pdf

PI 2.5.1	The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function
	Ruggerone, G and J. Irvine. Numbers and biomass of natural and hatchery origin Pink Salmon, Chum Salmon, and Sockeye Salmon in the North Pacific Ocean, 1925–2015. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* 10:152–168, 2018. Ruggerone, G., A. Springer, L. Shaul and G, van Vliet. 2019. Unprecedented biennial pattern of birth and mortality in an endangered apex predator, the southern resident killer whale, in the eastern North Pacific Ocean. MEPS 608:291-296 (2019) . https://www.int-res.com/abstracts/meps/v608/p291-296 Schrof, S. and S. Honnald. 2003. Salmon Enhancement, Rehabilitation and Evaluation and Monitoring Efforts Conducted in the Kodiak Management Area Through 2001. ADFG ROR No. 4K03-41. Kodiak. Shaul, L. and H. Geiger. 2016. Effects of climate and competition for off shore prey on growth, survival, and reproductive potential of Coho salmon in Southeast Alaska. N. Pac. Anadr. Fish Comm. Bull. 6: 329–347. https://npafc.org/wp-content/uploads/2017/09/bulletin6.pd Springera, A., G. van Vliet, N. Boolc, M. Crowleyd, P.Fullagare, M. Leac, R. Monashg, C. Price, C. Vertiganc, and E. Woehler. 2018 Transhemispheric ecosystem disservices of pink salmon in a Pacific Ocean macrosystem. PNAS. vol. 115. no. 22. https://www.pnas.org/content/115/22/E5038 Pearson, W., R. B. Deriso, R. A. Elston, S. E. Hook, K.R. Parker, and J. W. Anderson. 2012. Hypotheses concerning the decline and poor recovery of Pacific herring in Prince William Sound, Alaska. Rev Fish. Biol. Fisheries 22:95-135. https://link.springer.com/content/pdf/10.1007/s11160-011-9225-7.pdf Sturdevant, M. V., T. M. Willette, S. C. Jewett, E. Debevec, L. B. Hulbert, and A. L. J. Brase. 1999a. Diet composition, diet overlap, and size of 14 species of forage fish collected monthly in Prince William Sound, Alaska, 1994-1996. Pgs. 10-37 in: Forage fish diet overlap,1994-1996. *Exxon Valdez* oil spill restoration project final report (Restoration Project 971963C). http://www.evostc.state.ak.us/Universal/Documents/Publications/FinalAndAnnualReports.pdf Sturdevant, M. V., and L. B. Hulbert. 1999b. Diet overlap, prey selection and food competition among allopatric and sympatric forage fish species in Prince William Sound, 1996. pgs. 72-100 *in:* Forage fish diet overlap,1994-1996. *Exxon Valdez* Oil spill Restoration Project Final Report (Restoration Project 971963C). https://goa.nceas.ucsb.edu/#view/doi:10.5063/F1V985ZZ Sturdevant, M.V. (2013). Memorandum to the Alaska salmon MSC assessment team regarding Prince William Sound hatcheries and herring non-recovery. 4pp.

PI 2.5.1	**The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function**
	Willette, T. M., M. V. Sturdevant, and S. C. Jewett. 1997. Prey resource partitioning among several species of forage fishes in Prince William Sound, Alaska. Pgs. 11-29 *in*: Forage Fishes in Marine Ecosystems Alaska Sea Grant College Program AK-SG-97-01, 816 pgs.

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.5.1.A	2.5.1.B	Score
Southeast	100	80	90
Yakutat	100	100	100
P W S	100	80	90
Copper-Bering	100	80	90
L Cook Inlet	100	80	90
U Cook Inlet	100	80	90
Bristol Bay	100	100	100
Kuskokwim	100	100	100
Yukon	100	100	100
Norton	100	100	100
Kotzebue	100	100	100
Kodiak	100	80	90
Chignik	100	100	100
Ak. Peninsula	100	100	100

CONDITION NUMBER (if relevant):

Evaluation Table for PI 2.5.2 – Ecosystem management

PI 2.5.2		There are measures in place to ensure the UoA and enhancement activities do not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are **measures** in place, if necessary which take into account the **potential impacts** of the UoA on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a plan, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place
	Met?	Yes for all UoA's	Yes for all UoA's	Yes for all U of A without enhancmenrt. No for Southeast, Bering - Copper, LCI, UCI, Kodiak.
	Justification	The measures in place consist of clear policies (e.g. The Sustainable Salmon Policy (5 AAC 39.222) and the establishment of escapement goals (e.g. Munro and Volk 2017) constitute a partial strategy that aim to maintain healthy wild salmon populations, and provide for important ecosystem functions (e.g. nutrient cycling, Cederholm et al. 1999) and other species such as bears, birds and fish that depend on salmon (IMM 2013). All UoA's meet the SG 80 level of performance. While we agree that the measures in place constitute a partial strategy which takes into account the available information and is expected to restrain impacts on the ecosystem, we cannot confirm that the plan address all the main impacts on the ecosystem such as oceanic predator – prey relationships and as such cannot award a SG 100 level score where enhancement activities occur.		
b	Management strategy evaluation			
	Guide post	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoA/ ecosystems).	There is **some objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved	**Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or ecosystem involved

PI 2.5.2		There are measures in place to ensure the UoA and enhancement activities do not pose a risk of serious or irreversible harm to ecosystem structure and function		
	Met?	Yes for all UoA's	Yes for all UoA's	Yes for all UoA's without enhancement. No for Southeast, Bering-Copper, PWS, LCI, UCI, Kodiak.
	Justification	Testing of escapement goals is achieved by varying escapements over a range and re-evaluation of spawner - recruit relationships on a regular basis (Munro and Volk 12017). There is also substantial information about the role Pacific salmon play in both the freshwater and marine environments. However, the science surrounding carrying capacity and energy pathways, is highly complex and not fully understood (Schindler 2008). We conclude that there is substantial objective evidence that the partial strategy works based on information about the fishery and ecosystems involved, However, we cannot conclude that testing supports high confidence that the strategy is working. As such, the SG 80 level is achieved for all UoA's but not the SG 100 level where enhancement occurs.		
c	**Management strategy implementation**			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving its objective as set out in scoring issue (a).**
	Met?		Yes for all UoA's	Yes for all U of A's except Southeast, PWS, Bering/copper LCI, UCI and Kodiak.
	Justification	The annual catches and escapements across all UoA's are available. There is clear evidence (Munro and Volk 2017) that management to achieve escapement goals under a precautionary regulatory framework is realized for most stocks in every year despite changes in productivity. The SG 100 is achieved for all UoA's without enhancement, but not for U of A's with enhancement.		
e	Management of enhancement activities			
	Guidepost	There is an **established** artificial production strategy in place that is expected to achieve the Ecosystem Outcome 60	There is a **tested and evaluated** artificial production strategy with sufficient monitoring in place and evidence is	There is a **comprehensive and fully evaluated** artificial production strategy to verify with certainty that the

<table>
<tr><th colspan="2">PI 2.5.2</th><th colspan="3">There are measures in place to ensure the UoA and enhancement activities do not pose a risk of serious or irreversible harm to ecosystem structure and function</th></tr>
<tr><td rowspan="3"></td><td></td><td>level of performance.</td><td>available to reasonably ensure with high likelihood that the strategy is effective in achieving the Ecosystem Outcome 80 level of performance.</td><td>Ecosystem Outcome 100 level of performance.</td></tr>
<tr><td>Met?</td><td>Yes for all UoA’s</td><td>Yes for all UoA’s</td><td>Yes for the Norton Sound, Kotzebue, Yukon, Kuskokwim, Bristol Bay, North Peninsula, South Peninsula, Chignik, or Yakutat UoA’s.

No for Kodiak, Upper Cook Inlet, Lower Cook Inlet, Prince William Sound, Copper Bering or Southeast UoA’s</td></tr>
<tr><td>Justification</td><td colspan="3">There is no enhancement in the Norton Sound, Kotzebue, Yukon, Kuskokwim, Bristol Bay, North Peninsula, South Peninsula, Chignik, or Yakutat UoA’s and as such they meet the SG 100 level.

There is a comprehensive planning and permitting process in place to manage impacts of hatchery production and the state is in the process of evaluating all hatcheries for compliance with policies and permits. http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesOtherInfo.reports

ADFG is an active participant in the North Pacific Anadromous Fish Commission that coordinates research and monitoring of the North Pacific, including impacts of hatchery production.

These factors are sufficient to award a SG of 80, but we could not conclude that the process is sufficient to verify with certainty that the ecosystem outcome is assured and we therefore cannot award a SG of 100.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">Cederholm, C.J., M.D. Kuntz, T. Mutota, and S. Atuhiro. 1999. Pacific Salmon carcasses: essential contributions of nutrients and energy for aquatic ecosystems. Fisheries, Vol. 24,pp 6-15.

Munro, A. R., and E. C. Volk. 2017. Summary of Pacific salmon escapement goals in Alaska with a review of escapements from 2008 to 2016. Alaska Department of Fish and Game, Fishery Manuscript Series No. 17-05, Anchorage.

Schindler, D. 1980. Salmon-derived nutrients and dynamics of coastal ecosystems: how good is the story; In Salmon and nutrients: a seminar on science and policy; Speaking for the salmon series, Simon Frazer University.</td></tr>
</table>

PI 2.5.2	**There are measures in place to ensure the UoA and enhancement activities do not pose a risk of serious or irreversible harm to ecosystem structure and function**
	http://www.sfu.ca/coastal/research-series/listing/SpeakingfortheSalmon.html

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.5.2.A	2.5.2.B	2.5.2.C	2.5.2.E	Score
Southeast	**80**	**80**	**80**	**80**	**80**
Yakutat	**100**	**100**	**100**	**100**	**100**
P W S	**80**	**80**	**80**	**80**	**80**
Copper-Bering	**80**	**80**	**80**	**80**	**80**
L Cook Inlet	**80**	**80**	**80**	**80**	**80**
U Cook Inlet	**80**	**80**	**80**	**80**	**80**
Bristol Bay	**100**	**100**	**100**	**100**	**100**
Kuskokwim	**100**	**100**	**100**	**100**	**100**
Yukon	**100**	**100**	**100**	**100**	**100**
Norton	**100**	**100**	**100**	**100**	**100**
Kotzebue	**100**	**100**	**100**	**100**	**100**
Kodiak	**80**	**80**	**80**	**80**	**80**
Chignik	**100**	**100**	**100**	**100**	**100**
Ak Peninsula	**100**	**100**	**100**	**100**	**100**

CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA and associated enhancement activities on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guide post	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	Yes for All UoA's	Yes for All UoA's	
	Justification	The role salmon play as a keystone species in both the marine and freshwater food webs is well known. The role of species that compete with salmon, prey on salmon and those that serve as food at different life stage are also fairly well known. The physical habitat and dynamic conditions (i.e., currents, river flow, water temperatures) found within the ocean and freshwater have also been studied extensively. These investigations have been extensive enough to be the basis for many text books and college classes. Although much remains to be discovered about these ecosystems, the assessment team believes the available information is sufficient to meet the SG 80 level.		
b	Investigation of UoA impacts			
	Guide post	Main impacts of the UoA and associated enhancement activities on these key ecosystem elements can be inferred from existing information, and **have not been investigated in detail**.	Main impacts of the UoA and associated enhancement activities on these key ecosystem elements can be inferred from existing information and **some have been investigated in detail**.	Main interactions between the UoA and associated enhancement activities and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	Yes for all UoA's	Yes for all UoA's	No for all UoA's
	Justification	Harvests of salmon are well documented, information is available on by-catch of ETP species and other species, and impacts on habitats are typically small such that the main consequences for the ecosystem can be inferred. Some impacts have been investigated, including the effects of increased production of hatchery salmon on ocean ecosystems. The fishery meets the SG 80 level of performance. However, much work still needs to be done to investigate in detail many ecological process, as such the SG 100 level is not met.		
c	Understanding of component functions			
	Guide post		The main functions of the components (i.e., P1 target species, primary,	The impacts of the UoA and associated enhancement activities

PI 2.5.3		There is adequate knowledge of the impacts of the UoA and associated enhancement activities on the ecosystem		
			secondary and ETP species and Habitats) in the ecosystem are **known**.	on P1 target, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		Yes for all UoA's	No for all UoA's
	Justification	The main functions of the primary (Chinook, Coho, Sockeye, Chum and Pink Salmon, pacific Halibut and Lingcod), secondary (Rockfish) and ETP (marine mammals, migratory birds,) species and habitats are "well known" but surely not completely "understood" within the marine and freshwater ecosystems, as such all UoA's achieve the SG 80 level but not the SG 100 level.		
d	Information relevance			
	Guide post		Adequate information is available on the impacts of the UoA and associated enhancement activities on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the fishery and associated enhancement activities on the components **and elements** to allow the main consequences for the ecosystem to be inferred.
	Met?		Yes for All UoA's	Yes for all UoA's
	Justification	Adequate information is available on the impacts of the fishery by removing fish from the ecosystem, by-catch and on enhancement activities (e.g. fish health history, genetic origin, distribution and abundance) and of the hatchery facilities (water usage, discharges, etc.) to infer the main consequences on the ecosystem structure and function as such the SG 100 is achieved for all UoA's.		
e	Monitoring			
	Guide post		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		Yes for All UoA's	No for All UoA's
	Justific	Comprehensive information is collected in each UoA on the stocks being fished (distribution, abundance age structure), on the fisheries (catch, effort, gear used		

PI 2.5.3		There is adequate knowledge of the impacts of the UoA and associated enhancement activities on the ecosystem
	ation	distribution within fishing areas) on hatchery operations, egg takes, fish health, water use, releases, returns). Cooperative research with state, federal and international partners in the freshwater and marine environments is ongoing. This information is adequate to detect any increase in risk but not sufficient to develop strategies to manage all possible ecosystem impacts, as such the SG 80 is achieved but not the SG 100 for all UoA's.
References		

OVERALL PERFORMANCE INDICATOR SCORE:

UoA	2.5.3.A	2.5.3.B	2.5.3.C	2.5.3.D	2.5.3.E	Score
Southeast	80	80	80	100	80	85
Yakutat	80	80	80	100	80	85
P W S	80	80	80	100	80	85
Copper-Bering	80	80	80	100	80	85
L Cook Inlet	80	80	80	100	80	85
U Cook Inlet	80	80	80	100	80	85
Bristol Bay	80	80	80	100	80	85
Kuskokwim	80	80	80	100	80	85
Yukon	80	80	80	100	80	85
Norton	80	80	80	100	80	85
Kotzebue	80	80	80	100	80	85
Kodiak	80	80	80	100	80	85
Chignik	80	80	80	100	80	85
Ak Peninsula	80	80	80	100	80	85

CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.1.1 – Legal and/or customary framework

<table>
<tr><td colspan="2">PI 3.1.1</td><td colspan="3">The management system exists within an appropriate legal and/or customary framework which ensures that it:
Is capable of delivering sustainability in the UoA; and
Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and
Incorporates an appropriate dispute resolution framework.</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">a</td><td colspan="4">Compatibility of laws or standards with effective management</td></tr>
<tr><td>Guide post</td><td>There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2</td><td>There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.</td><td>There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Justification</td><td colspan="3">The management system exists within an appropriate legal and/or customary framework (see Clark 2006 for review). Sustainable use natural resources is explicitly directed in the Alaska state constitution’s Section 4: “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 uses.” The Alaska legislature created the Department of Fish and Game and the Division of Commercial Fisheries and passed statutes providing authority and guidance. The Alaska Board of Fish and Game and later the Alaska Board of Fisheries has promulgated a diverse set of regulations and plans for management of Alaska's subsistence and commercial salmon fisheries. Management regulation is defined by policies and plans adopted into Alaska Administrative Code which provides binding procedures directing actions by Division of Commercial Fisheries.

Within this framework, specific policies provide for management consistent with MSC Principles. For instance, a Policy for the Management of Sustainable Salmon Fisheries was adopted into State regulation in 2000 (5 AAC 39.222). The regulation states that “while, in the aggregate, Alaska’s salmon fisheries are healthy and sustainable largely because of abundant pristine habitat and the application of sound, precautionary, conservation management practices, there is a need for a comprehensive policy for the regulation and management of sustainable salmon fisheries.” The goal of the policy is to “ensure conservation of salmon and salmon’s required marine and aquatic habitats, protection of customary and traditional uses and other uses, and the sustained economic health of Alaska’s fishing communities.”</td></tr>
</table>

<table>
<tr><td colspan="2">PI 3.1.1</td><td colspan="3">The management system exists within an appropriate legal and/or customary framework which ensures that it:
• Is capable of delivering sustainability in the UoA; and
• Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and
• Incorporates an appropriate dispute resolution framework.</td></tr>
<tr><td></td><td></td><td colspan="3">US states are responsible for management of fishery resources in freshwater and marine waters within 3 miles of the coast. In Alaska, management of salmon fisheries in Federal waters of marine waters, 3-200 miles offshore of the Alaska coastline has also been delegated to the State by the North Pacific Fishery Management Council of the National Marine Fisheries Service. This delegation ensures that marine and freshwater management action is implemented consist with the requirement of long-term sustainability as specified in the guiding Federal Magnuson Stevens Act.
Alaska management is also consistent with the Pacific Salmon Treaty with Canada and the Pacific Northwest for transboundary salmon stocks.
Therefore, There is an effective national legal system and binding procedures governing cooperation with other parties (such as the US government and Canada) which delivers management outcomes consistent with MSC Principles 1 and 2 and the SG100 is therefore met.</td></tr>
<tr><td>b</td><td colspan="4">Resolution of disputes</td></tr>
<tr><td></td><td>Guide post</td><td>The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.</td><td>The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA.</td><td>The management system incorporates or subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the UoA and has been tested and proven to be effective.</td></tr>
<tr><td></td><td>Met?</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">The Alaska Board of Fisheries provides a transparent mechanism for resolution of disputes regarding fishery sustainability and harvest allocation. The BOF is established by Statute 16.05.221 for the purposes of the conservation and development of the fisheries resources of the state. The BOF has the authority to adopt regulations described in Alaska Statute 16.05.251 including: establishing open and closed seasons and areas for taking fish; setting quotas, bag limits, harvest levels and limitations for taking fish; and establishing the methods and means for the taking of fish. The regulations the BOF has authority over are 5 AAC Chapters 1- 77. http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main. The BOF process is transparent in that the Board receives and reviews proposals</td></tr>
</table>

<table>
<tr><td colspan="2">PI 3.1.1</td><td colspan="3">The management system exists within an appropriate legal and/or customary framework which ensures that it:
• Is capable of delivering sustainability in the UoA; and
• Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and
• Incorporates an appropriate dispute resolution framework.</td></tr>
<tr><td></td><td></td><td colspan="3">and testimony from the public. Findings are available on the ADF&G webpage. The BOF has been established for many years and it has been shown to be effective.

The BOF process is used to resolve disputes that may arise, such as the allocation of surplus salmon between gear types and between adjacent management areas. Local Advisory Committees (82 in the state) are used to identify and discuss issues that may be brought to the attention of the BOF and ADF&G. Meetings are always open to the public and are generally attended by ADF&G staff and members of the public who can offer background information on agenda topics.

Alaska participates in the Pacific Salmon Treaty as a means to resolve allocation issues of the salmon resources that migrate through Alaska’s marine and fresh waters, e.g., transboundary rivers. ADF&G participates in the North Pacific Anadromous Fish Commission as a means to communicate with management agencies of other countries given that salmon from all Pacific Rim countries share the ocean.

Disputes may also be adjucated through the State court system as happens on occasion.

Therefore, The management system incorporates or subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the UoA and has been tested and proven to be effective and the SG100 is met.</td></tr>
<tr><td rowspan="4">c</td><td colspan="4">Respect for rights</td></tr>
<tr><td>Guide post</td><td>The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</td><td>The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</td><td>The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Justific ation</td><td colspan="3">A formal and well-defined process exists to consider the views, customs, and interests of indigenous peoples who depend on fishing for their food or livelihood – this involves the Alaska BOF, a Federal Subsistence Board, and a series of</td></tr>
</table>

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainability in the UoA; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**
		Regional Advisory Councils. The BOF process provides a formal and well-defined process to consider the impact of the fishery on coastal communities that are closely tied to the fishery. This process regularly seeks and considers input from stakeholders in an effort to understand and address socioeconomic issues related to the fishery. A recent example of this in action is the reinstatement of the BoF Hatchery Committee upon the request of stakeholders engaged in the BoF process (AK BoF, 2019). The Federal Subsistence Management Program is a multi-agency effort to provide the opportunity for a subsistence way of life by rural Alaskans on federal public lands and waters while maintaining healthy populations of fish and wildlife (http://alaska.fws.gov/asm/about.cfml). The Alaska National Interest Lands Conservation Act (ANILCA), passed by Congress in 1980, mandates that rural residents of Alaska be given a priority for subsistence uses of fish and wildlife. In 1989, the Alaska Supreme Court ruled that ANILCA's rural priority violated the Alaska Constitution. As a result, the Federal government manages subsistence uses on Federal public lands and waters in Alaska- covering about 230 million acres or 60 percent of the land within the state. To help carry out the responsibility for subsistence management, the Secretaries of the Interior and Agriculture established the Federal Subsistence Management Program. The program provides for public participation through the Federal Subsistence Board and 10 Regional Advisory Councils. Regulations implementing the Federal Subsistence Management Program on Federal public lands within the State of Alaska can be found in the Code of Federal Regulations, Part 100, Section 1-23, available here: http://alaska.fws.gov/asm/pdf/50cfr100.pdf. Therefore, The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2 and the SG100 is met.
References		See Section 3.6
OVERALL PERFORMANCE INDICATOR SCORE:		**100**
CONDITION NUMBER (if relevant):		**--**

Evaluation Table for PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2	**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**			
Scoring Issue		SG 60	SG 80	SG 100
a	**Roles and responsibilities**			
	Guide post	Organizations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **generally understood**.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for key areas** of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction.
	Met?	Yes	Yes	Yes
	Justification	Organisations and individuals involved in the management process are clearly identified. At the international level or Federal level, these include the North Pacific Anadromous Fish Commission, the Pacific Salmon Commission, North Pacific Fisheries Management Council, Secretary of the Interior and the USFWS Office of Subsistence Management. At the State level, the BOF, Local Advisory Committees, native associations and ADF&G are involved in the management process. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction. Therefore Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction and the SG100 is met.		
b	**Consultation processes**			
	Guide post	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information and **explains how it is used or not used**.

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
	Met?	Yes	Yes	Yes
	Justification	The Secretary of the Interior and the USFWS Office of Subsistence Management actively engage members of the public in commercial fisheries issues that affect subsistence harvest, Advisory Boards to the North Pacific Fisheries Management Council, the BOF, Local Advisory Committees, native associations and ADF&G regularly seek and accept relevant information, meetings are open to the public, and it can be demonstrated that the processes **regularly seek and accept** available information on a regular basis, as required by the SG100. The BOF process provides an extremely open and transparent process for development and refinement of management policies and plans for fishery management. The BOA conducts public meeting for each fishery area In a rotating three-year cycle and also considers out-of-cycle issues in annual statwide work sessions. Regulatory proposals and testimony are invited from the public and other stakeholders. Related technical information is provided by ADF&G and every proposal is considered in an open public meeting which typically extends for multiple days depending on the region. Proceedings and decisions are documented extensively and publicized on the internet, including resulting management action if appropriate. Therefore, The management system demonstrates consideration of the information and **explains how it is used or not used**, and the SG100 is met.		
c	**Participation**			
	Guide post		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		Yes	Yes
	Justification	There is extensive evidence that consultation processes provide opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement. Meeting minutes, notes and agendas are available on the websites of the bodies listed in SI 100a, above. For example: • North Pacific Anadromous Fish Commission: www.npafc.org/ • The Pacific Salmon Commission: www.psc.org/ • The North Pacific Fisheries Management Council: http://alaskafisheries.noaa.gov/npfmc/ USFWS Office of Subsistence Management:		

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties	
		http://alaska.fws.gov/asm/osm.cfml BOF: http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main • Alaska Department of Fish and Game: http://www.adfg.alaska.gov/index.cfm?adfg=home.main Thus, the SG100 is met for this scoring issue.	
References		See Section 3.6	
OVERALL PERFORMANCE INDICATOR SCORE:			**100**
CONDITION NUMBER (if relevant):			**--**

Evaluation Table for PI 3.1.3 – Long-term objectives

PI 3.1.3		**The management policy for the SMU and associated enhancement activities has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach**		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	Long-term objectives to guide decision-making, consistent with the MSC fisheries standard and the precautionary approach, are **implicit** within management policy	**Clear** long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach are **explicit** within management policy.	**Clear** long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?	Yes	Yes	Yes
	Justification	The fishery meets the SG100 level of performance based on fishery objectives explicitly identified and required in Alaska State policies. Policies explicitly call for application of a precautionary approach and contain clear long-term objectives that guide decisionmaking consistent with the MSC fisheries standard. 5AAC 39.220, Policy for the management of mixed stock salmon fisheries, requires that "a) ... conservation of wild salmon stocks consistent with sustained yield shall be accorded the highest priority." 5AAC 39.222, Policy for the management of sustainable salmon fisheries, also describes a number of key requirements with respect to wild fisheries, these include: "2) in formulating fishery management plans designed to achieve maximal or optimum salmon production, the board and department must consider factors including environmental change, habitat loss or degradation, data uncertainty, limited funding for research and management programs, existing harvest patterns, and the fisheries or expanding fisheries, 3c1) wild salmon stocks and the salmon's habitats should be maintained at levels of resource productivity that assure sustained yields as follows: A) salmon spawning, rearing, and migrate three habitats should be protected as follows: i) salmon habitats should not be perturbed beyond natural boundaries of variation; ii) scientific assessments of possible adverse ecological effects of proposed habitat alterations and impacts of the alterations on salmon populations should be conducted before approval of a proposal; iv) all essential salmon habitat in marine, estuarine, and freshwater ecosystems and access of salmon to these habitats should be protected; B) salmon stocks should be protected within spawning, incubating, rearing and migratory habitats". With respect to enhanced fisheries, these include: "D) effects and interactions of introduced or enhanced salmon stocks on wild salmon stocks should be assessed; wild salmon stocks and fisheries on those stocks should be protected from adverse		

<table>
<tr><td colspan="2">PI 3.1.3</td><td colspan="2">The management policy for the SMU and associated enhancement activities has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach</td></tr>
<tr><td></td><td></td><td colspan="2">impacts from artificial propagation and enhancement efforts, G) depleted salmon stocks should be allowed to recover or, where appropriate, should be actively restored; diversity should be maintained to the maximum extent possible, at the genetic, population, species, and ecosystem levels”. The policy specifically identifies implementation of a precautionary approach for maintaining wild salmon populations. The SG100 is met.</td></tr>
<tr><td colspan="2">References</td><td colspan="2">See Section 3.6</td></tr>
<tr><td colspan="3">OVERALL PERFORMANCE INDICATOR SCORE:</td><td>100</td></tr>
<tr><td colspan="3">CONDITION NUMBER (if relevant):</td><td>--</td></tr>
</table>

Evaluation Table for PI 3.2.1 – Fishery-specific objectives

PI 3.2.1		**The fishery-specific and associated enhancement management system(s) activities have clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2**		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	**Objectives,** which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery and associated enhancement management system(s).	**Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery and associated enhancement management system(s).	**Well defined and measurable short and long-term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery and associated enhancement management system(s).
	Met?	Yes	Yes	Partial
	Justification	The fishery meets the SG80 level of performance based on short- and long-term fishery objectives explicitly identified in Alaska State statute and regulations including policies and management plans defined by the Alaska Administrative Code. These are carried into the management of salmon fisheries through the use of escapement goals, which are well defined and measurable. Objectives consistent with MSC principles include numerous Alaska mandates, policies and regulation for hatchery operations were specifically developed to minimize potential adverse effects to wild stocks (Stopha 2018). These regulations require fishery managers to consider the interactions of wild and hatchery salmon stocks when reviewing hatchery management plans and permits. Production objectives and requirements are specified for private non-profit hatchery operations through a comprehensive permitting and planning process. The policy for the management of sustainable salmon fisheries [5AAC 39.222], states that "wild salmon stocks and fisheries on those stocks should be protected from adverse impacts from artificial propagation and enhancement efforts", and "plans and proposals for development or expansion of salmon fisheries and enhancement programs should effectively document resource assessments, potential impacts, and other information needed to assure sustainable management of wild salmon stocks" The policy also advocates for a precautionary approach when there are uncertainties in the effects on sustainable fisheries and populations. The ADF&G Genetic Policy (Davis et al. 1985) sets out restrictions and guidelines for stock transport, protection of wild stocks, and maintenance of genetic variance banning importation of salmonids from outside the state (except US/Canada transboundary rivers); restricting transportation of stocks between the major		

PI 3.2.1		The fishery-specific and associated enhancement management system(s) activities have clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2
		geographic areas in the state; requiring the use of local broodstock; maintaining genetic diversity by use of large populations of broodstock collected across the entire run and without regard to any physical trait such as size; and limiting the number of hatchery stocks derived from a single donor stock. The Alaska Fish Health and Disease Control Policy (5 AAC 41.080) is designed to protect fish health and prevent spread of infectious disease in fish and shellfish. The policy is used by ADF&G fish pathologists to review hatchery plans and permits. The Alaska Policy for the Management of Mixed-Stock Salmon Fisheries (5 AAC 39.220), the Salmon Escapement Goal Policy (5 AAC 39.223), and local fishery management plans (5 AAC 39.200) provide further guidance to fisheries management for the protection of wild salmon stocks. As described under the SG80 rationale, short- and long-term objectives consistent with MSC principles are explicit within the fishery and met the SG100 standard. Relative to Principle 2-type objectives, it can be demonstrated through state, federal and regional policies in place that short- and long-term objectives are in place and reflected in salmon fisheries management. For instance, fishery regulations prohibit the deliberate take of ETP species in Alaska Salmon fisheries. Fishing is also prohibited near Stellar sea lion rookeries and haul-out areas. Relative to non-salmon bycatch, non-sale provisions coupled with the highly selective gear and fishing during times and places of peak abundance of targeted salmon populations demonstrate at least implicit objectives (partial strategy) to limit the impact of salmon fisheries. This is sufficient to meet the 80 level of performance. However, it is not clear that measurable objectives consistent with protection of wild stocks are explicitly defined for enhancement programs – specifically for acceptable limits of hatchery origin straying into natural production areas. The application of the precautionary principle identified in the sustainable salmon fishery policy to these limits is similarly unclear. For those UoCs where enhancement activities occur, related efforts are guided by comprehensive salmon plans for each region. Plans are developed by the regional management teams, which are composed of six members: three from ADF&G and three appointed by the regional aquaculture association Board of Directors (5 AAC 40.310). The Comprehensive Phase III plan for PWS states: "the proportion of hatchery salmon straying into wild stock streams must remain below 2% of the wild-stock escapement over the long-term; the growth rates ofjuvenile salmon during the early marine period must be density independent over the long term; and wildstock escapement goals must be achieved over the long-term." However, these plans are years or decades old, do not reflect current information, and specified straying limits are not being met. Therefore, the SG100 standard is not achieved for this issue. This issue is specific to UoCs with enhancement (SEAK,

PI 3.2.1		The fishery-specific and associated enhancement management system(s) activities have clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2	
		PWS, Copper/Bering, LCI, UCI and Kodiak) although Principle 3 was assessed based on the management system as a whole hence a partial achievement of the SG100 is indicated as allowed for this PI (with one scoring issue only).	
References		See Section 3.6	
OVERALL PERFORMANCE INDICATOR SCORE:			**90**
CONDITION NUMBER (if relevant):			**--**

Evaluation Table for PI 3.2.2 – Decision-making processes

PI 3.2.2		The fishery-specific and associated enhancement management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
Scoring Issue		SG 60	SG 80	SG 100
a	Decision-making processes			
	Guide post	There are **some** decision-making processes in place that result in measures and strategies to achieve the fishery-specific and enhancement objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific and enhancement objectives.	
	Met?	Yes	Yes	
	Justification	ADF&G and the BOF provide well-established decision-making processes that result in measures and strategies to achieve the fishery-specific and enhancement objectives. The Board of Fishery establishes polices and fishery implementation direction in the form of management plans for specific areas and stocks. ADF&G implements fisheries according to management plans based on inseason information to optimize harvests and achieve escapement goals. Regional Planning Teams provide for an established decision-making processes with regard to enhancement activities. There are regulations governing actions of RPT's requiring actions to prevent negative impacts of hatchery operatons on wild stocks. Therefore, the SG80 is met for this scoring issue.		
b	Responsiveness of decision-making processes			
	Guide post	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Yes	Yes	No
	Justification	Decision-making processes respond to serious and other important issues, For instance, action Plans are developed in a timely manner when a Stock of Concern is identified by ADF&G and the BOF. The management system may also respond to		

PI 3.2.2		The fishery-specific and associated enhancement management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
		important issues before stocks become a stock of concern. Management plans are revised by the Board of Fisheries to address issues identified during regular BOF meetings in a public process. In addition, hatchery permits are awarded or declined (including requests for expansion) on the basis of commitment and adherence to hatchery management policies as described in earier PIs. Therefore the SG80 is met. The assessment team does not have full evidence that decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. For instance recent issues pertaining to inter-regional straying of hatchery fish from PWS to LCI have not yet received a management response or been explicitly incorporated into ongoing hatchery impact studies. Therefore, the SG100 standard is not met.		
c	Use of precautionary approach			
	Guide post		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Yes	
	Justification	Decision-making processes use best available information and typically balance the socio-economic needs with the precautionary approach to maintain sustainable fisheries. Evidence for this is shown from consistent achievement of established escapement goals on the whole, and where this is not the case, management has responded by closing fisheries where appropriate and designating Stocks of Concern which require specific management and monitoring action. Thje precautionary approach is mandated by specific precisions in the Sustainable Salmon Fishery Policy adopted by the Board of Fisheries. The scientific basis for fishery management is continually being refined based on an extensive research program. Thus, the SG80 is met.		
d	Accountability and transparency of management system and decision-making process			
	Guide post	Some information on fishery performance and management action is generally available on request to stakeholders.	**Information on fishery performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings	Formal reporting to all interested stakeholders **provides comprehensive information on fishery performance and management actions** and describes how the management system

PI 3.2.2		The fishery-specific and associated enhancement management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
			and relevant recommendations emerging from research, monitoring, evaluation and review activity.	responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Yes	Yes	Yes
	Justification	Explanations for actions are typically provided in management reports, Board of Fishery reports, advisory meetings, or other public meeting for actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity. ADF&G prepares annual management reports, escapement goal reviews, and hatchery production trends, and these reports typically respond to emerging issues. Other reports provide all recent information and data relative to hatchery impacts such as reporting levels of inter-regional straying. ADF&G has also completed program reviews for current hatchery programs and documented findings in a series of regular and publically available reports. Stakeholders have raised concerns that, e.g. enhancement annual production reports do not include all recent and relevant research findings. Upon investigation, however, the team confirmed that information emerging from monitoring and research findings is indeed published, albeit in separate report series. Therefore, the SG100 is met.		
e	Approach to disputes			
	Guidepost	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Yes	Yes	Yes
	Justification	The management system acts to avoid legal disputes and rapidly mplements judicial decisions arising from legal challenges where appropriate. The proactive avoidance of legal disputes is evidenced primarily through the transparent and inclusive fsiheries management process within the BoF and others. Early and frequent public engagement and responsiveness can be regarded as proactive		

PI 3.2.2		**The fishery-specific and associated enhancement management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.**
		avoidance of legal action due to unresolved disputres. Fishery allocation and jurisdictional issues are periodically challenged in the court system and adjudicated, hence the SG100 s met for this scoring issue.
References		See Section 3.6
OVERALL PERFORMANCE INDICATOR SCORE:		**95**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery and associated enhancement activities are enforced and complied with.		
Scoring Issue		SG 60	SG 80	SG 100
a	MCS implementation			
	Guide post	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and associated enhancement activities and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery and associated enhancement activities and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and associated enhancement activities and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Yes	Yes	Yes
	Justification	Fish tickets provide the means to monitor fishery and hatchery harvests, and sampling by biologist of the harvests for length, age, gender and genetics (sometimes) provide for a relatively comprehensive monitoring program. Fish tickets must be completed and submitted to the nearest ADF&G office within 7 days of the landing and/or first purchase of the fishery resource. The primary responsibility for enforcing fish and wildlife-related statutes and regulations in Alaska lies with the Alaska Department of Public Safety, through its Division of Alaska Wildlife Troopers. Biologists and other staff of ADF&G participate in enforcement activities and assist the Wildlife Troopers as needed. Additionally, fishermen continually watch activities on the water and would likely report illegal fishing activity given that this would impact their livelihood. Activities of private nonprofit hatcheries are monitored by ADFG as a condition of permitting. Hatchery Permits are required for the construction and/or operation of a private nonprofit (PNP) salmon hatchery in Alaska. Hatchery permits specify the species and number of salmon than can be incubated at the hatchery, as well as the number released, release sites, broodstock sources, and other conditions of operation. Once they are issued, hatchery permits do not expire, but they may be revoked. Hatchery permits are non-transferable, so if a hatchery is sold or leased, the new operator must apply for a new permit. Hatchery permits may only be issued to private nonprofit corporations. Hatchery operators are required to submit annual reports of egg takes, releases, and adult returns. Annual reports from each hatchery must be submitted by December 15th. The disposal of salmon carcasses used for broodstock must be documented in carcass disposal logs, which are due no later than the end of the calendar year.Comprehensive evaluations of individual hatchery programs have been completed by ADF&G within the last few		

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery and associated enhancement activities are enforced and complied with.		
		years for consistency with statewide policies and prescribed management practices. This comprises a **comprehensive** monitoring, control and surveillance system that has been implemented in the fishery and associated enhancement activities and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules. Hence, the SG100 is met.		
b	Sanctions			
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	Yes	Yes	Yes
	Justification	Non-compliance with fishery and hatchery management regulations is rare in Alaska salmon fisheries. The risk of being fined, losing a fishing permit, and being identified for illegal activity by other fishermen provides strong incentive for fishermen to comply with rules and regulations. Thus, the sanctions that exist to deal with non-compliance are consistently applied and demonstrably provide effective deterrence, as evidenced by consistently compliant fisheries and hatchery management. Thus the SG100 is met.		
c	Compliance			
	Guide post	Fishers and hatchery operators are **generally thought** to comply with the management system for the fishery and associated enhancement activities under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers and hatchery operators comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery and associated enhancement activities.	There is a **high degree of confidence** that fishers and hatchery operators comply with the management system under assessment, including, providing information of importance to the effective management of the fishery and associated enhancement activities.
	Met?	Yes	Yes	Yes
	Justification	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery. Fish tickets are reported by the buyers and fishermen typically comply with requests by ADF&G staff to sample their catch for biological attributes. Hence, the SG100 is met.		

<table>
<tr><td colspan="2">PI 3.2.3</td><td colspan="3">Monitoring, control and surveillance mechanisms ensure the management measures in the fishery and associated enhancement activities are enforced and complied with.</td></tr>
<tr><td rowspan="4">d</td><td colspan="4">Systematic non-compliance</td></tr>
<tr><td>Guide post</td><td></td><td>There is no evidence of systematic non-compliance.</td><td></td></tr>
<tr><td>Met?</td><td></td><td>Yes</td><td></td></tr>
<tr><td>Justification</td><td colspan="3">The Alaska fishery is monitored for compliance by ADF&G staff and State Troopers. Commercial harvests, including retained non-salmonids, must be documented on fish tickets. Fishermen may occasionally fail to abide by regulations but there are strong incentives that prevent this behaviour from becoming systematic or wide-spread. Violations are effectively addressed. There is no evidence of systemic non-compliance and the SG80 is therefore met.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">See Section 3.6</td></tr>
<tr><td colspan="4">OVERALL PERFORMANCE INDICATOR SCORE:</td><td>100</td></tr>
<tr><td colspan="4">CONDITION NUMBER (if relevant):</td><td>--</td></tr>
</table>

Evaluation Table for PI 3.2.4 – Monitoring and management performance evaluation

<table>
<tr><td colspan="2">PI 3.2.4</td><td colspan="3">There is a system of monitoring and evaluating the performance of the fishery-specific and enhancement management system(s) against its objectives
There is effective and timely review of the fishery-specific and associated enhancement program(s) management system</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">a</td><td colspan="4">Evaluation coverage</td></tr>
<tr><td>Guide post</td><td>The fishery and associated enhancement program(s) has in place mechanisms to evaluate some parts of the management system.</td><td>The fishery and associated enhancement program(s) has in place mechanisms to evaluate key parts of the management system</td><td>The fishery and associated enhancement program(s) has in place mechanisms to evaluate all parts of the management system.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td>Justification</td><td colspan="3">The fishery management system is subject to an extensive and muli-layered evaluation system. Annual management reports are produced for each management area and provide a record of harvests and spawning escapements in relation to escapement goals. Escapement goals and annual management plans are reviewed by ADF&G and the BOF every three years. Failure to meet expected harvest or escapement levels can lead to a SOC declaration by the BOF, which then triggers an action plan to fix the problem. The public has input into the management system via advisory committees and testimony and Board of Fishery meetings. Key parts of the enhancement program are subject to regular evaluation. Hatchery programs have recently undergone a detailed program by program review. These review assessed consistency with statewide policies and prescribed management practices. Some projects were not properly permitted in earlier years, and recommendations for clarification of outstanding issues were addressed by the reviews including updates of basic management plans with descriptions of current permit conditions and operations. This demonstrates that the fishery and associated enhancement programs have in place mechanisms to evaluate key parts of the management system and the SG80 is met.

Although the enhancement program has undergone an internal review, the review considers only key parts of the management system. It is unclear whether some elements including enhancement effects on the marine ecosystem have been fully evaluated (e.g., Ruggerone and Irvine 2018). Therefore the SG100 guidepost is not met with respect to statewide enhancement programs.</td></tr>
<tr><td rowspan="2">b</td><td colspan="4">Internal and/or external review</td></tr>
<tr><td>Guide post</td><td>The fishery-specific and associated enhancement program(s) management system is subject to occasional internal</td><td>The fishery-specific and associated enhancement program(s) management system is subject to regular internal and</td><td>The fishery-specific and associated enhancement program(s) management system is subject to regular internal and</td></tr>
</table>

PI 3.2.4		**There is a system of monitoring and evaluating the performance of the fishery-specific and enhancement management system(s) against its objectives** **There is effective and timely review of the fishery-specific and associated enhancement program(s) management system**		
		review.	**occasional external** review.	**external** review.
	Met?	Yes	Yes	No
	Justification	ADF&G technical reports are reviewed internally by other biologists, and more controversial reports may be reviewed by the Chief salmon Scientist. Some reports are reviewed by external experts, especially if they are controversial. ADF&G regularly contracts for reviews by Federal and University scientists, hence the SG80 is met. The enhancement program has undergone an internal review and an ongoing hatchery research project is subject to external scientific review. However, the enhancement programs, which are large and often controversial, do not have regular reviews by external scientists and managers. Therefore the SG100 guidepost is not met with respect to statewide enhancement programs.		
References		See Section 3.6		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				**--**

APPENDIX 2 CONDITIONS & CLIENT ACTION PLAN

Table A1.3: Condition 1

Performance Indicator	**1.3.1-SEAK:** Enhancement activities do not negatively impact wild stocks or substitute for a stock rebuilding strategy.
Score	60
Rationale	This condition was behind target as of the November 2017 surveillance audit, pending completion and peer review of a report on the comprehensive hatchery-wild interaction study for Southeast Alaska chum salmon. (see MRAG 2018) Results of the hatchery interactions study for 2015 were published in November 2016 in an annual project report (Knudsen et al. 2016). Sampling of four streams occurred in 2017 in four northern southeast streams to assess relative fitness of hatchery and wild spawners (SSSC 2017). Manuscripts summarizing results for the first phase of the project are in preparation and were expected to be available in 2018. These manuscripts were expected to provide a complete description of the 2013-2015 PWS ocean and stream research including estimates of stream-specific and aggregate hatchery proportions of Chum Salmon in Southeast Alaska streams. The assessment team received a draft of a publication in preparation for the journal of Marine and Coastal Fisheries and made available to the AHRP Science Panel in advance of publication entitled "Spatial and Temporal Distribution in the Returns of Hatchery- and Natural-origin Pink Salmon and Chum Salmon to Prince William Sound, Alaska during 2013-2015 (Knudsen et al in prep). This document includes a comprehensive summary of hatchery contribution and straying results in the study to date. This includes hatchery contributions of both pink and chum salmon to the PWS return and to spawning escapements. Rigorous statistical methods are used to estimate hatchery and wild proportions. This information is consistent with the action plan and effectively brings the condition back on schedule with respect to hatchery straying in PWS. However, at the time of writing, a similar publication needed to fulfill the year for milestone for Southeast Alaska was still in prepratation and a draft was not available to the team. This paper, entitled *Spatial and temporal patterns in the returns of hatchery- and natural-origin Chum Salmon to spawning streams of Southeast Alaska during 2013-2015* is also In prep for Marine and Coastal Fisheries and a draft is expected to be available to the AHRP and assessment team early in 2019. If this is of the same caliber as the PWS-focused paper the team has already reviewed, we would expect this to result in the condition being back on target before this reassessment is completed. Carry over of Condition 1 from 2013 assessment as originally specified under exceptional circumstances allowances at the time. Regarding chum salmon, the field sampling is not scheduled to conclude until 2023, therefore a reasonable extension will be allowed for condition closure on this aspect.
Condition	By the end of 2024, the SG 80 scoring requirements must be met in full. This

	will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a): It is highly likely that the Chum salmon enhancement activities in SEAK do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Chum salmon stocks.
Milestones	Initiation of an independent peer review of the study plan was delayed by changes in the certificate holder between completion of this action plan and the second surveillance. In the interim, a comprehensive study plan was developed by a science panel composed of current and retired scientists from ADF&G, University of Alaska, aquaculture associations, and National Marine Fisheries Service. Major elements of the study design were implemented from 2013-2015 to determine hatchery proportion of straying and collect genetic data for a pedigree fitness study. This included sampling and analysis of Chum salmon otoliths in representative natural production areas throughout southeast Alaska. Additional data to determine fitness from the 1st and 2nd progenies is being collected through 2023. Given the scientific rigor of the study design provided by science team and advanced stage of study implementation, PSPA has concluded that a peer review of the study at this stage of implementation would be more effectively focused on study conclusions than on the planned study design. Toward that end, PSPA proposed the following revision in action milestones to address condition one (revised in 2016). Year 1 (2014): Monitor the development and implementation of a rigorous scientific hatchery/wild interaction study. Years 2-3 (2016-2016): Provide annual reports on progress of the investigation, including straying and genetic findings. Year 4 (2017): Provide an interim technical report summarizing results of investigations including straying and genetic findings for years 1-4. Review possible management actions for potential implementation as appropriate to ameliorate adverse effects if found. Years 5-9 (2018-2022): Provide annual reports on progress of the investigation, including straying and fitness findings. Year 10 (2023): Provide a summary of fitness data collection and any preliminary findings from data collection (scheduled for conclusion in summer of 2023). Year 11 (2024) Provide a finall report, including a peer review report demonstrating that it is highly likely that Chum salmon enhancement activities in SEAK do not have significant negative impacts on the local adaptation,

	reproductive performance and productivity or diversity of wild Chum salmon stocks.
Client action plan	See above under "milestones"
Consultation on condition	All parties implicated in the achievement of this client action plan have been consulted and agree on their responsibilities. A letter from the interim director of commercial fisheries at ADFG to this effect is included as an appendix to this report.

Table A1.3: Condition 5

Performance Indicator	**1.3.1 and 1.3.3 for Kodiak**
Score	PI 1.3.1: 60 PI 1.3.3: 60
Rationale	PI 1.3.1 – The SG 80 is not met. The previous assessment (IMM 2015) noted that Kodiak does not have a marking program for hatchery releases, an activity essentially universally required in PWS and SEAK, the other regions that have very high production levels of hatchery fish, particularly of chum and pink salmon. Sockeye meets this level of performance based on periodic evaluations of interceptions in the fishery by use of scale pattern analysis (Nelson and Swanton 1996; Foster 2010). These scales are quite unique and allow visual separation of Spiridon stocks from other migrating salmon. Also, sockeye have a high degree of fidelity to their natal areas (or areas imprinted as fry), so the team believed it is highly likely that sockeye salmon stocks do not have negative impacts on wild stocks (IMM 2015). No evaluation of straying of Chum or pink salmon has previously been undertaken in the Kodiak area. In addition, no sampling of the common property fisheries to determine the enhanced contribution is performed. Current estimates of the commercial harvest of hatchery-produced fish are based on catches in the vicinity of Kitoi Bay. For thee species, it could not be concluded with high liklihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks. Therefore the team has introduced a condition for continued certification that requires an analysis of the risks associated with Chinook, coho, pink and chum salmon straying and uncertainty in stock identification in mixed stock fisheries. With respect to Condition 5, it was noted that hatchery stocks of all species do not comprise a major part of the harvests in the Kodiak UoC to date, and so the primary concern was related

	to straying into other systems at the current levels of release. Chum salmon produced at Kitoi Bay Hatchery are now being thermally marked by making use of the difference in temperature between deep and shallow lake withdrawal water sources used for incubation. Marking of 100% of Chum salmon began in 2014. The first otolith-marked Chum will return in 2016 but the marked age class will comprise a small portion of the total return. Marking was required by ADFG as a condition of approval for a requested increase in Chum salmon production at Kitoi Bay from 28 to 36 million eggs in 2014 (ADF&G 2014). More than 100 million pink salmon fry are released each year, and none have been marked to date. Thermal otolith marking is not feasible with existing water systems because the difference in water temperature between incubation sources has diminished by the time the pink salmon embryos reach the critical marking stage. The egg mass in each incubator is too large for effective dry marking for pinks. The Kitoi Bay Hatchery was recently remodelled, and considerations were made for installing the equipment necessary for marking pink salmon. At this time there is no marking requirement by ADF&G for pink salmon at the Kitoi Bay Hatchery. A marking requirement could be implemented if the program sought to increase pink salmon production. However, the KRAA Board of Directors have not committed to marking of pink salmon at this time given costs relative to perceived value to management. Chinook and Coho salmon produced by Pillar Creek Hatchery are released for sport rather than commercial fisheries, whereas numerous Coho salmon released from Kitoi Bay (~1.4 million) are largely for commercial purposes. Experimental marking of a portion of the Coho production has been implemented at Pillar Creek Hatchery using the dry method. As of the fourth surveillance of the previous certification, a revised action plan called for KRAA to provide an update on plans for marking pink and Coho salmon at Kitoi Hatchery and results of any new research findings regarding the impact of Kodiak hatchery pink salmon on wild populations based on available data in the absence of marking. KRAA has continued to explore alternatives for thermal marking of pink salmon. Further testing is being conducted of a salt water check as a potential alternative to thermal marking. This method was identified following 1-hour salt water treatment of eggs for fungus control. Application of this treatment was extended to 12 hours as a marking experiment of approximately 18-19 million of the current brood year production in the incubation stage. (10% of the scheduled 2018 release). The efficacy of this method will be assessed upon hatching. This effort was found by the surveillance team to satisfy progress toward completion of this condition. The action plan also reported that KRAA would sample the Kodiak fishery for Chum salmon and streams within a 50 km radius of Kitoi Hatchery as outlined

	in the PSPA report for year 2. In 2017, KRAA conducted limited sampling of chum salmon in the fishery for otolith marks. However, no stream sampling was conducted. PI 1.3.3 – While a variety of studies have examined the impacts of enhancement activities on Chinook and Coho salmon wild stock status, productivity and diversity in other areas, the assessment team is not aware of similar evaluations of Pink and Chum salmon. Undesirable effects of hatchery rearing through inadvertent selection or domestication have been hypothesized to be less for Pink and Chum salmon due to the shorter period of hatchery rearing than for Chinook and Coho salmon. However, direct evidence is not available for testing this hypothesis. Completion of the ongoing hatchery fitness study will likely be necessary to satisfy the SG80 scoring guidepost for this indicator. Additional information may also be required on hatchery practices to address a potential concern regarding the potential for divergence of hatchery stocks in the absence of continuing incorporation of natural origin broodstock (recognizing this is not feasible in a production scale program for Pink or Chum salmon). Carry over of condition 5 from 2013 assessment as originally specified under exceptional circumstances allowances.
Condition	By the end of the ninth year (2022) of certification, the SG 80 scoring requirements for PI 1.3.1 and PI 1.3.3, and the SI 80e requirements for PI 2.5.2, must be met in full. With respect to the current hatchery program at Kitoi Bay for Coho, Pink and Chum salmon, this will be achieved when it has been demonstrated that: a) (PI 1.3.1, SG80a) it is highly likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks. b) (PI 1.3.3, SG80a) sufficient relevant information is available on the contribution of enhanced Coho, pink and Chum salmon to the harvest and wild escapement of the stocks. c) (PI 1.3.3, SG80b) the assessment includes estimates of the impacts of enhancement activities on wild stock status, productivity and diversity.
Milestones	The 2018 assessment begins in year 5 of the following action plan. Up until now, progress against this plan for years 1-4 is contained within previous surveillance reports. The text in the gray box below indicates parts of the action plan that have already been completed with progress having been previously reported. To satisfy the intent of this condition, PSPA will monitor and review study plans by KRAA and ADF&G to develop a Chum and pink salmon mark and recovery plan, including sampling of selected streams for rates of straying.

	Year 1 (2014): Monitor and review plan for 100% marking of hatchery Pink and Chum salmon and for select sampling on spawning grounds and in fisheries. PSPA will provide a report. Year 2 (2015): For Chinook and Coho salmon, PSPA will conduct a risk assessment to evaluate whether or not releases might contribute to more than minimal proportions of hatchery fish on the spawning grounds. PSPA PSPA and KRAA produced a report during the 2nd Surveillance Audit (2015). Year 3 (2016): KRAA will share with PSPA an estimate of the total cost to outfit Kitoi Hatchery with thermal marking equipment including annual operation costs to mark pink and Coho salmon. KRAA and PSPA will investigate data and research alternatives to assess the impact of hatchery pink salmon on wild stocks (in the absence of marking) per the language in the performance indicator and present these to the assessment team. [completed in year 3 (2016)] Year 4 (2017): KRAA will sample the Kodiak fishery for Chum salmon and will initiate stream sampling for Chum within a 50 km radius of Kitoi Hatchery on the same timeline as stream sampling for pink. PSPA will provide a report. KRAA will provide an update on plans for marking pink and Coho salmon at Kitoi Hatchery and results of any new research findings regarding the impact of Kodiak hatchery pink salmon on wild populations based on available data in the absence of marking. Year 5 (2018): KRAA will continue to sample the Kodiak fishery for Chum salmon and will initiate stream sampling for Chum within a 50 km radius of Kitoi Hatchery on the same timeline as stream sampling for pink. If appropriate, PSPA will ensure during years 5-9 (2018-2022) implementation of plan revisions devised in Year 4, or otherwise demonstrate that: a) It is highly likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks. b) Sufficient relevant information is available on the contribution of enhanced Coho, pink and Chum salmon to the harvest and wild escapement of the stocks. c) The assessment includes estimates of the impacts of enhancement activities on wild stock status, productivity and diversity. d) There is a tested and evaluated artificial production strategy, if necessary, with sufficient monitoring in place and evidence is available to reasonably ensure with high likelihood that strategy is effective in achieving the SG 80 outcome. Should revisions as mentioned above need to be implemented, achievement of (a) – (d) above must be demonstrated by the end of year 9 (2022).
Client action plan	See above under "milestones" The 2013 Assessment reviewed sockeye and coho salmon produced at both Pillar Creek and Kitoi hatcheries, Chinook salmon produced at Pillar Creek hatchery and pink and chum salmon produced at Kitoi hatchery. The

	Assessment concluded that sockeye salmon met the 80 SG but the others did not. The Assessment acknowledged that hatchery production of all species was minor compared to the wild production. The Assessment stated that it may be possible to conduct a "risk analysis" to assess the effects of Chinook and coho salmon. The Client provide such an analysis during the year 2 Surveillance Audit that addressed those concerns. The Client has succeeded in marking 100% of chum salmon and is experimenting with saltwater marking pink salmon with two years of approximately 20% marked. The Client is currently seeking funding to sample both the harvest and streams for marked pink and chum salmon.
Consultation on condition	Actions by KRAA are needed for the fulfillment of this condition. As such, they have been involved in the drafting of the client action plan and have agreed to their responsibilities within it.

Table A1.3: Condition PWS1

Performance Indicator	**1.3.1 for PWS**
Score	60
Rationale	pHOS averaged <1% for 20% of Pink salmon populations and 30% of Chum salmon populations (Knudsen et al. 2015a, 2015b, 2016). This does not meet the adapted population-level guidance of <1% for 50% of population at the SG80 level. Therefore, the SG80 standard is not achieved in the absence of more specific information on effects of hatchery straying on wild fitness of ocean-rearing salmon and the condition remains open. Carry over from 2015 scope extension to add PWS unit, with milestones to align with those under Conditon 1 for SEAK according to exceptional circumstances allowances.
Condition	Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness of Pink Salmon.
Milestones	Each year the client will provide the assessment team with progress reports and/or conclusions of research relevant to demonstrating the impacts of pink and chum salmon enhancement activities on wild pink and chum Salmon populations. In accordance with the milestone timeline in condition 1 from SEAK the PSPA

	will provide a comprehensive, peer reviewed report, demonstrating with a high likelihood, that pink and chum salmon enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of pink and chum salmon wild stocks based on impact on wild fitness.
Client action plan	The 2018 assessment begins in year 5 of the following action plan. Up until now, progress against this plan for years 1-4 is contained within previous surveillance reports. Below, actions begin with year 5. Years 2019 through 2022: PSPA will consult with the ADF&G and/or the Science Panel annually and provide any documents/reports on the progress and/or conclusions of the work of pedigree fitness study for PWS. PSPA will also provide any analysis that the Science Panel provides relative to hatchery proportions in streams if new analysis occurs within this timeframe. Year 2023: PSPA will provide a detailed technical report including peer review of the final report demonstrating that it is highly likely that Pink and Chum Salmon enhancement activities in PWS do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Pink and Chum Salmon stocks.
Consultation on condition	All parties implicated in the achievement of this client action plan have been consulted and agree on their responsibilities. A letter from the interim director of commercial fisheries at ADFG to this effect is included as an appendix to this report.

Table A1.3: Condition PWS2

Performance Indicator	**1.3.2 for PWS**
Score	70
Rationale	Monitoring of hatchery contributions to the fishery and escapements provide an objective basis that the hatchery strategy is at least partially effective. However, this information indicates that outcome metrics identified for hatchery contributions to wild populations is not consistent with the SG80 standard identified in PI 1.3.1. Therefore, this SG is not met in the absence of additional information on the relative fitness of hatchery-origin fish spawning in natural production areas. Carry over from 2017 scope extension to add PWS unit, according to exceptional circumstances allowances.
Condition	Demonstrate an objective basis for confidence that the pink and chum salmon enhancement strategy is effective for protecting pink and chum salmon wild

	stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.
Milestones	Annually each year PSPA will provide the assessment team with progress reports and/or conclusions of research relevant to demonstrating the impacts of enhancement activities on wild Salmon populations. In accordance with the milestone timeline in condition 1 from SEAK , PSPA will provide a comprehensive, peer reviewed report demonstrating with a high likelihood that pink and chum salmon enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of pink and chum salmon wild stocks based on impacts on wild fitness.
Client action plan	Years 2018 through 2022: PSPA will consult with the ADF&G and/or the Science Panel annually and provide any documents/reports on the progress and/or conclusions of the work of hatchery contributions and/or impact on wild fitness for PWS. PSPA will also provide any analysis that the Science Panel provides relative to hatchery proportions in streams if there is information available in addition to what has already been provided. Year 2023: PSPA will provide a detailed technical report including peer review of the final report demonstrating that it is highly likely that Pink and Chum Salmon enhancement activities in PWS do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Pink and Chum Salmon stocks. ADF&G has monitored for negative effects of hatchery programs by sampling for hatchery strays in wild stock escapements and conducting a pedigree fitness study. As noted in the scoring table for PWS 1.3.2, ADF&G is co-sponsoring and managing the AHRP quantifying straying rates and evaluating impacts of hatchery strays in PWS and SEAK. If a reduction in fitness of wild stocks is seen, ADF&G (personnel communication J. Regnart, ADF&G (retired)) has identified the following directed actions with which it may respond: • Reduction in production from hatcheries most likely contributing to the problem; • Elimination or relocation of remote release sites where higher stray rates may increase introgression; • Changes to management of brood stock or hatcheries, which may include introduction of additional sources of wild brook stock; • Specific management actions which seek to further avoid harvest of wild stocks while increasing harvest of hatchery fish. Appropriate remedies will depend on the nature and magnitude of any

	potential detrimental hatchery effects.
Consultation on condition	All parties implicated in the achievement of this client action plan have been consulted and agree on their responsibilities. A letter from the interim director of commercial fisheries at ADFG to this effect is included as an appendix to this report.

Table A1.3: Condition PWS3

Performance Indicator	**1.3.3 for PWS**
Score	70
Rationale	While a variety of studies have examined the impacts of enhancement activities on Chinook and Coho salmon wild stock status, productivity and diversity in other areas, the assessment team is not aware of similar evaluations of Pink and Chum salmon. Undesirable effects of hatchery rearing through inadvertent selection or domestication have been hypothesized to be less for Pink and Chum salmon due to the shorter period of hatchery rearing than for Chinook and Coho salmon. However, direct evidence is not available for testing this hypothesis. Completion of the ongoing hatchery fitness study will likely be necessary to satisfy the SG80 scoring guidepost for this indicator. Additional information may also be required on hatchery practices to address a potential concern regarding the potential for divergence of hatchery stocks in the absence of continuing incorporation of natural origin broodstock (recognizing this is not feasible in a production scale program for Pink or Chum salmon). Carry over from 2015 scope extension to add PWS unit, with milestones to align with those under Conditon 2 for SEAK according to exceptional circumstances allowances.Carry over from 2017 scope extension to add PWS unit, with milestones to align with those under Condition 1 for SEAK according to exceptional circumstances allowances.
Condition	Provide information on the relative fitness o sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.
Milestones	The 2018 assessment begins in year 2 for the PWS unit (it came in via scope extension in 2017) of the following action plan. Each year the client will provide the assessment team with progress reports and/or conclusions of research relevant to demonstrating the impacts of enhancement activities on wild pink and chum Salmon populations. In the seventh year (2023), the client will provide a comprehensive, peer reviewed report sufficient to evaluate the effect of pink and chum salmon enhancement activities on pink and chum salmon wild stock status,

	productivity and diversity.
Client action plan	Years 2 (2019) through 6 (2022): PSPA will consult with ADF&G and/or the Science Panel annually and provide any documents/reports on the progresspedigree fitness study.. PSPA will also provide any analysis that the Science Panel provides relative to hatchery proportions in streams if there is any information additional to what has already been provided. Year 7 (2023): PSPA will provide a detailed technical report including peer review of the final report sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.
Consultation on condition	All parties implicated in the achievement of this client action plan have been consulted and agree on their responsibilities. A letter from the interim director of commercial fisheries at ADFG to this effect is included as an appendix to this report.

Table A1.3: Condition LCI1

Performance Indicator	**1.3.1 for LCI**
Score	60
Rationale	Recent assessments of spawning escapement have identified an incidence of hatchery strays in many natural production areas including fish originating from both LCI and PWS hatchery programs. Additional assessments are needed to determine the significance and implications of observed straying levels.
Condition	Demonstrate a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness of Pink Salmon.
Milestones	Each year the client will provide the assessment team with current information on the incidence of hatchery strays of Pink Salmon in natural spawning escapements of Lower Cook Inlet. In accordance with the milestone timeline in condition 1 from SEAK the PSPA will provide a comprehensive, peer reviewed report, demonstrating with a high likelihood, that pink and chum salmon enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of pink and chum salmon wild stocks based on impact on wild fitness.
Client action plan	Years 2019 through 2022: PSPA will consult with the ADF&G and/or the Science Panel annually and

	provide any documents/reports on the progress and/or conclusions of the work of pedigree fitness study for PWS. PSPA will also provide any analysis that the Science Panel provides relative to hatchery proportions in streams if new analysis occurs within this timeframe. Year 2023: PSPA will provide a detailed technical report including peer review of the final report demonstrating that it is highly likely that Pink almon enhancement activities in PWS do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Pink Salmon stocks.
Consultation on condition	All parties implicated in the achievement of this client action plan have been consulted and agree on their responsibilities. A letter from the interim director of commercial fisheries at ADFG to this effect is included as an appendix to this report.

Table A1.3: Condition LCI2

Performance Indicator	1.3.2 for LCI
Score	70
Rationale	Monitoring of hatchery contributions to the fishery and escapements provide an objective basis that the hatchery strategy is at least partially effective. However, this information indicates that outcome metrics identified for hatchery contributions to wild populations is not consistent with the SG80 standard identified in PI 1.3.1. Monitoring of hatchery contributions to the fishery and escapements indicate that significant numbers of hatchery fish are found in many natural spawning areas following recent expansion of largescale hatchery production of Pink Salmon in LCI as well as straying from PWS hatcheries. Therefore, this SG is not met in the absence of additional information on the relative fitness of hatchery-origin fish spawning in natural production areas.
Condition	Demonstrate an objective basis for confidence that the pink and chum salmon enhancement strategy is effective for protecting pink and chum salmon wild stocks from significant detrimental impacts based on evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.
Milestones	Annually each year PSPA will provide the assessment team with progress reports and/or conclusions of research relevant to demonstrating the impacts of enhancement activities on wild Salmon populations. In accordance with the milestone timeline in condition 1 from SEAK , PSPA will provide a comprehensive, peer reviewed report demonstrating with a high

	likelihood that pink salmon enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of pink salmon wild stocks based on impacts on wild fitness.
Client action plan	Years 2019 through 2022: PSPA will consult with the ADF&G and/or the Science Panel annually and provide any documents/reports on the progress and/or conclusions of the work of hatchery contributions and/or impact on wild fitness for PWS. PSPA will also provide any analysis that the Science Panel provides relative to hatchery proportions in streams if there is information available in addition to what has already been provided. Year 2023: PSPA will provide a detailed technical report including peer review of the final report demonstrating that it is highly likely that Pink and Chum Salmon enhancement activities in LCL do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild Pink and Chum Salmon stocks. ADF&G has monitored for negative effects of hatchery programs by sampling for hatchery strays in wild stock escapements and conducting a pedigree fitness study. As noted in the scoring table for PWS 1.3.2, ADF&G is co-sponsoring and managing the AHRP quantifying straying rates and evaluating impacts of hatchery strays in PWS and SEAK. If a reduction in fitness of wild stocks is seen, ADF&G (personnel communication J. Regnart, ADF&G (retired)) has identified the following directed actions with which it may respond: • Reduction in production from hatcheries most likely contributing to the problem; • Elimination or relocation of remote release sites where higher stray rates may increase introgression; • Changes to management of brood stock or hatcheries, which may include introduction of additional sources of wild brook stock; • Specific management actions which seek to further avoid harvest of wild stocks while increasing harvest of hatchery fish. Appropriate remedies will depend on the nature and magnitude of any potential detrimental hatchery effects.
Consultation on condition	All parties implicated in the achievement of this client action plan have been consulted and agree on their responsibilities. A letter from the interim director of commercial fisheries at ADFG to this effect is included as an appendix to this report.

Table A1.3: Condition LCI3

Performance Indicator	1.3.3 for LCI
Score	70
Rationale	While a variety of studies have examined the impacts of enhancement activities on Chinook and Coho salmon wild stock status, productivity and diversity in other areas, the assessment team is not aware of similar evaluations of Pink and Chum salmon. Undesirable effects of hatchery rearing through inadvertent selection or domestication have been hypothesized to be less for Pink and Chum salmon due to the shorter period of hatchery rearing than for Chinook and Coho salmon. However, direct evidence is not available for testing this hypothesis. Completion of the ongoing hatchery fitness study will likely be necessary to satisfy the SG80 scoring guidepost for this indicator. Additional information may also be required on hatchery practices to address a potential concern regarding the potential for divergence of hatchery stocks in the absence of continuing incorporation of natural origin broodstock (recognizing this is not feasible in a production scale program for Pink or Chum salmon).
Condition	Provide information on the relative fitness sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.
Milestones	Each year the client will provide the assessment team with progress reports and/or conclusions of research relevant to demonstrating the impacts of enhancement activities on wild pink and chum Salmon populations. In 2023, the client will provide a comprehensive, peer reviewed report sufficient to evaluate the effect of pink and chum salmon enhancement activities on pink and chum salmon wild stock status, productivity and diversity.
Client action plan	2019 through 2022: PSPA will consult with ADF&G and/or the Science Panel annually and provide any documents/reports on the progress of the pedigree fitness study. PSPA will also provide any analysis that the Science Panel provides relative to hatchery proportions in streams if there is any information additional to what has already been provided. 2023: PSPA will provide a detailed technical report including peer review of the final report sufficient to evaluate the effect of enhancement activities on wild stock status, productivity and diversity.
Consultation on condition	All parties implicated in the achievement of this client action plan have been consulted and agree on their responsibilities. A letter from the interim director of commercial fisheries at ADFG to this effect is included as an appendix to this

	report.

Department of Fish and Game

DIVISIONS OF COMMERCIAL FISHERIES

1255 W. 8th St.
Juneau, Alaska 99811-5526

MEMORANDUM

TO:	Ms. Amanda Stern-Pirlot Director – Fisheries Certification MRAG Americas – Seattle 1631 15th Ave W, Suite 215 Seattle, WA 98119	DATE:	November 2, 2018
FROM:	Forrest R. Bowers, Acting Director Division of Commercial Fisheries	SUBJECT:	PSPA Action Plan to Address Conditions for MSC Certification

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Dear Ms. Stern-Pirlot,

The Alaska Department of Fish and Game (ADF&G) received a request from the Pacific Seafood Processors Association (PSPA) for a letter recognizing its action plan to address certain conditions set forth in the Marine Stewardship Council assessment report for certification of Alaska commercial salmon fisheries. We understand that what is required are final reports from the ongoing ADF&G Alaska Hatchery Research Program (AHRP). The reports will describe the results of the proportion of hatchery pink and chum salmon found in streams with wild populations of the same in Prince William Sound and similarly for chum salmon in Southeast Alaska as well as the results of the pedigree fitness study for the same assemblages.

We understand that the certification is valid through November 11, 2023 and that all conditions must be closed at that time. The AHRP study requires obtaining two full life cycles of data from each species. Data collection for pink salmon was completed this year and we expect to be able to provide a report with enough time left for a peer review, as required by PSPA, to meet the timeline. However, we cannot do that for chum salmon. Data collection for chum salmon will be completed in the summer of 2023. Analysis and report writing will take additional time. We expect to be able to produce a final report by late 2024 or early 2025.

Prior to completion of this final report there several other AHRP-related manuscripts in various stages of preparation, that will publish prior to the end of 2024. Attached is a draft manuscript for the first of these reports to be published in early 2019, titled: *Spatial and Temporal Distribution in the Returns of Hatchery- and Natural-origin Pink Salmon and Chum Salmon to Prince William Sound, Alaska during 2013-2015*.

Following later in 2019 we expect publication of a companion paper on chum salmon: E.E. Knudsen, K.B. Gorman, P.S. Rand, B. Adams, V. O'Connell, and D. Bernard. *Spatial and* *temporal patterns in the returns of hatchery- and natural-origin Chum Salmon to spawning streams of Southeast Alaska during 2013-2015*. In prep for Marine and Coastal Fisheries.

This paper is expected for review by the AHRP Science Panel in December 2018.

The next product we anticipate publishing as a result of the Alaska Hatchery Research Program is the work funded by the North Pacific Research Board (NPRB) on relative reproduction of pink salmon in Hogan Creek for two brood years. We obtained a 6-month no-cost extension for this project which now ends on December 31, 2018. This extension was needed because implementing new genotyping-by-sequencing methods in the lab to reduce genotyping costs took longer than anticipated. We now have all the genotypes collected and have started on the statistical analyses. NPRB requires a final report within 60 days of the end of the project. We plan to produce this final report on time by March 1, 2019.

This report will contain a subset of all the tissue samples we plan to analyze for the final Hogan Creek analyses and we plan to delay publishing in a peer-reviewed journal until we have completed all the sample analyses for one brood year. NPRB provided funding to process 8,000 samples and we wrote the proposal before we knew size of 2015 and 2016 runs and how many samples the contractor would be able to obtain from these returns. The AHRP has authorized the analyses of the additional samples collected in 2015 and those should be through the lab in early 2019. We estimate that we can get these additional samples analyzed and a peer-reviewed manuscript submitted by September 30, 2019. Tentative title for this report is:

Relative reproductive success between hatchery strays and wild pink salmon in a natural stream in Prince William Sound.

This publication will provide the first estimates of relative reproductive success between hatchery- and wild-origin of pink salmon in a natural stream (Hogan Creek) in Alaska. This ambitious project required the collection, determination of origin (hatchery/natural; hatcheries otolith mark fish), and genotyping of one brood year followed the collection, genotyping, parentage assignment, and estimating of relative reproductive fitness of their returning progeny. A total of 5,000 fish have been genotyped for this analysis (2013/2015).

Please don't hesitate to contact me if you require further information.

Sincerely,

Forrest R. Bowers
Acting Director
Alaska Department of Fish and Game
Division of Commercial Fisheries

APPENDIX 3 PEER REVIEW REPORTS

Peer Reviewer 1 Summary

General comments

Question	Yes/No	**Peer Reviewer Justification (as given at initial Peer Review stage).** Peer Reviewers should provide brief explanations for their 'Yes' or 'No' answers in this table, summarising the detailed comments made in the PI and RBF tables.	**CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)**
Is the scoring of the fishery consistent with the MSC standard, and clearly based on the evidence presented in the assessment report?	Yes	The overall review is reasonably in agreement with MSC standards. I believe that there are (probably) three reasonably separate fisheries that should be evaluated as such. The first is net fisheries that target wild stocks. The management framework, data collection, and such demonstrate a successful sustainable fishery. The net fisheries that target enhanced stocks represent sustainably managed fisheries but there are significant questions about the open ocean ecological impact that crosses the equator suggest the need for more research and precaution. The troll fishery, which targets feeding immature fish, often of non-local origin, is an entirely different situation since issues of release mortality, significant changes in age, size, and fecundity, and impacts to other jurisdictions suggest this fishery should be evaluated separately. It is relatively small in comparison to the net fisheries. As such, when combined with "whole fleet" the impacts become mathematically minor. Lastly, these fisheries, but particularly the troll, have an impact on many ESA listed stocks and species. As an example, the fish eating (and Chinook-preferring) Southern Resident Killer Whales of the Salish Sea are starving. Insufficient adult salmon are making it back to them. While doing this review, two more were identified as close to death.	The assessment team appreciates the reviewer's thoughts on how the Units of Assessment for this fishery might be differently organized around the likely types of impacts of the fisheries instead of regionally by management units, as they are now. At this stage of the assessment, it is impractial to consider complete revision to the Unit of Assessment structure as it is currently laid out (in fact, the MSC standards require that these units are established at the very start of the assessmnet and can only be changed later on if they had been deemed 'provisional' at the start with a rationale to support this). In this case, the re-assessment was structured the same way the previous two MSC assessments for this fishery were structured, and is logical for a number of reasons. However, there will be an opportunity at the next re-assessment to consider the pros and cons of organizing units in a different way. Specific responses to concerns raised regarding impacts to killer whales and other potential indirect impacts are given under the respective PIs.

Are the condition(s) raised appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCP v2.1, 7.18.1 and sub-clauses]	Yes	The Conditions seem well thought out and will provide information that, when acted on, will lead to improved scores.	Thank you.
Is the client action plan clear and sufficient to close the conditions raised? [Reference FCR v2.0, 7.11.2-7.11.3 and sub-clauses]	No	The Action Plan, while well laid out and proceeding, is too limited. Studies of the impact of enhancement fish on the high seas ecosystem (both hemispheres) need to developed and applied. The increasing numbers of pink salmon in the North Pacific have been correlated with significant declines in Southern Hemisphere seabirds, some of which are subject to culturally and socially significant harvests.	The assessment team will monitor progress against the action plan and other changes in the fishery through annual surveillance.
Enhanced fisheries only: Does the report clearly evaluate any additional impacts that might arise from enhancement activities?	No	The issue of the impact of the enhanced pink and chum to the ocean ecosystem is not given sufficient attention. The ongoing studies are a good start but there needs to be some immediate response. The pink abundance has been correlated to declines in Chinook numbers, Chinook and coho size at age, declines in important southern hemisphere petrals (subject to culturally important harvests).	Ecosystem impacts of hatchery enhancement are covered under 2.5 including additional material in response to specific review comments. In addition to our updated material, we have reviewed recent correlative studies on possible impacts of Pink Salmon enhancementand the relative magnitude of effect of the various factors remains unclear. Significant research programs currently being conducted by various parties including NOAA and the University of Alaska and coordinated through the North Pacific Anadromous Fish Commission may help clarify these issues.

Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary)	N/A	The troll fishery should be analyzed separately from the net fisheries. Possibly, Yakutat and SE troll fisheries coupled be analyzed separately as they likely access different combinations of stocks. The impact of the enhanced stocks, particularly pink and chum, needs to be expanded to the high seas ecosystem and impacts in both Northern and Southern hemispheres. Spawner escapement goals should be re-evaluated to include ecosystem needs as an explicit component in addition to human catch and escapement. Ultimately, non-human predators may need to be accorded an allocation of the population. A last comment is that ADFG seems committed to doing quality management within legal, financial, and political constraints.	See response to the first comment above related to the organization of the Units of Assessment. Specific responses to issues raised regarding SEAK chinook catches and the possibility to impact non-human predator populations is given under the specfiic PIs (e.g. response to comment on 2.5.1).

Specific PI comments

PI	PI Inform ation	PI Scoring	PI Condi tion	Peer Reviewer Justification (as given at initial Peer Review stage)	CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)	CAB Res-ponse Code
1.1.1	Yes	Yes		The fisheries on pink and chum (particularly) are enhanced and are able to achieve escapement targets due to presence of hatchery fish. In the absence of the enhancement fish, total catch or realized escapement would be significantly reduced. Many coho and Chinook stocks are showing at least short term declines. More of this question discussed under ecosystem effects of enhanced fish.	No response required. Escapement monitoring in UoCs with significant enhancement programs indicates that escapement targets are largely being met with natural origin fish.	Accepted (no score change)

1.1.2	No (scoring implications unknown)	No (scoring implications unknown)		Species/stocks managed on a purely wild basis are doing as well as can be expected given natural variability, climate change, and management imprecision. The enhanced stocks create significant questions in that the harvest and overall escapement levels are sustained not by the natural production but by enhancement. Specific studies need to be done to quantity the level of pHOS not only in the overall SMU but within each of the streams that provide (cumulatively) at least half of the escapement and to determine the actual impact that the enhanced pink and chum have on wild spawners.	Ambitious studies of hatchery contributions to natural spawning have been conducted in Prince William Sound and Southeast Alaska where large-scale hatchery production programs exist. These studies produced estimates of hatchery contributions in the aggregate annual run and also into a representative sample of natural spawning streams. These studies found that significant straying of both Pink and Chum salmon occurs in some streams, particularly those closely associated with hatchery programs and also along routes of migration. However, straying was much more limited or negligible in may or most natural spawning areas within these UoCs. For instance, the incidence of hatchery-origin fish in Prince William Sound spawning streams is reported in Section 3.3.3 Table 14 for Pink Salmon and Table 17 for Chum Salmon. This information clearly indicates that hatcheries produce large numbers of fish for harvest but that escapement levels are largely sustained by natural production.	Not accepted (no score change)
1.2.1	Yes	Yes		Management is fairly robust given variability inherent in the system(s). The exception is the troll fishery, managed by a quota based on pre-season estimates and agreements rather than in-season evaluation. Places risk onto the resource rather than the fishers.	Risk is inherent in the normal variability of production in salmon systems, in stock assessments relative to biological reference points, and in fishery responses to regulation. Management of the troll fishery based on preseason forecasts can result in higher and lower harvest rates than might ideally result if management were based on more accurate inseason estimates of abundance. However, effects fall within the normal range of natural variability and likely to have little impact on future yields given the modest exploitation rates in this fishery. Many of the stocks harvested in this fishery are also subject to harvest in fisheries closer to rivers of origin. The more-terminal fisheries afford additional opportunity to regular total harvest consistent with escapement or harvest rate goals.	Accepted (no score change)

1.2.2	No (scoring implications unknown)	No (scoring implications unknown)		AK in-season management does very well, given the vastness of area, vagaries of the environment, and funds availability in managing stocks of Alaskan origin. Continue to be concerned about the troll fishery based on forecasts. A possible condition is that the non-local stocks of salmon (BC, WA, OR) and the SRKW (which are "listed under ESA or SARA) show annual positive changes in population numbers and population demographic characteristics. There is always the fear (well justified) that if AK (and BC) reduced marine mixed-stock catches that the survivors would just be caught in WA and OR fisheries with no benefit to salmon rebuilding or SRKW stomachs. Attaching a clear performance condition would alleviate this fear.	The Southeast Alaska troll fishery is regulated according to exploitation rate targets identified in the Pacific Salmon Treaty between US and Canada. These targets are based on annual abundance forecasts of the aggregate Chinook stock in US and Canadian waters including Alaska. Exploitation rate targets are based on abundance, decreasing at low abundance and increasing at high abundance of the aggregate Chinook stocks in the fishery area. SEAK Alaska fisheries harvest significant numbers of some Chinook stocks listed in the U.S. under the Federal Endangered Species Act and in Canada by the Species at Risk Act as well as nonlisted southern US Chinook stocks. In the U.S., NOAA Fisheries has reviewed and approved the current Treaty Agreement for compliance with the Endangered Species Act. This consultation is based on a finding of no jeopardy to ESA species as a result of subject exploitation rates in PST fisheries. Therefore, this fishery meat the SG80 guideposts for PI 1.2.2. Well defined HCRs are in place that ensure LRPs for nonlocal Chinook stocks based on exploitation rate limits are achieved. The HCRs are robust to the main uncertainties, associated with annual forecast errors. Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs. It is highly likely that harvest control rules and tools are consistent with maintaining the diversity and productivity of the wild component populations as affirmed by the NOAA biological opinion. It is also noted that mixed stock BC, WA and OR fisheries are also subject to similar exploitation rate limits which typically constrain harvest in these fisheries and ensure that significant numbers of fish are delivered to spawning escapements.The assessment and scoring is based on the fishery as it is currently implemented with limits to protect southern US and Canadian stocks and does not	Not accepted (no score change)

					contemplate any potential benefits or lack thereof of further restrictions to promote rebuilding.	
1.2.3	Yes	Yes		The managers are doing well. The review recognizes that the managers don't have all the tools they might like but the long-standing success with (especially) pink, chum , and sockeye suggest they have the tools. Chinook appear to be suffering but actions are in place to determine the cause.	No response required	Accepted (no score change)

1.2.4	Yes	Yes		Managers appear to have a robust program in place. There does need to be increased external peer review, with external including peers not involved in Pacific Salmon Management so that the review will more closely look at the methods and weakness rather have a pre-conceived understanding of the challenges. "Why do you do it this way" has to be asked by someone who doesn't already know the answer.	No response required	Accepted (no score change)
1.3.1	Yes	No (scoring implications unknown)	Yes	The analyses required previously have been more or less met. They do note to species of salmon not rearing in freshwater (primarily the pink and chum) may accumulate poor adaptations at a rate significantly different from salmon whose juveniles have extended freshwater rearing in culture. Proper evaluation of risk should require that the actual differential of pHOS be measured in comparison to wild spawners in the same stream at the same time.	The Alaska Hatchery Research Project is also examining the relative fitness of hatchery-origin and wild-origin spawners based on pedigree analysis of returning fish through several generations. Additional explanation was added to the assessment to this effect. This evaluation of fitness specifically addresses condition 1 for southeast Alaska and PWS - 1 for Prince William Sound which call for demonstrating a high likelihood that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks based on low hatchery contributions and/or impact on wild fitness.	Accepted (no score change)
1.3.2	Yes	No (scoring implications unknown)	Yes	Conditions already in place should be extended until compliance is achieved. Additional conditions applied that cover impacts of enhancement fish to the open ocean ecosystem. There should be some focused study on the impact of Pink and Chum enhancement on wild spawning populations. These species are subject to little in-facility selection (as opposed to species reared for more than a few days, especially yearlings) so they may be able to have a higher pHOS than, say, steelhead or coho.	Focused studies are underway as part on the Alaska Hatchery Research Project on the relative fitness of hatchery and wild Pink Salmon and Chum Salmon spawners (see previous comment). Objective criteria are identified in CR2.0 for evaluating hatchery impacts based on the percentage of hatchery spawners in natural production areas (CR 2.0 Box GSC1 pg. 496). This guidance recongizes differences in potential risk between species like Pink and Chum Salmon which can be expected to experience much less in-facility selection than Chinook, Coho, Sockeye and Steelhead which are typically reared in the hatchery for one year. A detailed explanation of hatchery impact guidelines applied in this	Accepted (no score change)

					assessment was added to Section 4.3.3.	
1.3.3	Yes	No (scoring implications unknown)	Yes	As above, studies need to examine high seas impacts of enhanced fish on the ecosystem, including Alaskan stocks. It appears that the managers are doing their best to answer these complex questions. Facts, like trees, take time and they appear to be dealing with the questions as they arise.	Conditions are identified for Kodiak and Prince William Sound for assessment of the contribution of enhanced fish to wild escapement and the effects of enhancement activities on wild stock status, productivity and diversity. The most direct and significant impacts of enhancement are likely to be manifest on fish of the same species as those enhanced. The marine ecosystem is complex and and difficult to study due to its large scale, inherent variability and continuing change in environmental conditions that have occurred concurrent with development of large scale Alaskan salmon hatchery programs. Significant research programs are currently being conducted by various parties including NOAA and the University of Alaska. If it difficult to conceive of a reasonable research condition that could be expected to resolve questions of the high seas impacts of enhanced fish on the ecosystem.	Accepted (no score change)

2.1.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)		There are a couple of areas of concern. The troll fishery takes, in total, a miniscule amount of the total catch even when they note that more than 90% is non-local. The troll fishery should be evaluated separately. Also, the analysis relies on data agreed-to by the PSC. The PSC has not agreed to the escapement goals utilized by the Co-Managers in WA. So, the analysis can ignore the continued decline of these listed fish. Data are being cherry-picked.	This reassessment was consistent with prior assessments and reassessments in the definition of Units of Assessment/Certification including Southeast Alaska. In all cases, UoAs were defined based on regions with all gears in a region combined. The troll fishery was not considered as a separate UofA because most of the troll catch of Pink, Chum, Sockeye and Coho salmon comes from stocks within the Southeast UofA and these stocks are shared with the purse seine and gill net fleets as well as the recreational and personal use fishers of the region. We do acknowledge that about 90% of the troll fishery catch of Chinook Salmon are from non-local stocks, however, the Chinook catch is less than 10 % of the troll landing by weight (e.g. 6% in 2017). While it is true that the troll fleet landings are the smallest of the three gear types with their annual landing accounting for about 10 percent of the total weight, their landed catch is still substantial. For example, in 2017 the landed troll catch was about 25 million pounds. For comparison, in that same year the drift gill net catch was about 42 million pounds. Clearly the landing of both the troll and gill net fleets are much smaller than of the seine fleet that landed almost 200 million pounds in 2017. Regarding assessment of impacts to non-local Chinook stocks from SEAK fisheries, please see the team's response to your comment on PI 1.2.2.	Not accepted (no score change)
2.1.2	No (scoring implications unknown)	No (scoring implications unknown)		As in 2.1.1 the selection and aggregation of fisheries and associated data, plus ignoring of local manager data hides the impact of Chinook harvests on stocks south of Alaska.	See comment above	

2.1.3	No (scoring implications unknown)	No (scoring implications unknown)		As in 2.1.1 the selection and aggregation of fisheries and associated data, plus ignoring of local manager data hides the impact of Chinook harvests on stocks south of Alaska.	See comment above	
2.2.1	Yes	Yes		Fishery impacts on local (Alaskan) stocks seem to be well considered and managed for.	No response required	Accepted (no score change)
2.2.2	Yes	Yes		Management seems to have shown responsiveness to identifiable impacts to these stocks. Managers appear willing to, and in the past have, acted on concerns.	No response required	Accepted (no score change)
2.2.3	Yes	Yes		The management scheme in place is reasonably responsive to other (local) resource needs. They do recognize that a higher level of certainty could be achieved, at the expense of more time and funds, but does not appear justified by actual stock status.	No response required	Accepted (no score change)

2.3.1	No (scoring implications unknown)	No (scoring implications unknown)		The fishery, especially the troll, intercepts listed Chinook from the lower 48. Many of these stocks are showing no (positive) response to 20+ years of "recovery" efforts. But, since the escapement goals for these stocks are not agreed-to by PSC, they can be ignored in the analysis. Further, the Southern Resident Killer Whales (also listed) are not only not recovering but are continuing to die from starvation. They eat fish, primarily salmon. Further, the ecological impact of the enhancement pink salmon on the N Pacific Ecosystem, and southern hemisphere seabirds that feed there, is unknown but there is a good correlation between increased pink numbers and declines in salmon size, age, survival, and seabird survival. For these resources (listed salmon, Killer Whales, seabirds) the metric should be detectable change in population trajectory into a positive direction.	Salmon are a significant component of the North Pacific ecosystem and by extension, activities that impact salmon abundance, including harvest and hatchery enhancement, can be expected to affect the ecosystem. However, the ecosystem is complex and dynamic, and varies in response to a wide variety of environmental and biological factors independent of salmon effects. The relative magnitude of effect of the various factors remains unclear. Assesments are forced to rely of correlative studies and inferences from mechanistic linkages. Given related uncertainties, it would be inappropriate to link performance metrics of the Alaska fishery with detectable changes in population trajectories of listed salmon, Killer Whales or seabirds for which salmon harvests may or may not be a significant driver in population dynamics. Risk management-based standards are more apporpriate. For instance, Alaskan harvest of ESA-listed stocks is managed based on exploitation rate limits rather than escapement goals because Alaskan harvest comprises only a limited proportion of the net human impacts on these listed stocks. For example the most recent 2017 PSC report (https://www.psc.org/publications/technical-reports/technical-committee-reports/chinook/) found that while escapements have varied around goals and some stocks are not meeting goals), exploitation rate goals for the Alaska fishery are generally met. In regard to Killer whales after reviewing several publications (see added text) we concluded that there is substantial uncertainty regarding the level of impact between the conduct of the Southeast Alaska troll fishery (as managed under the Pacific Salmon Treaty) and the status of that harvests Chinook from a wide variety of stocks (see PSC CTC 2018). Many of the stocks which NOAA and WDFW have characterized as important are not	Accepted (no score change)

					harvested in Southeast Alaska (e.g. Puget Sound Fall, Lower Georgia Strait Fall, Lower Columbia River Fall). Critically important stocks that spawn in Puget Sound because these Chinook stocks are harvested primarily in Puget Sound, Georgia Strait and on the outer cost of Vancouver Island with only minor harvest in Northern British Columbia and Southeast. Southern resident Killer Whale limitations related to salmon abundance have only recently begun to be understood and the assessment team will continue to evaluate the significance of this concern with respect to Alaska salmon fisheries during subsequent fishery surveillances as new information continues to become available. In particular, we will partucularly be looking for guidance from NOAA in the form of biological assessments, biological opinions, and recovery plans for the listed SRKWs.	
2.3.2	No (scoring implications unknown)	No (scoring implications unknown)		The evaluation looks exclusively at a narrow view of "take". The fisheries are catching fish that are listed, are not recovering, and are even moving more in the direction of extinction than recovery. The two culprits are the troll harvest of Chinook and the impact of the rearing pink and (probably) chum on the high seas.	See comment above	Accepted (no score change)

2.3.3	No (scoring implications unknown)	No (scoring implications unknown)		Fishery impacts are well monitored for direct impacts within Alaska. The US Supreme Court's Palila Decision held that allowing continued destruction of the food base (sheep ate young plants that would eventually provide the Palila's primary food source) was a "take". As such, removal of Killer Whale food, especially in a starving population, should be considered a take, even though it is remote. Further, the growing data from the high seems seems to show that pinks are outcompeting other species, causing them to be smaller and less fecund, in addition to having reduced numbers. This is also a take.	See comments above in regard to Kliler Whales and Chinook. We have no comemnt on the legal issue of what consitutes "take" under the ESA.	Not accepted (no score change)
2.4.1	Yes	Yes		Scoring agreed	No response required	Accepted (no score change)
2.4.2	Yes	Yes		Scoring agreed	No response required	Accepted (no score change)
2.4.3	Yes	Yes		Scoring agreed	No response required	Accepted (no score change)

2.5.1	No (scoring implications unknown)	No (scoring implications unknown)		The analysis seems to be conducted within a narrow set of boundaries. This is compounded by climate change. For example, the reduced size at age in salmon reduces fecundity. If escapement goals are based on fish numbers (as they generally are) smaller fish produce fewer eggs and bury the eggs shallower (easier to scour out). To maintain salmon production, goals would need to be raised. Increasing pinniped populations are eating more fish (and the MMA prevents control of them), increasing great whales (like the Humpback) eat more herring. If harvests aren't reduced, then the result is fewer spawners. The actual data (starving Killer Whales, non-recovery of Chinook, declining seabirds) all point to serious issues in the ecosystem that will require response.	In regard to fecundity, we tend to agree that for Chinook Salmon at least (which the reviewers have emphasized and tend to spawn in large rivers), a loss of larger more fecund females is an important issue for understanding population dynamics. We note that in Alaska, escapement goals are evolving to include "large fish" in recognition of this problem. To date, all 11 of the Chinook escapement goals in Southeast Region and the Kenai River goal in Upper Cook Inlet express the goal in numbers of large fish. In addition, periodic review of escapement goals (Alaska does so every three years as new data becomes available) to detect and respond to changes in productivity caused by any factor including regime shifts and climate change) is clearly desirable. In regard to reducing harvests to compensate for increased marine mammals, we note that by regulation, Alaska escapement goals must consider ecological impacts as described in the text and we there is evidence that they do. The relationship between an MSY escapement and subsequent returns (or other proxy as described in the text) is based on the observed spawning escapement and as such includes natural mortality that occurs in the marine environment and estuaries, thereby accounting for such ecological process as predation by marine mammals. In addition, when estimates are made on or near the spawning grounds, the impact of freshwater predation is also implicitly included in the analysis even if the estimate of escapement is biased high. These factors demonstrate that the establishment of escapement goals and analysis was not conducted within a narrow set boundaries. Specific issues regarding killer whales and sea birds were addressed above.	Not accepted (no score change)

2.5.2	No (scoring implications unknown)	No (scoring implications unknown)		While the narrative here describes the overall ecosystem and need for salmon carcasses the management section (above) has three definitions for escapement goals and they all describe the goal in terms of optimal/maximum harvest. Salmon are either to be killed by humans or allowed to spawn. Managers are making some moves to recognize ecosystem needs but dead fish in the boat comes in first, second, and third.	We note that by regulation, Alaska escapement goals must consider ecological impacts as described in the text. We also note that in Alaska, the relationship between escapement and subsequent returns (or other proxy as described in the text) is based on observed spawning escapement and as such includes natural mortality that occurs in the marine environment and estuaries, thereby accounting for such ecological process as predation by marine mammals. In addition, in all cases when estimates are made on or near the spawning grounds, the impact of freshwater predation is implicitly included in the analysis even if the estimate of escapement is biased high.	
2.5.3	No (scoring implications unknown)	No (scoring implications unknown)		These fisheries are being evaluated in a vacuum. Assuming an MSY model is correct, the assumption is made that the troll harvest is within yields and, as such, is appropriate. Complete closure would, in a local sense, mean all that catch was lost, resulting in a catastrophic overescapement. But, given the nature of the fish, after passing by the Killer Whales ll fish remining would still be available to catch. But, by different fishermen. These fisheries exist in an ecosystem larger than just local. Those far-ranging impacts need better quantification and public debate in the areas where the resources are impacted. The New Zealand and Australian Mutton-bird harvesters should have input into North Pacific salmon management.	The historical record of implementing the Pacific Salmon Treaty and Magnuen -Stevens act in the North Pacific Fishery Management Council clearly demonstates that the Southeast troll fishery is not evaluated in a vacuum. Nothiung could be further from the truth. Management of the fishery is subject to exhaustive scrutiny by Canada, the states of Oregon and Washington, the treaty Indian tribes of the Columbia River and Washington and the federal government. It is true that closure of the Southeast troll fishery for Chinook (implied) would pass fish south towards their spawning grounds. In addition to the fact that some of these fish would likely pass thru to escapement, they would also be subject to the commercial and recreational fisheries of Canada , Washington and Oregon. Which leads to the very essence of the Pacific Salmon Treaty, which is to manage the Chinook fisheries all along the West Coast in response to annual abundance in a way that shares both the harvest and conservation burden. In regard to New Zealand and Australian mutton-bird harvesters having input to these fisheries we point out that diplomatic channels are available to make their views known to US authorities. We	Not accepted (no score change)

					also note that there is a a joint protection project between Japan and Australia uner the the Japan Australia Migratory Bird Treaty.	
3.1.1	No (scoring implications unknown)	No (scoring implications unknown)		There is a conundrum here. The laws under which Alaska defaults to are very clear on maintaining the sustainability of, and access to, natural resources. Alaska has a reasonably good track record of doing just that. But, the laws do not recognize that a user outside of Alaska has any rights to resources produced in Alaska or impacted by Alaskan-produced resources.	While state law clearly does not explicitly provide property rights to other states or nations , we do note two things. First if the reviewers concern is with the Southeast fisheries (as seems to the primary issue), state law clearly recognizes that supremacy of the Pacific Salmon Treaty to set management requirements (that include such parameters as harvest sharing limits in times and areas.) The Treaty process clearly recognizes users outside of Alaska who not only have a seat at the table but also the ability to veto (not agree) to proposed fishing regimes as the process requires the consent of all Parties. Second we also note that Alaska Board of Fisheries meetings are open to the public, and people are free to attend and submit testimony. Last we also note that where endangered species interactions occur, NOAA must evaluate impacts and can establish terms and conditions on the fishery that recognize species that are directly or indirectly affected and thsi provides a link between the fishery and non	Accepted (no score change)

					Alaskan resources.	
3.1.2	Yes	Yes		The problem here is that the Federal Government does not adequately represent the needs of interstate and international resources. Further, those with interests other than fish harvest are not really participating in the process; it is not the manager's fault.	No response required	Accepted (no score change)
3.1.3	No (scoring implications unknown)	No (score increase expected)		As mentioned earlier, there is reason to believe that pink, chum, and sockeye enhancement based on unfed and lightly fed fry are inherently different from culture of other salmonids. The risk of these fish spawning in the wild are lower. A condition should be applied for a (reasonably) long-term and focused study on the success of the enhancement fish spawning in the wild with the ultimate possibility that different criteria for straying could be developed for these species. The previously applied conditions looked at the volume of enhanced fish on the spawning grounds as a measure of "impact". Given that the life history of pink and chum is so different from most species whose poor performance as pHOS has been documented, additional study (condition) may show that there is lower impact/risk, thereby raising the score for the enhanced situations while still protecting the	See responses for PI 1.3.1 and 1.3.2 above. A long-term study is currently underway evaluating the relative fitness of hatchery and natural origin Pink and Chum Salmon, and evaluation guidance for risk associated with hatchery contributions currently allows for the potential differences in risk and impact of fish like Pink and Chum Salmon which spend a relative small portion of their life cycle in the hatchery. Additional explanation of hatchery evaluation criteria was added to section 4.3.3 of the assessment (from CR 2.0 Box GSC1 pg. 496)+L15.	Accepted (no score change)

				wild fish.		
3.2.1	Yes	Yes		Scoring agreed	No response required	Accepted (no score change)
3.2.2	Yes	Yes		Scoring agreed	No response required	Accepted (no score change)
3.2.3	Yes	Yes		Scoring agreed	No response required	Accepted (no score change)
3.2.4	Yes	Yes		Scoring agreed	No response required	Accepted (no score change)

Peer Review 2 Summary

General comments

Question	Yes/No	Peer Reviewer Justification (as given at initial Peer Review stage). Peer Reviewers should provide brief explanations for their 'Yes' or 'No' answers in this table, summarising the detailed comments made in the PI and RBF tables.	CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)
Is the scoring of the fishery consistent with the MSC standard, and clearly based on the evidence presented in the assessment report?	Yes	In general, scoring appeared to be consistent with the standard, and a good level of detail was provided in the scoring justifications. One of my main questions was why the the lower end of escapement goal ranges was used as a TRP proxy, rather than the midpoint, for evaluation of PI 1.1.1. If not adequately explained, it might be viewed as way to increase scores. There were several other areas where additional information would be useful, or scoring might need to be adjusted, but these were specific and relatively minor. Management and monitoring of these Alaska salmon fisheries is intensive and clearly based on science, and the overall conclusions appear apt.	As explained under 1.1.1, escapement of salmon are managed for escapement goal ranges based either on sustainable escapement goal ranges that have been shown to provide for sustained yield over an extended period or biological escapement goal ranges shown to provide the greatest potential for sustainable yield based on historical production data. As per guidance in GSC2.2.3, directed fishing in Alaska fisheries is lowered as the lower bound is approached, such that escapements are distributed around the midpoint of the range due to normal variation in returns. The point is that management for the goal range results in reductions in directed fishing as the lower goal is approached and this management structure effectively distributes escapement around the midpoint of the range. This is consistent with the guidance in GSC2.2.3 which states: "If the target reference point is expressed as a range, with an upper and a lower bound, the SMU should have met or exceeded the mid-point of the escapement goal range <u>and/or the assessment team should look for evidence that directed fishing is lowered as the lower bound is approached</u>."

Are the condition(s) raised appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCP v2.1, 7.18.1 and sub-clauses]	Yes	Not surprisingly, the outstanding issues and associated conditions relate largely to hatchery impacts on wild salmon populations in the UoAs with significant enhancement activities. The conditions are mostly carryovers from those that remained open as of the most recent surveillance audit and are consistent with achieving SG80 outcomes.	No response required
Is the client action plan clear and sufficient to close the conditions raised? [Reference FCR v2.0, 7.11.2-7.11.3 and sub-clauses]	Yes	The Client Action Plan looks fine. The relevant studies being conducted by ADF&G are very valuable and will help address the conditions. Alternatively, reducing or at least not increasing the scale of hatchery production would help address the root of potential problems, but I realize enhancement is an industry in itself involving many stakeholders, and so that route may not be realistic. One minor point on Condition 5: if the scoring issue E requirements for 2.5.2 have already been met, perhaps it should be removed from the Condition description.	Thank you, error corrected!
Enhanced fisheries only: Does the report clearly evaluate any additional impacts that might arise from enhancement activities?	Yes	Enhancement impacts on wild populations is a key issue for multiple UoAs, and the report does describe and evaluate the available information on these impacts.	No response required
Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary)	N/A		No response required

Specific PI comments

PI	PI Information	PI Scoring	PI Condition	Peer Reviewer Justification (as given at initial Peer Review stage)	CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)	CAB Response Code
1.1.1	Yes	No (scoring implications unknown)	NA	Explicitly describing how LRPs and TRPs were defined and evaluated in the justification would help with clarity. For example, it would be useful to mention that 50% of the lower bound of the escapement goal range was used as the proxy LRP for evaluation of scoring issue A. For scoring issue B, it seemed that the lower end of the escapement goal range was used as the TRP for evaluation purposes, but my understanding is that the range midpoint is the default TRP proxy (MSC GSC2.2.3). Was that the case, and if so, was there a rationale for using the lower end rather than the midpoint?	Additional explanation was added to this effect to the scoring rationale in the form of a footnote under PI 1.1.1. Escapement of salmon are managed for escapement goal ranges based either on sustainable escapement goal ranges that have been shown to provide for sustained yield over an extended period or biological escapement goal ranges shown to provide the greatest potential for sustainable yield based on historical production data. As per guidance in GSC2.2.3, directed fishing in Alaska fisheries is lowered as the lower bound is approached, such that escapements are distributed around the midpoint of the range due to normal variation in returns.	Accepted (no score change)
1.1.2	Yes	Yes	NA		No response required	Accepted (no score change)
1.2.1	Yes	Yes	NA		No response required	Accepted (no score change)
1.2.2	Yes	Yes	NA		No response required	Accepted (no score change)

1.2.3	Yes	Yes	NA	Minor note: the UoC groupings in the 'Met?' row for scoring Issue B, SG100 are not consistent with the justification and scoring.	Correction of groupings was made in the report.	Accepted (no score change)
1.2.4	Yes	No (non-material score reduction expected)	NA	The justification mentions that this UoA does not meet SG100 for Scoring Issue F, but the score is 100 in the scoring element table.	The scoring element table was corrected to reflect that the SG100 scoring level was not met for Kotzebue consistent with the explanation in the scoring rationale. This change had no effect on the rounded score for PI 1.2.4.	Accepted (non-material score reduction)
1.2.4	Yes	Yes	NA		No response required	Accepted (no score change)
1.3.1	Yes	No (no score change expected)	No	In the Evaluation Table for this PI, Conditions 5 and PWS 1 mention only pink salmon, not chum or any other relevant species. The condition descriptions in Table 34 look fine.	The concern is primairly limited to Pink Salmon in Prince William Sound and Kodiak. Chum Salmon are the concern in Southeast Alaska.	Not accepted (no score change)
1.3.1	Yes	No (no score change expected)	NA	The justification states that Cook Inlet Aquaculture plans to increase hatchery production, but also states that many enhancement activities have been curtailed as rationale for meeting SG 80. This sounds somewhat problematic, but does seem to be addressed under 1.3.2 with the note that the "standard will be reconsidered in the event that significant increases in hatchery production occur." The >5% level of strays from PWS hatcheries is a concern and suggests that straying isn't a localized issue, though the issue likely relates more directly to evaluation of the PWS UoA.	Any increases in Lower Cook Inlet hatchery production will be considered in surveillance audits of the fishery. The scoring rationale for Prince William Sound was expanded to note the occurrence of PWS hatchery Pink Salmon in Lower Cook Inlet streams.	Accepted (no score change)
1.3.1	Yes	No (non-material score reduction expected)	NA	A hatcheries review published in 2012 isn't very recent, which calls into question the 100 score for scoring issue A. Would 80 be more appropriate?	No significant changes have occurred in the Copper River or Upper Cook Inlet programs since the program was reviewed in 2012. Enhancement activities are documented in annual reports produced by ADFG (e.g., Stopha 2018).	Not accepted (no score change)

1.3.1	Yes	Yes	Yes	There seems to be an incomplete sentence in the second to last paragraph on p. 202.	Corrected	Accepted (no score change)
1.3.2	Yes	Yes	Yes	Typo in (SG100) - should say "The standard is NOT met…."	Corrected	Accepted (no score change)
1.3.2	No (no score change expected)	Yes	Yes	The not insignificant presence of PWS-origin strays in other districts such as LCI might also be mentioned as a concern under scoring issue B.	Occurrence of PWS hatchery strays was added to scoring rationale for LCI.	Accepted (no score change)
1.3.2	Yes	Yes	NA		No response required	Accepted (no score change)
1.3.3	Yes	Yes	Yes		No response required	Accepted (no score change)
2.1.1	Yes	No (scoring implications unknown)	Yes	NPFC et al. 2012 was cited as evidence that the fisheries are not hindering recovery of ESA listed stocks, but I wonder if there's more recent or direct evidence that can be provided to better support the scoring.	Reference was updated to 2018 version of NPFC salmon management plan. Additional explanation was also added that NOAA Fisheries has reviewed and approved the current Treaty Agreement for compliance with the Endangered Species Act.	Accepted (no score change)
2.1.1	Yes	Yes	NA			Accepted (no score change)
2.1.2	Yes	Yes	NA			Accepted (no score change)
2.1.3	Yes	Yes	NA			Accepted (no score change)
2.2.1	Yes	Yes	NA			Accepted (no score change)
2.2.2	Yes	Yes	NA			Accepted (no score change)

2.2.3	Yes	Yes	NA			Accepted (no score change)
2.3.1	Yes	Yes	NA			Accepted (no score change)
2.3.2	Yes	Yes	NA			Accepted (no score change)
2.3.3	Yes	Yes	NA			Accepted (no score change)
2.4.1	Yes	Yes	NA			Accepted (no score change)
2.4.2	Yes	Yes	NA			Accepted (no score change)
2.4.3	Yes	Yes	NA			Accepted (no score change)
2.5.1	No (no score change expected)	Yes	NA	Although not specifically required by current MSC guidance, I suggest mentioning the potential for ghost gear impacts under the ecosystem PIs, or elsewhere based on the assessment team's judgment.	We have added language under P2.4.1 to address this issue.	Accepted (no score change)
2.5.1	No (scoring implications unknown)	Yes	NA	The sockeye stocking and lake fertilization efforts undertaken in the Copper/Bering district and Lower and Upper Cook Inlet (described under PI 1.3.1) are somewhat controversial from an ecosystem perspective, as they are adding inputs to 'salmon-barren' systems. It may be worthwhile to address potential impacts here, providing justification on whether such efforts are/are not highly likely not to disrupt key ecosystem elements.	We have added language under P2.5.1 to address this issue.	Accepted (no score change)

2.5.2	Yes	Yes	NA	In Table 34, the description of Condition 5-Kodiak mentions that the UoA needs to meet SG80 for PI 2.5.2, but information elsewhere suggests that this part of the condition was closed in 2017. This PI is also mentioned in the Client Action Plan.	The condition is closed for Coho and Chinook. The condition is on target for Pink and Chum. Sorry for the confusion.	Accepted (no score change)
2.5.2	Yes	Yes	NA		No response required	Accepted (no score change)
2.5.3	Yes	Yes	NA		No response required	Accepted (no score change)
3.1.1	Yes	Yes	NA		No response required	Accepted (no score change)
3.1.2	Yes	Yes	NA		No response required	Accepted (no score change)
3.1.3	Yes	Yes	NA		No response required	Accepted (no score change)
3.2.1	Yes	Yes	NA		No response required	Accepted (no score change)
3.2.2	Yes	Yes	NA		No response required	Accepted (no score change)
3.2.3	Yes	Yes	NA		No response required	Accepted (no score change)
3.2.4	Yes	Yes	NA		No response required	Accepted (no score change)

APPENDIX 4 STAKEHOLDER SUBMISSIONS

Comments were received from several stakeholders on the Public Comment Draft report. These are given below, together with the assessment team's responses to each. Where changes to the report and/or scoring have been made as a result of these comments, this is indicated in the responses as well. The assessment team wishes to thank these stakeholders for their active and constructive engagement with this process.

Peer Reviewer A

As part of the Peer Review College Process, peer reviewrs are afforded the opportunity to respond to the CABs initial responses to their review. In this case, Peer Reviewer A submitted such a follow-up response. This, and the assessment team's responses to these follow-up comments, are given in the following table:

PI	PR Comm-ent Code	Peer Reviewer Justification (as given at Public Comment Draft Report (PCDR) stage)	CAB response to Peer Reviewer's comments (as included in the Final Draft Report)	CAB Res-ponse Code
1.1.1	Yes			
1.1.2	No (no score change expected)	The CAB aggregated stocks within the UOA. They noted that some streams were receiving many strays. If the streams receiving the larger number of strays compose a (minor) fraction of the UOA natural production then it is not a significant problem. If (made up number) 30% of actual spawning area in the UOA or 30% of the total escapement in the UOA is subject to elevated stray levels, then we have a problem.	The significance of hatchery straying was assessed under PI 1.3.1 according to guidelines identified in MSC CR 2.0 (Box GSC1) as summarized in this report under the assessment methodology chapter on pages 121-122. This methodology includes quantitative guidelines defined at both the stock management unit and the population level. To meet the 80 scoring guidepost for a segregated chum or pink salmon hatchery program, hatchery origin spawning would need to comprise less than 10% in aggregate and less than 1% in at least 50% of the spawning populations. To meet the 60 scoring guidepost, hatchery origin spawning would need to comprise less than 20% in aggregate and less than 5% in at least 50% of the spawning populations. The hatchery research study has demonstrated that hatchery-origin fish comprise a small percentage of the natural spawning escapement even in Prince William Sound where large scale hatchery enhancement programs are operated. SMU level pHOS averaged 10% for Pink Salmon and 3% for	Accepted (no score change)

			Chum salmon in PWS in 2013-2015 (Knudsen et al. 2015a, 2015b, 2016). These results are summarized in Tables 12-13 and 15-17 of this report. Thus, Pink salmon meet the adapted SMU guidance for this species at the SG60 (<15%) and are approximately equivalent to SG80 level (<10%). Chum salmon meet the adapted SMU guidance for this species at both the SG60 and SG80 levels. pHOS averaged <1% for 20% of Pink salmon populations and <5% for 50% of populations (Knudsen et al. 2015b). Thus, the adapted population-level guidance for Pink Salmon is marginally met at the SG60 standard but not met at the SG80 level. pHOS averaged <1% for 30% of Chum salmon populations and <5% for 70% of populations (Knudsen et al. 2015b). This would meet the adapted standard for SG60 but not for SG80. As a result, corresponding conditions were identified for this PI in Prince William Sound.	
1.2.1	Yes	While the response is adequate, it should be noted that most of the subsequent fisheries are also quota-based, forecast-based and there is little meaningful in-season management that is applied, especially when the majority of the fish have already been taken.	So noted.	Accepted (no score change)
1.2.2	No (scoring implications unknown)	The problem is that AK, and all the other managers, rely on compliance with the harvest models they have developed and management success is measured in compliance with those models/standards. The fact remans that the US ESA-listed salmon and SRKW have not positively responded to the management regime. Sustainable natural resource management requires a higher standard; the resource must respond, endangered resources must recover. It is not enough to simply follow guidelines; those guidelines must work. But, within the framework of current management, AK is meeting the management obligations.	Status of ESA-listed salmon harvested in Alaska fisheries (primarily Lower Columbia and Snake River Fall Chinook, and Willamette Spring Chinook) is primarily constrainted by habitat conditions in freshwater, particularly including land and water use in tributary streams and hydro development in both tributary streams and mainstem migration corridors. Fishery mortality in Alaska is typically 10% or less under current management constraints and historically – much less than other impacts in freshwater which are orders of magnitude higher. Given the relative scales of these limiting factors, it would be unreasonable to expect that fishery management in Alaska would produce a strong	Not accepted (no score change)

			postitive response in status of ESA stocks. Fishery management is instead constrained so as not to reach high levels which might be expected to substantially increase extinction risks such that the fishery might jeopardize the continuing persistence of listed stocks. We would also note that recovery actions including fishery constraints have been associated with measurable improvements in the status of some ESA listed stocks and been instrumental in avoiding extinction of others.	
1.2.2				
1.2.2				
1.3.1	Yes			
1.3.2	Yes			
1.3.3	No (scoring implications unknown)	Precautionary management requires that the ecosystem not bear the risk of our actions. Something is obviously going on in the North Pacific that is affecting seabirds, Chinook, coho, SRKW's and all of these are associated with the abundance of pink salmon. Studies are ongoing.	Principle 1.3.3 concerns effects of enhancement on wild stocks. Ecosystem effects and information are assessed under PIs 2.5.2, 2.5.2 and 2.5.3. Precautionary management is assessed under Principle 3. It is clear that the conditions in the North Pacific complex and dynamic. It is also clear that environmental variability is a key driver of these conditions. Hatchery-origin Pink and Chum Salmon are abundant in this ecosystem and as such, have the potential to affect and be effected by complex interactions within this ecosystem. The available information on the magnitude of these interactions and effects remains inconclusive and subject to interpretation.	Not accepted (no score change)
2.1.1	Yes	Consideration of separation of troll fishery from the UOA should await the next review cycle.	Agreed.	Accepted (no score change)
2.1.2	Yes	see 2.1.1	see above	Accepted (no score change)
2.1.3	Yes	see 2.1.1	See above	Accepted (no score change)
2.2.1				
2.2.2				
2.2.3				

2.3.1	No (scoring implications unknown)	Differences are mostly philosophical in that AK relies on the PSC and NOAA to set standards and recovery goals and then bases the acceptability of management performance on meeting those goals and not on the response to the resource. There also seems to be a disconnect in that at some of this issues raised do not deal with the fishery (the specific act of catching the fish) but in the ecological impact of enhanced fish on the marine ecosystem. The AK salmon fishery is not harming the Antipodean shearwaters but the fish used to drive that fishery appear to.	Under P2 we addressed the status of IPI and ETP species caught in Southeast. Under the Pacific Salmon Treaty there is a commitment to managing stocks for sustainable fisheries and that when those stocks are harvested in multiple jurisdictions all parties play important roles to ensure the goal is achieved. We do acknowledge that for the fisheries of Canada, Oregon and Washington that are being managed for under the provisions for "Individual Stock Based Management" regimes that management for biologically based escapement goals, rather than harvest rates as is currently done, would likely increase the prospects for higher long-term production as would implementing habitat based improvements identified in ESA Recovery Plans. We also note that many of the stocks in these jurisdictions are not caught to any significant degree in Alaska, We clearly understand the difference between direct impacts a fishery may have on an ecosystem by methods and means a fishery harvests fish or by removal of fish from the ecosystem and the effects that can be caused by increasing biomass within an ecosystem associated with hatchery production. We acknowledge that we disagree on the establishment of a clear and convincing link between hatchery production and observations of shearwater mortality that would cause us to, for instance, require a new condition. With that said we also clearly stated under 2.4.2 that " We cannot conclude however that there is a high degree of confidence that there are no significant indirect effects by the UoA's, as such the SG 100 level is not met." We also note that issue of possible interactions between hatchery releases and Shearwaters is best addressed under Section 2.5.1 (which we have done).	Not accepted (no score change)
2.3.2	No (scoring implications unknown)	see 2.3.1	See above	
2.3.3	Yes			

2.4.1				
2.4.2				
2.4.3				
2.5.1	Yes	The text of the document defines the three types of escapement goals used as evaluating escapement vs. catch by humans. Analysis of escapement performance is always a back-cast. For example, as marine mammal predation (as is being seen in WA) increases, the actual harvest from a certain escapement declines. If that escapement also, declines, we get into situations where goals and catches end up being lowered since the predation is not a constant. Basically, the undocumented catch, which includes increased predation, may be increasing and should be more explicitly examined in the future.	We agree that this issue is worth some examination. In fact the possible effects, if any, wouldl likely belikely similar to the impact that high seas fishing, undocumented by-catch or undocumented interceptions by fisheries in the same or other Uof A's may have or are having on evaluation of escapement goals statewide.	Accepted (no score change)
2.5.2	Yes	see 2.5.1		
2.5.3	Yes	The CAB accurately describes the management scenario for the Pacific Coast of N America. AK is meeting all of its commitments but many of the resources decline. Based on the actual performance of the resources, the management that is jointly agreed-to by States, Tribes, and Countries is not working; is not sustainable.	The comment "….many of the resources decline " is too general to provide much pacific feedback. Under P2 we addressed the status of IPI and ETP species caught in Southeast. Under the Pacific Salmon Treaty there is a commitment to managing stocks for sustainable fisheries and that when those stocks are harvested in multiple jurisdictions all parties play important roles to ensure the goal is achieved. We do acknowledge that for the fisheries of Canada, Oregon and Washington that are being managed for under the provisions for "Individual Stock Based Management" regimes that management for biologically based escapement goals, rather than harvest rates as is currently done, would likely increase the prospects for higher long-term production as would implementing habitat based improvements identified in ESA Recovery Plans. We also note that many of the stocks in these jurisdictions are not caught to any significant degree in Alaska.	Not accepted (no score change)
3.1.1	Yes	This might be referred to as the tragedy of the commons. Jointly, the managers are not meeting a conservation ethic in terms of restoring	Although no response is needed to this comment, we acknowledge that these types of concerns are best raised with MSC itself, rather than assessment	

		depleted resources.	teams working on specific assessments, because it is our remit to assess the fisheries according to the requirements of the existing standard, rather than to question whether the standard itself is sufficient.	
3.1.2				
3.1.3	Yes			
3.2.1				
3.2.2				
3.2.3				
3.2.4				

Performance	Justification

Birdlife International

BirdLife international work on the conservation of seabirds worldwide by tackling major threats, such as bycatch from fisheries.

MRAG Americas received the following comments from Mr. Yann Rouxel, Bycatch Project Officer with RSPB/Birdlife International:

Indicator	
2.3.1 2.3.3	We do not agree that the data available from test fishing and observations of fisheries are sufficient to quantitatively estimate take of seabird species in the fishery, and is enough to prove that it does not hinder recovery of the ETP species. Overall, the data used in the assessment are highly variable both in time and space, and do not specifically address the different fishing practices or question enough the data accuracy. - Data from test fishing (Chafee, 2005) were provided by ADF&G staff to Scientific Certification Systems only through the form of a summary and no direct access of these data is possible for other stakeholders to evaluate data quality (e.g. were the data from observers? from Interviews? what about the fishing effort? etc.). Also, test fisheries are said to "identify numbers of salmon that might be available for harvest early in the season", but no rationales are given that link early season and bycatch events. - It is stated that "no birds and no marine mammals have been captured by the test fishery program", which questions the quality of the data collected when compared to other sources (Manly, 2015). For example, for the Southeast Region, the test fishery only occurred in the rather small location of Hawk Inlet - N.Chatham Strait, in which Purse Seines were used. Apart from the fact that purse seines are known to be relatively much less of a threat to seabirds (hence it is not surprising that no bycatch was recorded), such bycatch rates cannot be extrapolated to give an accurate picture of bycatch from gillnet/driftnet fisheries in the whole Southeast region. The Alaska Marine Mammal Observer Program (AMMOP) (Manly, 2015) indicates, however, that significant seabird bycatch levels occurred in fisheries of the Southeast region - ranging from 772 (lower estimate) to 2,049 (higher estimate) – and in only three districts (6, 7, and 8). This shows that zero bycatch is an unrealistic figure and that the data from the test fisheries are likely to be unreliable in providing quantitative estimates of seabird bycatch in the Commercial Salmon Management Areas. Although the sampling effort between data sources might appear consistent, the quality of these data is, however, highly questionable. - The AMMOP program (Manly, 2005) has shown that bycatch hotspots exist in this fishery. For instance, the bycatch rate was much higher in 6A than in the other areas sampled, and seasonal/inter-annual variations exist (e.g. Manly 2015 - "A crucial question is why there were so many more takes of mammals and birds in 2013 than in 2012. This is not just because there was more fishing and more observed fishing periods in 2013"). Therefore, test fisheries and observation programs - that are significantly limited in time and space – and spaced in time (the most recent AMMOP Southeast data is now 6 years old, data from South Unimak is now almost 30 years old) can't give an accurate and up to date picture of the seabird bycatch issue in this fishery. - Regarding the Kittlitz's murrelet: Although it is true that "Blejwas & Wright (2012) examined spatial and temporal overlap of Kittlitz's murrelets with gillnets and concluded that overlap areas is small; they also noted that "Assessing the spatial and temporal distribution of gillnet fishing effort is problematic, both because ADF&G does not track fishing effort directly and because the spatial resolution of harvest data is not fine scale". Aerial surveys indicated discrepancy in the number of nets at sea compared to self-reporting from fishermen, suggesting that misreporting and illegal

	fishing might occur. Also, conclusion from Blejwas & Wright (2012) heavily relies on the stated assumption that the "distributions of both KIMU and gillnets are relatively stable over time, noticing that there was greater variation at an annual scale", while most of the data are 10 years old or more. Determining that the Alaskan Salmon fishery is not impacting this Near Threatened species should be based on updated data. We would recommend that a condition is placed on the fishery to implement a coherent yearly observer coverage (on the four Areas of management) on a sufficient percentage of the fleet (10%) and applying similar methodology to adequately assess the scale of bycatch. It is necessary, for the purposes of ensuring the MSC certification process is robust, that a more representative assessment of bycatch in this fishery is made.
Assessment Team Response	BirdLife International states that the level of information available is insufficient to quantitively estimate the level of by-catch of ESA listed marine birds (Steller Eiders and Spectacled Eiders) and recommend….. " a coherent yearly observer coverage (on the four areas of management) on a sufficient percentage of the fleet (10%) and applying similar methodology to adequately assess the scale of bycatch." The range of the Speckled eider includes the waters of the Bering Sea north of the Kuskokwim River and into the Chuckchi Sea. There is very little commercial fishing in the Bering Sea portion of the range and no commercial fishing in the Chuckchi Sea portion of the range. The range of the Steller's eider includes the waters of West of Cook Inlet, west to the Aleutian Island of Chuginadah and then north to include the Bering and Chuckchi Sea east to the Alaska Canada Boarder. There are commercial fisheries in the coastal waters of the North Pacific and Bering Sea portions of the range. By-catch of birds and marine mammals was the subject of a Condition of Certification during the first MSC certification in 2000. The condition required collection of by-catch data in test fisheries as a means to identify whether by-catch was a significant conservation issue. That condition was closed when the data collected by that effort, along with other available data, provided no indication of a significant conservation concern. While we can agree that conducting another expanded observer program would provide additional quantitative data, there is no data to support the need for such a program in order to achieve a score of 80. 1. Section 2.3.1 requires that the fishery meets national and international Standards for the protection of ETP species. 1. Scoring element A requires… " that effects of the U of A on population/stocks are within national or international limits". We scored this element as "Not Applicable" because no permit requirements, by-catch limits or other conditions have been placed on the Alaska Salmon Fishery as a result of listing these species. 2. Scoring element B requires an evaluation of how likely it is that U of A does not hinder recovery of ETP species. The best available data led the U.S. Fish and Wildlife Service to conclude that the Alaska Salmon Fisheries pose no risk to these species. We note that even though the Fish and Wildlife Service has not identified that the Alaska Salmon Fishery posed any risk, we took a precautionary approach in scoring of this element by not awarding it a score of 100 because the available

	data does not provide " a high degree of confidence that there are no significant detrimental direct effects". Implementing an expanded observer program would provided sufficient data to determine if this level of confidence (a score of 100) is warranted, and we have therefore added a non-binding recommendation for the for the marine gill net fisheries of Cook Inlet, Kodiak, Ak Peninsula, Bristol Bay and AYK to repeat the earlier observation of test fisheries or conduct an equivalent study to update verification of the degree of interaction between these fisheires and seabird species. Section 2.2 evaluates whether or not the U of A and associated enhancement activities have in place precautionary management strategies designed to a) meet national and international requirements and b) ensure the U of A does not hinder recovery of ETP species. 2. Scoring element A requires that there is a strategy in place for managing the U of A and enhancement activities' impact on ETP species, including measures to minimize mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species. As noted above, because there are no permit requirements or other conditions placed on the U of A, the clause is not relevant. 3. Scoring element B requires evaluation of the management strategy in place to not hinder recovery of ETP species. We gave the Alaska Salmon Fishery a score of only 80 because of the lack of ongoing and extensive observer program (as suggested by Bird Life International) despite the fact that no data suggest a need for such a program for these ETP species, and have added a recommendation as described above. 4. Scoring Element C requires an evaluation of or confidence that management strategy is working. Once again, we scored this as only an 80 because the quality of the available data. While implementation of an expanded and extensive program as recommended by Bird Life International would provide the information needed to justify a score of 100. 5. Scoring element D requires evaluation of the evidence that the measures/strategy is being implemented successfully. We scored this as only an 80 because the quality of the available data. While implementation of an expanded and extensive program as recommended by Bird Life International would provide the information needed to justify a score of 100. 6. Scoring element E requires evaluation of the review process in place of the potential effectiveness and practicality of alternative measures in place to minimize mortality of ETP species. Because there is no indicaton of interactions of concern, and no permit requirements or other conditions in place to control take of these ESA listed species there is no need for review other than the general NOAA review procedures for ESA listed species, which are conducted as required by regulation.
2.3.2	Given that the AMMOP program latest monitoring happened in 2013 (Southeast region),

	that bycatch data from other areas of the Alaska salmon fishery are already 10 to 30 years old, and that no certainty exists that the program will re-open anytime soon, the data provided by this program do not inspire any confidence that a workable strategy to promote the recovery of ETP species is established in this fishery. The argument that the level of mortality of ETPs is too low to require a take reduction program is based on bycatch estimates that are likely underestimating the problem (see below). This is mainly due to the lack of temporal and spatial consistency within the fishery regarding bycatch data collection, and the reliability of self-reporting of bycatch levels remains unproven, especially in quantitative terms. While we agree that certain measures are in place, we contest that a real and independently verifiable management strategy exists, and therefore that such a strategy should be developed and implemented if this fishery is to be certified.
Assessment Team Response	1. To receive a score of 80, element A requires only that some quantitative information be available to assess the mortality and impact of the U of A to determine whether it may pose a threat to protection and recovery of the ETP species. The data outlined in the report is sufficient to meet this level of performance. If implemented as recommend, the observer program would be sufficient to achieve a score of 100 with respect to quantitative information availability. 2. To receive a score of 80, element B requires that the information is adequate to measure trends and support a strategy to manage impacts on ETP species. The extremely low level of encounters makes it unnecessary to implement an ongoing comprehensive observer program. Such activities as annual test fishing and on-the grounds fishery monitoring by area biologists and enforcement officers are sufficient to achieve a score of 80. The recommend level of observer coverage by BirdLife International is far more comprehensive than required to meet this scoring level, but if implemented as recommend, the observer program would be sufficient to achieve a score of 100 for this information PI.

Kachemak Bay Conservation Society[9]

The Kachemak Bay Conservation Society's mission is to protect the environment of the Kachemak Bay region and greater Alaska by encouraging sustainable use and stewardship of natural resources through advocacy, education, information, and collaboration.

[9] MRAG Americas received comments from Ms. Roberta Highland, President of the Kachemak Bay Conservation Society. The responses of the assessment team follow, organized according to the specific themes raised.

1. We question MSC's determination with regard to PWS, SEAK and Kodiak on Principle 1, considering (a) that "emerging science has…identified significant risks of hatchery production to wild stocks and potential impacts on portions of the marine ecosystem," and (b) that ADF&G ha done little to no research on any of these significant risks mentioned in these regions and (c) what little research has been done is only very recent, is unfinished and does not encompass predation or competition. Why are these regions being given an over-80 percent rating when they have little to no evidence to demonstrate "a high likelihood that enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks"? There is an unreasonable and unscientific disconnect between the high ratings and extreme lack of data to show that these vital standards are being met. These regions have been operating and increasing production of hatchery stocks for the past 45 years *without conducting even the most limited research into straying, and they have yet begin any research whatsoever on competition and predation in the nearshore and pelagic environments*. For these reasons, MSC's certification would not be evidence based. There can be no certification of sustainability absent sufficient supporting evidence.

Assessment Team Response: Risks of hatchery enhancement were addressed with respect to impacts on wild stocks under performance indicators 1.3.1, 1.3.2 and 1.3.3, and with respect to ecosystem effects under performance indicators 2.5.1, 2.5.2, and 2.5.3. Under Principle 1, historically high levels of abundance and productivity of Pink, Chum and Sockeye salmon in Alaska units of certification including areas of significant enhancement led the assessment to conclude that it was likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks. Evidence on hatchery risks was such that the assessment was unable to conclude a high likelihood that enhancement activities do not have significant negative impacts on the local adapation, reproductive performance of wild stocks for Southeast Alaska, Prince William Sound, Lower Cook Inlet, and Kodiak where significant hatchery programs occur. As a result, none of these areas achieved an 80 score for these indicators and conditions were identified for each requiring that a high likelihood of no significant impact be demonstrated. Under Principle 2, a comprehensive review of the available information led the assessment team to conclude that while there was likely some effect of hatchery enhancement on elements of ecosystem structure and function, effects did not rise to the level of serious or irreversible harm. Consequently, areas with significant hatchery programs were determined to reach the 80 scoring standard but not the 100 scoring standard which was based on an evidentiary standard.

Concern about potential predation and competition in the near shore and pelagic environments and that ADFG has not conducted any research into these topics.

As we have discussed in the document, the science of competition and predation in the marine environment is highly complex and it is difficult to draw specific conclusions regarding consequences of these ecological factors of hatchery releases on wild stocks given the dynamic physical, chemical and biological environment. That is not to say that some studies have correlated the size of hatchery releases to various trends in wild stocks and other organisms that utilize the marine environment. This is no different in the near-shore than in the pelagic biomes, or that there is not a need for research into these ecological forces in the near shore marine environment and we would encourage such research. Research funding for the ADFG from the Alaska legislature has historically been limited to programs required to directly support stock assessment not ecological research. While the Department would most likely be supportive of conducting such research internally, they simply have not been funded to work in this area, and likely would not prioritize such research in the department because there are outstanding needs for applied stock assessment research and data. That is not to say that ADFG does not support such research, they do, but it is thru, the North Pacific Anadromous Fish Commission, University of Alaska, University of Washington and National Marine Fisheries

Service where federal funds for basic science is available.

2. Furthermore, ADF&G does have some evidence to demonstrate that there *is* a likelihood that enhancement activities have significant negative impacts on the local adaptation, reproductive performance and productivity or diversity of wild stocks: (a) Stray rates near release sights are very high. (b) The *Alaska Department of Fish and Game Lower Cook Inlet Pink Salmon Otolith Sampling Summary, 2017* reports that Prince William Sound hatchery-produced pink salmon are generally found at levels ranging **2%–70%** in the Lower Cook Inlet, a substantial number of which are found in the Critical Habitat Area of Kachemak Bay. (c) Preliminary results of recent genetic pedigree data from the ADF&G-sponsored study "Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska" found *dramatic declines in fitness of progeny (F1)* of hatchery - wild crosses. These results were presented at the recent Alaska Marine Science Symposium meeting in Anchorage by ADF&G Fisheries Geneticist II, Kyle Shedd. They are consistent with what has been found with other salmon species in the Pacific Northwest: Alaska is not an exception.

Assessment Team Response: The assessment considered emerging information on levels of hatchery straying in Lower Cook Inlet streams and also examined additional information on hatchery returns and straying in LCI presented by ADFG at the 2019 Board of Fisheries meeting. Based on this new information, scoring of Lower Cook Inlet was downgraded under Principle 1 Performance Indicators regarding enhancement and corresponding conditions were added to the certification.

Preliminary results of hatchery fitness studies has recently been reported to the Alaska Board of Fish but have not yet been published. Initial results appear to suggest that hatchery fish produce fewer adult offspring than wild fish but additional work will be necessary to replicate and interprete these results. These results will be essential for assessing hatchery-related conditions identified by this assessment and will be evaluated during subsequent fishery audits as more comprehensive information becomes available.

3. Current Alaska hatchery releases are approximately 1.7 billion per year, and hatchery returns comprise about one third of the total commercial salmon harvest (Alaska MSC 2018 Reassessment, p. 24). The primary data on the impact of these releases to the sustainability of Alaskan fisheries is not to be found from the Alaska Department of Fish and Game but from the following independent researchers:

Alan M. Springer
Institute of Marine Science
University of Alaska Fairbanks,
Fairbanks, AK 99775.
amspringer@alaska.edu

Greg Ruggerone
Natural Resources Consultants, Inc.
4039 21st Avenue West, Suite 404
Seattle, WA 98199
nrc@nrccorp.com

Sonia Batten
The Marine Biological Association
The Laboratory, Citadel Hill
Plymouth, Devon
PL1 2PB, UK

cprsurvey@mba.ac.uk

Peter Rand
Prince William Sound Science Center
300 Breakwater Ave.,
PO Box 705
Cordova, AK 99574
pwssc@pwssc.org

James Richard Irvine
Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Road Nanaimo,
BC V9T 6N7
250-756-7000

Michael Malick
NRC Postdoctoral Research Fellow
NOAA Fisheries, Seattle, WA.
mjm@michaelmalick.com

MSC must use data collected by these researchers and their colleagues to determine the sustainability of Alaska's fisheries.

Assessment Team Response: The assessment considered a comprehensive suite of information available from all sources including the aforementioned authors.

4. Our conversations with over 8 AD&G fishery management and research biologists across Alaska make it clear that ADF&G has fostered an unscientific culture of silencing concern about the significant impacts of straying, competition, and predation of hatchery stocks vis a vis wild stocks. ADF&G biologists who are concerned about hatchery straying, competition and predation are afraid that they will loose their jobs if they speak publicly about their concerns. For example, they are afraid that they will loose their jobs if they speak to the Board of Fisheries about their concerns. This is not a sign of a healthy agency managing a healthy, sustainable fishery.

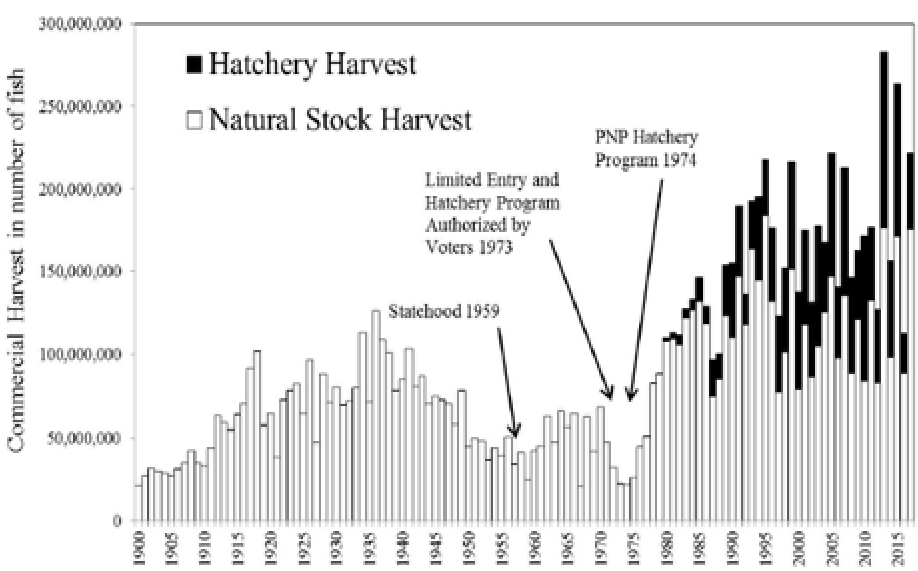
ADF&G has succumbed to significant industry pressure to increase hatchery production without researching impacts. Despite a long list of policies and requiring ADF&G to prioritize the protection of wild stocks over hatchery stocks, they have done little to nothing to determine the extent to which they are following these policies. One example of this is the fact that The Comprehensive Phase III plan for PWS states: "the proportion of hatchery salmon straying into wild stock streams must remain below 2% of the wild-stock escapement over the long-term; the growth rates of juvenile salmon during the early marine period must be density independent over the long term; and wildstock escapement goals must be achieved over the long-term" (Alaska MSC 2018 Reassessment, p. 108). Current research on stray rates in the PWS indicate that a significant number of wild streams far exceed that limit, yet the Department continues to permit large-scale hatchery releases. The problem is larger: a short phone call to DEC on hatchery carcass dumping will reveal that there is little to no record or water quality in the receiving body of water for the great majority of hatcheries in the State of Alaska for their entire 45 year history of operation. Dig a little, and you will discover more and more examples of extreme lack of enforcement.

Assessment Team Response: The assessment team has reviewed extensive published and unpublished information regarding operation and effects of large-scale hatchery enhancement programs in Alaska. During site visits, the assessment team had numerous conversations with representatives of the Alaska Department of Fish and Game, Private Non-profit Hatchery Associations, scientists from Universities and Federal Agencies, and other stakeholders and interests. Interactions included honest discussion of the pros, cons and risks associated with hatcheries as well as extensive information on hatchery programs, practices, effects and consistency with established permits and policies.

Implementation of a costly, large scale hatchery evaluation study clearly demonstrated a willness to collect and consider information critical to assessing hatchery-related risks. We also reviewed a number of other scientific reports and publications critical of hatchery programs that were prepared by ADFG staff and others. These include scientific assessments of the levels of straying by hatchery fish in Southeast Alaska, Prince William Sound, and Lower Cook Inlet, as well as introgression and fitness studies in Prince William Sound.

In addition, we reviewed a number of conditions and actions required of hatchery programs under permits issued by ADFG as part of their regulatory oversite responsibility. These included a series of program-specific reviews for consistency with statewide policies and prescribed management practices (e.g., Stopha 2013a, 2013b, 2013c). It is also apparent that the Board of Fisheries process has provided an open opportunity for public input regarding hatchery concerns and an opportunity for policy level consideration of existing programs, policies and related management. Based on public input and recent hatchery assessments conducted largely by ADFG, the Alaska Board of Fisheries has recently reconvened its hatchery committee. The hatchery committee has authority to regulate access to returning salmon and to amend, by regulation, the terms of the hatchery permit relating to the resource and number of eggs. Most recently in March 2019, the hatchery committee reviewed current production trends, management issues, planning efforts and research.

5. There is a significant risk that Alaska’s hatchery program has already replaced and will continue to replace wild stocks with hatchery stocks on a large scale. The lack of agency research on this question makes it impossible to know with certainty, but the ADF&G graph that shows wild stocks rebounding after the initiation of the hatchery program in 1974 should be examined carefully and critically:



3-6. Historic commercial catch of salmon in Alaska showing the contribution of fish from enhancement activities, 1900 – 2017 (Stopha 2018).

(a) This figure counts hatchery fish as wild fish for a significant period, because for much of the hatchery program, there was no way to differentiate between hatchery-origin and wild stocks, as thermal marking was not used, and indeed is still not used in some parts of the state today. (b) The fact that stray rates into wild streams has gone unexamined by ADF&G until very recently, compounded by recent findings that stray rates near release sites range from 10% to over 20% each year—and this may have been going on for 45 years—indicates that a significant number of hatchery-wild progeny are being counted as "wild" in F-1 and F-2, and so on. The consequence of this is that the genetics of "wild" streams near hatcheries are highly degraded and in some cases obliterated and the number of "wild" fish is inflated.

MSC's explanation for why Alaska's salmon fishery began rebounding in 1975 (the year after hatcheries were instituted) reads:

> "The salmon stock assessment program improved in the 1970's, goal setting improved, and salmon managers used emergency order authority to achieve the spawning goals. These improvements, in conjunction with an extended period of favorable marine conditions beginning in the late 1970s, led to an extended period of high salmon harvests which continues today" (Alaska MSC 2018 Reassessment, p. 21).

This may all be true, but the role of hatcheries and the significant concerns mentioned above are conspicuously absent from the explanation. This must be amended.

Finally, we would like to urge you again to make your determinations based on evidence.

Assessment Team Response:

Alaska hatchery programs have implemented comprehensive hatchery marking and mark sampling programs (with small exception of Kodiak Island and Annettee Island programs where marking programs are in development). This information has provided an objective basis for assessing hatchery contributions to fisheries and spawning escapements. A ground breaking and costly hatchery study has been implemented in Southeast Alaska to assess levels of hatchery straying and the relative fitness of hatchery and natural origin spawners.

This study has demonstrated that hatchery-origin fish generally comprise a small percentage of the natural spawning escapement even in Prince William Sound where large scale hatchery enhancement programs are operated. SMU level pHOS averaged 10% for Pink Salmon and 3% for Chum salmon in PWS in 2013-2015 (Knudsen et al. 2015a, 2015b, 2016). These results are summarized in Tables 12-13 and 15-17 of this report. Thus, Pink salmon meet the adapted SMU guidance for this species at the SG60 (<15%) and are approximately equivalent to SG80 level (<10%). Chum salmon meet the adapted SMU guidance for this species at both the SG60 and SG80 levels. pHOS averaged <1% for 20% of Pink salmon populations and <5% for 50% of populations (Knudsen et al. 2015b). Thus, the adapted population-level guidance for Pink Salmon is marginally met at the SG60 standard but not met at the SG80 level. pHOS averaged <1% for 30% of Chum salmon populations and <5% for 70% of populations (Knudsen et al. 2015b). This would meet the adapted standard for SG60 but not for SG80. As a result, corresponding conditions were identified for this PI in Prince William Sound.

Estimates of hatchery stray rates have provided a basis for determining whether hatchery fish are biasing estimates of natural spawning escapement and masking declines in wild fish abundance. These assessments have consistently demonstrated continuing high levels of wild escapement in areas with significant hatchery production including Southeast Alaska, Prince William Sound and Lower Cook Inlet. High levels of hatchery straying have been identified in some areas in close proximity to hatchery release sites. However, wild fish continue to comprise all or most of the spawning escapement in significant areas of all units of certification. High levels are sustainability continue to be demonstrated by wild Pink and Chum salmon which are at historically high levels of abundance and productivity throughout southeast and southcentral Alaska where hatchery production is concentrated.

In the Kodiak UoA, the assessment team shares the concerns raised with respect to non-marked hatchery production. As such, a condition remains open on PIs 1.3.1 and 1.3.3 for Kodiak. See Table 34, condition 5 for a summary, and Table A1.3, condition 5 for details. While the assessment team is not permitted to require specific client actions in response to conditions (only that the SG80 must be met upon completion of the action plan) we have not specified that marking of Kodiak hatchery fish is required. However, absent marking, it is difficult for the team to envision how we can be provided with "sufficient relevant information on the contribution of enhanced Coho, Pink and Chum salmon to the harvest and wild escapement of the stocks" which is what ultimately is required to maintain certification. The team will continue to monitor progress against this condition in subsequent surveillance audits and will take action as required if progress falls behind target.

Nancy Hillstrand

Pioneer Alaskan Fisheries
P.O. Box 674
Homer, Alaska 99603

RE: HATCHERY PRODUCTION FISHERY IS NOT SUSTAINABLE

PWS Study Design has no PEER review and attempts to question design was suppressed

- PWS Study Design protocol was never PEER reviewed
- The study scientific panel was primarily hatchery proponents without objectivity
- ADFG concerns were not openly discussed to ensure factors that influence estimates of hatchery straying proportions were considered for a defensible study design protocol
- Potential flaws in the study design create concern of flawed results.

Inter-regional straying

- The high proportions of Inter-regional straying of PWS hatchery fish into the Lower Cook Inlet Wild significant river systems is contrary to the genetics policy.
- Inter-regional straying demand lower score and strict conditions
- Power point of PWS into LCI straying is here starting page 14: https://www.adfg.alaska.gov/static-f/regulations/regprocess/fisheriesboard/pdfs/2018-2019/hc/or3.pdf
- This inter-regional straying has been documented since 2014 without any corrective action
- PWS hatchery production continues to expand in a facility documented as one of the facilities from PWS (Solomon Gulch Hatchery) documented to produce inter-regional straying.
- The 2010 ADFG Internal Review showed many problems with noncompliance from hatchery operators, one was the issues being straying.

SEGs Escapement Goals masked by straying

- Masking of SEG's by hatchery strays defeats the concept of Sustainable Escapement Goals.
- We can not honestly state that Escapement Goals are made up of wild fish
- After the Tutka Hatchery closed in 2005 the escapement goals went down in some index streams?
- Investigation is needed of harvest during the years 2005-2013 while the hatchery was closed as compared to years prior to the hatchery releases in 1980. Are there missing fish?

Straying

- Damage is being done by cherry picking streams or using the numbers game of combining all streams together does not address damage to those streams with high (50- 90%) straying proportions.
- Contrary to the statements that the issues of the ADFG Internal Review issue being corrected, this Straying issue continues at high proportions year after year without any corrective action (Crawfish Inlet Chum Salmon NSE at 98% in 2018 and inter-regional straying LCI 70% 2017)
- Where can MSC find the straying issue of Crawfish Inlet? This issue is not transparent because this information is suppressed and ADFG employees are afraid for their jobs.

- Efforts to provide sanctuary stock designations to protect wild stocks from remote releases are being impeded.
- There is no systematic monitoring protocol in the State of Alaska to begin seeing how far this straying is contaminating wild stocks of salmon.
- Results at Hidden Lake in a larger-than-desirable proportion of hatchery-origin fish spawning with natural-origin fish 88% at the release site of Hidden Lake increasing genetic risks to natural populations.[10]

Marking of all hatchery

- Kodiak still needs to have an acceptable accurate readable mark on their 150,000,000 pink salmon and other species. Outlying areas like Chignik and Area M need to understand if hatchery fish are straying into their wild river systems

Systematic in river statewide perspective monitoring protocol

- Otolith in river sampling studies are sporadic and by chance yet years of major abundance of pink salmon show major straying in LCI. What about Chignik? Yakutat? Unalaska? All of which documented gluts of salmon never seen before. Were these hatchery fish?
- The differentiation of wild pink salmon from hatchery salmon is muddied when considering straying. Wild fish straying is differentiated by laws compared to hatchery fish straying

Fitness

- Ist assessment of hatchery fish fitness study showed pink hatchery females with 50% less productivity. Previous studies showing fitness problems are ignored.
- The precautionary principle is not being considered
-

Ecosystem

- Hatcheries purposely release hundreds of millions of fry to target optimal zooplankton bloom abundance to feed on future valuable fisheries like crab shrimp, clams, herring.
- Hatcheries are located up in critical nursery estuaries. The function of these nurseries are not considered for wild species of not only wild salmon but all other wild species using these spawning, larval and rearing areas.
- Ecosystems are not considered in any studies.
- Competition between species is not considered
- predator fields drawn in by hatcheries creating predator pits adversely affecting wild fish is not considered
- density dependency all is being ignored and rarely mentioned as if not a factor in Hatchery wild interaction
- Loss of weight up to a pound in the valuable wild sockeye fishery when high returns of hatchery pinks costs Alaskan fisherman millions of dollars intercepted by hatchery pinks, not considered.
- Competition of out-migrating fry eating 4-10% of their body weight per day competing with wild rearing fish in estuarine near shore waters is not considered.

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[10] North American Journal of Fisheries Management33:777–782, 20 Homing of Sockeye Salmon within Hidden Lake, Alaska ,Can Be Used to Achieve Hatchery Management Goals

- Competition of returning adults eating 2-7% of their body weight per day competing with wild fish is not considered.
- Pink salmon growth of 500% in the last 4 months of their lives before spawning is not considered.
- On years of high hatchery pink abundance birds starvation is not considered (2015)
- 3 year ocean GOA sockeye did not materialize from smolt entry into marine waters and the massive predator field of 2015 pink salmon and higher metabolism of the blob
- How much food did the 140,000,000 2015 PWS hatchery pinks eat (434,000,000 pounds of predator biomass at 2% body weight per day) in the last month of their lives in nearshore waters? 10,000,000 pounds of food per day?
- Prey switching seen in food web studies between pink salmon and other salmon species not considered

Habitat

- Seining in Special Harvest Areas push boats up into nearshore areas scraping bottoms removing aquatic vegetation and crustaceans in sensitive shallow nursery habitats. Dungeness have been documented scraped up in Kachemak Bay (China Poot)
- Precautionary Principle is not being considered. Business as usual continues with factory production as the many concerning indicators compounded by warm water (blob), acidification, and starvation issues documented in birds, fish and marine mammals.

No centralized location for hatchery issues

- Information pertaining to hatcheries is not in one place so comprehensive understanding even within the ADFG is difficult
- Annual Enhancement Reports do not document comprehensive information only production
- Most of the SHA's, THA's and remote release sites are embedded within the Hatchery Annual Management Plans (AMP) so the right hand does not know what the right hand is doing
- All historical straying results from independent studies is not in a centralized location to begin to create the picture needed to see the contamination already caused to wild streams
  Regional Planning teams
- Regional Planning Teams have become commandeered by members with a bias toward economic hatchery production goals losing the professional bias for the Wild fish priority of the state of Alaska.
- Regional Planning teams require assessment
- Comprehensive Salmon Plans are losing the objectivity of all-encompassing comprehension for wild fish production.
- Hatchery permits that have become self-serving taking the majority of the cost recovery fish for decades are not suspended nor revoked by RPT's
- Some Comprehensive Salmon Plans have actually removed the statutory term "Comprehensive" and arbitrarily replaced it with Salmon "Enhancement" Plans
- The definition of significant stocks has used arbitrary definitions based only on size of run contrary to the genetics policy

Hatchery Act of 1974 non compliance

- Hatcheries are being inserted as the dominant approach going far beyond as a "contribution for the rehabilitation of depressed fisheries" as the original intent of the PNP Hatchery Act stated. Competitive intrusion into regional fisheries is based on maximum production without consideration of wild fish, food webs, habitats or the complexities of the ecosystem.
- The Hatchery law stating "operations shall have no adverse affects on wild fish of the state." is not upheld.
- "With reasonable segregation from naturally occurring stocks", is far out of compliance with the intense "unreasonable" straying documented in recent years
- Habitat barriers like culverts, better management, invasive species, water diversion, aquatic vegetation and substrate structure are a token part used to provide wild production diverted by the Band-Aid of cost prohibitive hatcheries.

Wanton Waste

- 40% of hatchery production goes to roe stripping without consideration for the ecosystem impacts to create this commodity.
- The intense straying then dying unspawned or harvested up into the river systems is suffocating streams of wild production.
- Massive wastage of harvestable surplus not spawned not harvested with no processor capacity

Quality wild salmon

- Wild sockeye harvest is delayed on big hatchery pink salmon years from processor capacity
- Tenders tending hatchery pinks can delay quality processing of high valued sockeye bumped for hatchery pinks
- Hatcheries have become the 21st century fish traps

Precautionary Principle not in compliance
Wild Fish Priority not in compliance

Ms. Hillstrand also provided the assessment team with the following documents for consideration:

Otis, T., and G. Hollowell. 2017. Lower Cook Inlet Pink Salmon Otolith Sampling Summary, 2017. ADFG Memorandum to B. Templin, J. Erickson, and C. Habicht.

Otis, T., and G. Hollowell. 2019. Pink Salmon Hatchery Proportions in Selected Lower Cook Inlet Commercial Fisheries, 2015–2018. Thermally Marked Pink Salmon in Selected Lower Cook Inlet streams, 2014–2018. http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2018-2019/hc/or3.pdf.

Evenson, D., C. Habicht, M. Stopha, A. Munro, T. Meyers, and W. D. Templin. 2018. Salmon Hatcheries in Alaska – A Review of the Implementation of Plans, Permits, and Policies Designed to Provide Protection for Wild Stocks. ADFG special publication 18-12.

ADFG. 2018. RC 2 ALASKA DEPARTMENT OF FISH AND GAME STAFF COMMENTS ON AGENDA CHANGE REQUESTS ALASKA BOARD OF FISHERIES MEETING ANCHORAGE, ALASKA October 15-16, 2018.

Hillstrand, N. 2018. Emergency petition to the Alaska Board of Fisheries.

KRSA et al. 2018. Petition for finding of emergency and scheduling hearing on the adverse biological impacts that will result from recent amendments to Prince William Sound Private Non-Profit Hatchery Management Plans that add an increment of 20 million pink salmon egg take to existing permitted capacity. Alaska Board of Fisheries. https://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2018-2019/july_petitions/petition_KRSA.pdf.

Lewis, B., J. Botz, S. Moffitt, G. Hollowell, D. Gray, J. Regnart, S. Palmer, C. Farrington, and B. White. 2009. Alaska Department of Fish and Game Internal Review of Prince William Sound Aquaculture Corporation. ADFG Special Publication 09-10.

Summary of Actions Alaska Board of Fisheries Work Session to Review Committees July 28, 1999.

Alaska Board of Fisheries and Alaska Department of Fish and Game. Joint Protocol on Salmon Enhancement #2002-FB-215.

Couture, M. 2016. Leveraging legitimacy: How Alaska circumvented salmon sustainability by creating their own ecolabel. Master's thesis. WWU Graduate School Collection. https://cedar.wwu.edu/wwuet/500

Stray hatchery fish returning to Crawfish Inlet near Sitka: https://www.youtube.com/watch?v=hvxIyoHq2IE&feature=share

PWS pinks find their wayt into Cook Inlet commercial harvest: https://www.kbbi.org/post/pws-pinks-find-their-way-cook-inlet-commercial-harvest

ADF&G study begins to answer whether hatchery salmon produce fewer offspring: https://www.kbbi.org/post/adfg-study-begins-answer-whether-hatchery-salmon-produce-fewer-offspring

Scientists question whether Fish and Game's massive hatchery salmon study is biased. https://www.kbbi.org/post/scientists-question-whether-fish-and-game-s-massive-hatchery-salmon-study-biased

International Voyage Aims to Unravel Mysteries of Pacific Salmon Survival: https://www.fisheries.noaa.gov/feature-story/international-voyage-aims-unravel-mysteries-pacific-salmon-survival

Assessment Team Response: Risks of hatchery enhancement were addressed with respect to impacts on wild stocks under performance indicators 1.3.1, 1.3.2 and 1.3.3, and with respect to ecosystem effects under performance indicators 2.5.1, 2.5.2, and 2.5.3. Under Principle 1, historically high levels of abundance and productivity of Pink, Chum and Sockeye salmon in Alaska units of certification including areas of significant enhancement led the assessment to conclude that it was likely that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks. Evidence on hatchery risks was such that the assessment was unable to conclude a high likelihood that enhancement activities do not have significant negative impacts on the local adapation, reproductive performance of wild stocks for Southeast Alaska, Prince William Sound, Lower Cook Inlet and Kodiak where significant hatchery programs occur. As a result, none of these areas achieved an 80 score for these indicators and conditions were identified for each requiring that a high likelihood of no significant impact be demonstrated. Under Principle 2, a comprehensive review of the available information led the assessment team to conclude that while there was likely some effect of hatchery enhancement on elements of ecosystem structure and function, effects did not rise to the level of serious or irreversible harm. Consequently, areas with significant hatchery programs were determined to reach the 80 scoring standard but not the 100 scoring standard which was based on an evidentiary standard.

The assessment considered emerging information on levels of hatchery straying in Lower Cook Inlet streams and also examined additional information on hatchery returns and straying in LCI presented by ADFG at the 2019 Board of Fisheries meeting. Based on this new information, scoring of Lower Cook Inlet was downgraded under Principle 1 Performance Indicators regarding enhancement and corresponding conditions were added to the certification.

Other specific concerns raised are in common with those received from the Kechemek Bay conservation society and as such have been explicitly addressed above.

Greg Young

MRAG Americas received the following comments from Mr. Greg Young of Spearfish, South Dakota. The exact content of his submission has been edited slightly for formatting consistency. The team's responses are given below the submission and organized by theme.

General comments On the Certification Process

1. Certifying region with mixed stocks and mixed gear types does not fulfill the mission of a certification process intended to help end consumers select sustainably managed products. This allows acutely or chronically over exploited stocks to face continued market pressure further complicating recovery measures under the umbrella of "Sustainably Managed" Consumers are becoming actively aware and willing to vote with their virtual money to try to participate in sustainable management.

   If historic data from per juried research and internal Fish and Game reports are acually considered in the process, there is no way that any targeted fishery for chinook, or any by catch mixed stock fishery can be scored above 80 across all categories .

Examples:

a. Chinook stocks throughout Alaska continue to exhibit a decline in size at age, maturity at younger age, reduced fecundity, and loss of older age classes. Reduced size at age is a phenomena linked to growth related feeding aggression. Fish that feed more agressively are more likely to get caught in hook and line fisheries resulting in genetic shift in the breeding population to the smaller slower growing fish.Smaller females have fewer eggs so egg production is reduced. The larger older females also face additional years of fish harvest. This creates a two parameeter reduction in yield for weight and egg production.

b. Small sockeye stocks in SEAK Auke Lake , Turner Lake, Sweet Heart Creek? Are not even listed as being managed under index stock management. Some of these small stocks may already be with the passenger pigeons.

Supportive documentation:

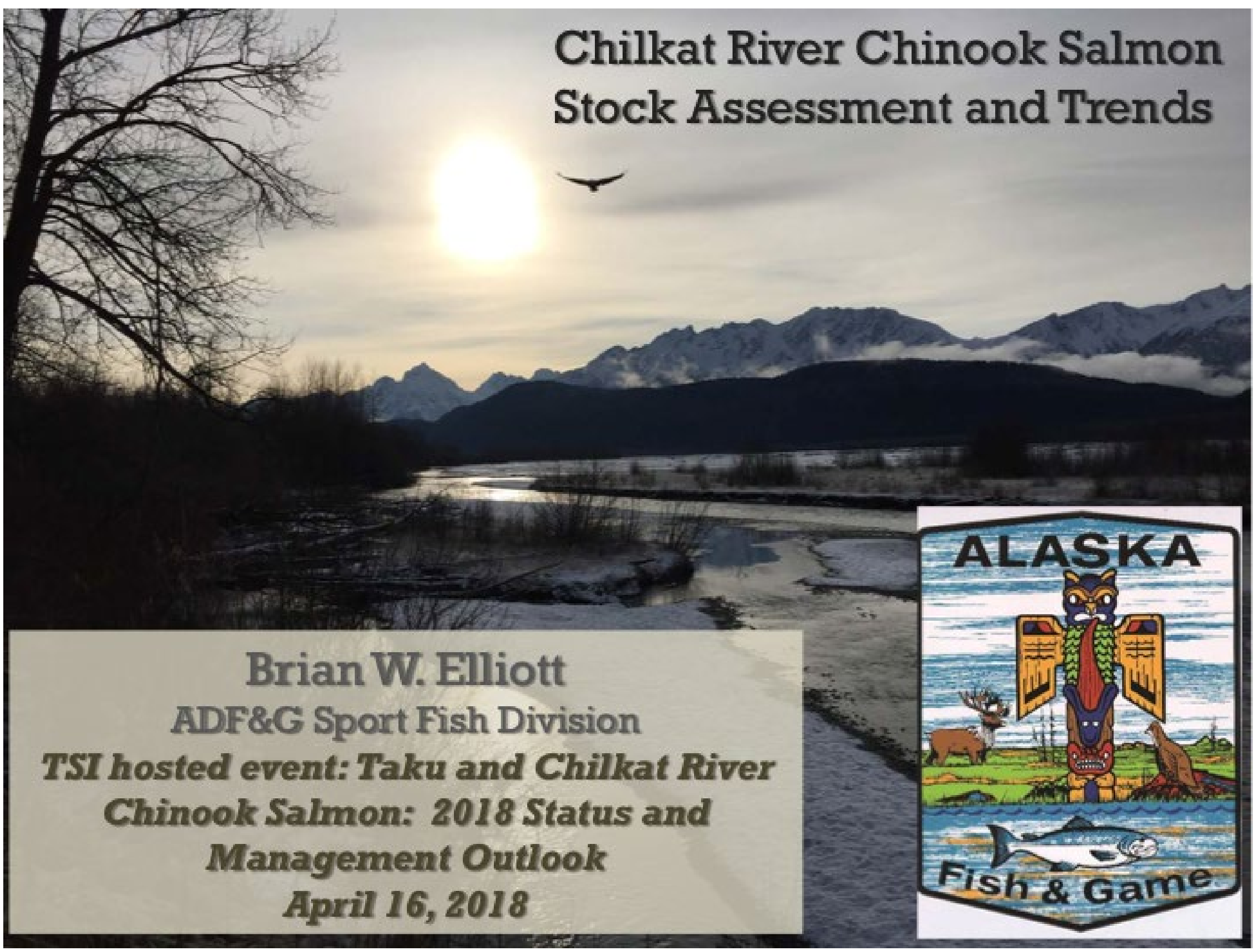
Changes in Size and Age of Chinook Salmon Oncorhynchus tshawytscha Returning to Alaska
Bert Lewis , W. Stewart Grant, Richard E. Brenner, Toshihide Hamazaki Published: June 19, 2015
https://doi.org/10.1371/journal.pone.0130184

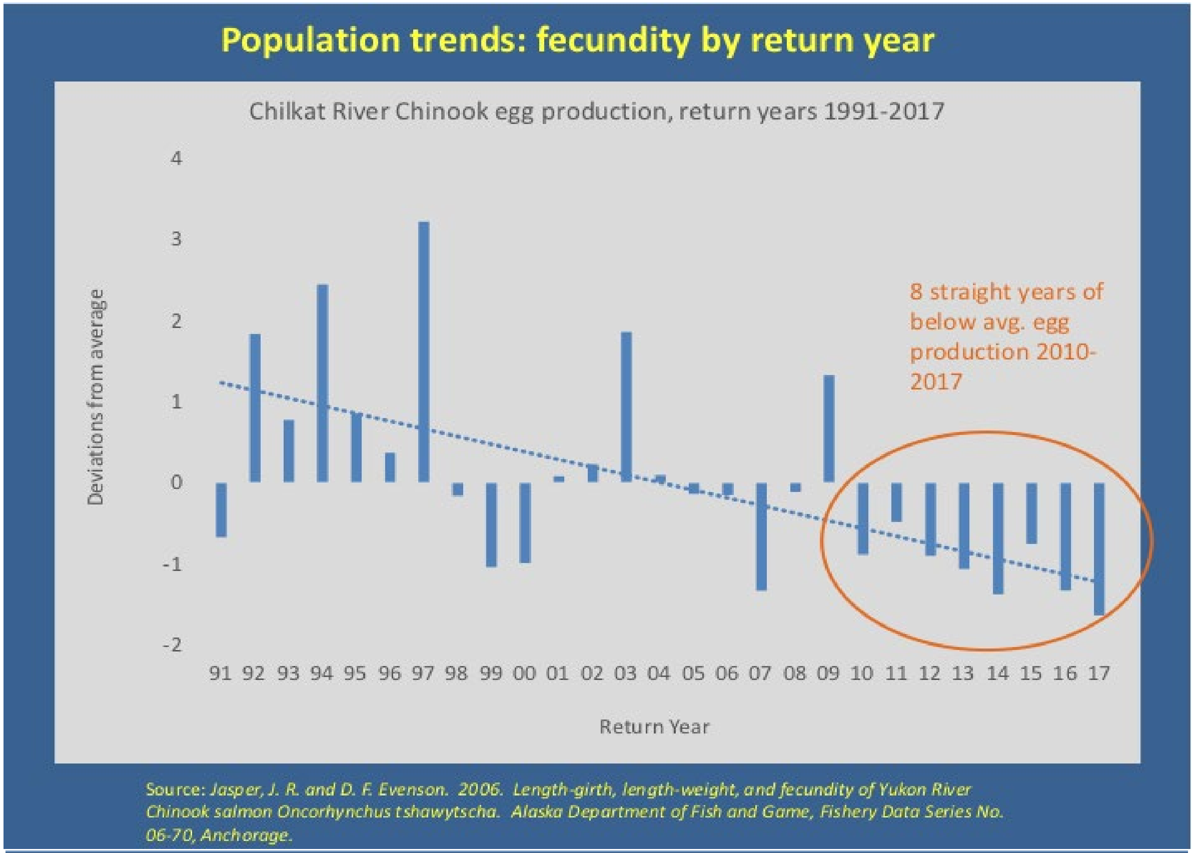
Abstract
The average sizes of Pacific salmon have declined in some areas in the Northeast Pacific over the past few decades, but the extent and geographic distribution of these declines in Alaska is uncertain. Here, we used regression analyses to quantify decadal trends in length and age at maturity in ten datasets from commercial harvests, weirs, and spawner abundance surveys of Chinook salmon *Oncorhynchus tshawytscha* throughout Alaska. We found that on average these fish have become smaller over the past 30 years (~6 generations), because of a decline in the predominant age at maturity and because of a decrease in age-specific length. The proportion of older and larger 4-ocean age fish in the population declined significantly ($P < 0.05$) in all stocks examined by return year or brood year. Our analyses also indicated that the age-specific lengths of 4-ocean fish (9 of 10 stocks) and of 3-ocean fish (5 of 10 stocks) have declined significantly ($P < 0.05$). Size-selective harvest may be driving earlier maturation and declines in size, but the evidence is not conclusive, and additional factors, such as ocean conditions or competitive interactions with other species of salmon, may also be responsible. Regardless of the cause,

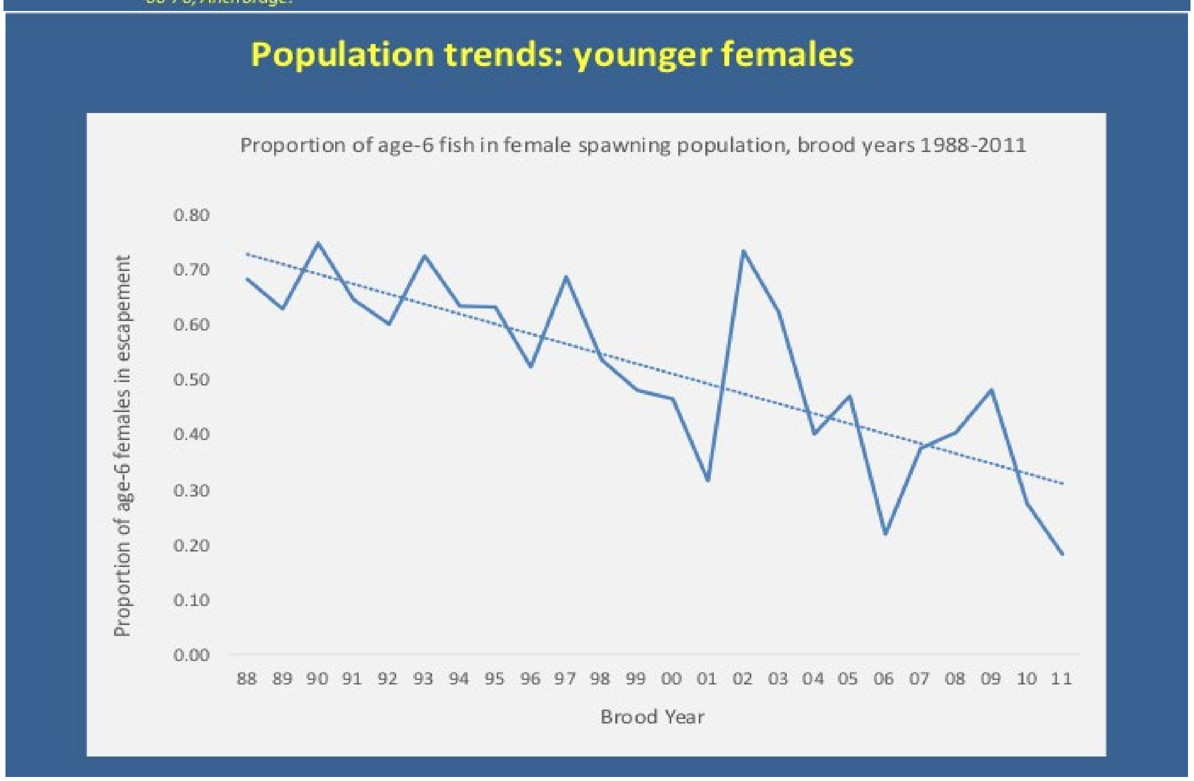
these wide-spread phenotypic shifts influence fecundity and population abundance, and ultimately may put populations and associated fisheries at risk of decline.

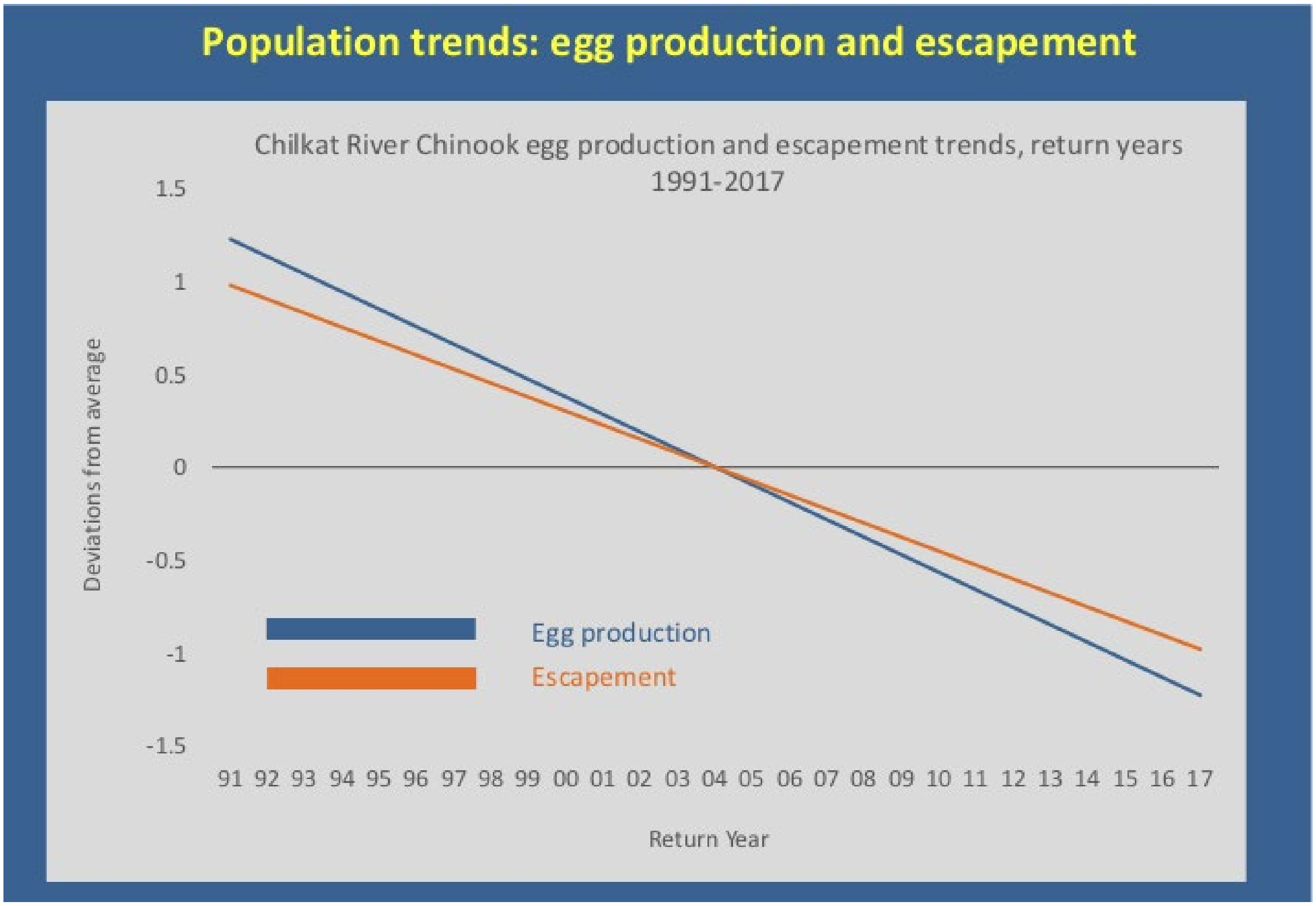
How fast is fisheries-induced evolution? Quantitative analysis of modelling and empirical studies
Asta Audzijonyte Anna Kuparinen Elizabeth A. Fulton
First published: 24 January 2013 **https://doi.org/10.1111/eva.12044** Cited by: 36

Abstract
A number of theoretical models, experimental studies and time-series studies of wild fish have explored the presence and magnitude of fisheries-induced evolution (FIE). While most studies agree that FIE is likely to be happening in many fished stocks, there are disagreements about its rates and implications for stock viability. To address these disagreements in a quantitative manner, we conducted a meta-analysis of FIE rates reported in theoretical and empirical studies. We discovered that rates of phenotypic change observed in wild fish are about four times higher than the evolutionary rates reported in modeling studies, but correlation between the rate of change and instantaneous fishing mortality (*F*) was very similar in the two types of studies. Mixed-model analyses showed that in the modeling studies traits associated with reproductive investment and growth evolved slower than rates related to maturation. In empirical observations age-at-maturation was changing faster than other life-history traits. We also found that, despite different assumption and modeling approaches, rates of evolution for a given *F* value reported in 10 of 13 modeling studies were not significantly different.




Population trends: fecundity by return year
Chilkat River Chinook egg production, return years 1991-2017
Deviations from average
4
3
2
1
0
-1
-2
8 straight years of below avg. egg production 2010-2017
91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17
Return Year
Source: Jasper, J. R. and D. F. Evenson. 2006. Length-girth, length-weight, and fecundity of Yukon River Chinook salmon Oncorhynchus tshawytscha. Alaska Department of Fish and Game, Fishery Data Series No. 06-70, Anchorage.


Population trends: younger females
Proportion of age-6 fish in female spawning population, brood years 1988-2011
Proportion of age-6 females in escapement
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11
Brood Year



Assessment Team Response:

Units of assessment were defined by region and within each unit, every species was considered relative to performance indicators and scoring guidelines. Status of every stock was considered relative to reference points generally defined by spawning escapement goals (or exploitation rate limits in the case non-Alaska stocks intercepted by Southeast Alaska fisheries). Scores and conclusions were based on achievement of established reference points for each stock.

Widespread declines in Chinook returns have occurred in recent years throughout Southeast and SouthCentral Alaska as a result of unfavorable environmental conditions. Periodic low escapements are characteristic of salmon even in the absence of significant fisheries. Long-term assessment data has demonstrated that these stocks recover readily from periodic low escapements and do not suffer long-term impairments of productivity. In response to these declines, widespread fishery closures or restrictions have been implemented so that fisheries do not impair the potential for stocks to rebound. A long-term declining trend in average size and age of return has also been documented for Chinook stocks throughout Alaska and the eastern Pacific. This pattern also appears related to environmental conditions as it has been documented for stocks subject to widely varying levels of fishery harvest.

Southeast Alaska Sockeye stocks have generally rebounded from 2008-2009 when many did not meet their escapement goals. Weak returns were related to marine survival conditions rather than to any management actions (Munro & Volk 2012). More recently, SEAK Sockeye are consistently meeting or exceeding established goals based on index stocks. Small populations of sockeye occur in a variety of systems throughout Southeast Alaska and it is assumed that status of index stocks are representative of the stock management unit as a whole.

2. Scoring criteria can be objectively rated yet still due to the mathematics of the weighting and averaging process significantly bias the certification outcome.

Example;
The general 3.x.x Scoring citeria. Relates to the following directly from the MSC standard:

The management system exists within an appropriate legal and/or customary framework which ensures that it:
• Is capable of delivering sustainability in the UoA; and
• Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and
• Incorporates an appropriate dispute resolution framework.

Again if you actually accept what is occurring and has occurred since statehood and later changes, It is not apparent than any stock can receive a 100 score in this caategory.

The original state constitution clearly identified the common property fishery as beling to the people with no exclusive rights or special priveleges. Then the special interst groups are able to get Limited Entry adopted into the constitution. They did this under the cover of retrieving the bulk of the resource from non-resident holders primarily canners and fish trappers. That part is consistent with the original language and intent of the constitution, but when later implementing it under adminstrative procedures they took it for their own personal use and excluded the average Alaskan.

Article VIII of the Alaska Constitution is dedicated to natural resources. Sections pertinent to the management of salmon include: “Section 1. It is the policy of the State to encourage the settlement of its land and the development of its resources by making them available for maximum benefit of its people. Section 2. The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of its people. Section 3. Wherever occurring in the natural state, fish, wildlife, and waters are reserved to the people for common use(original constitutional intent). Section 4. 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 uses. Section 15. No exclusive right or special privilege offishery shall be created or authorized in the natural waters of the State.” Section 15 of the Alaska constitution was included due to the special privileges granted to the salmon canning industry by the federal fishery management program prior to statehood, particularly the ownership and use of fish traps. Fish traps were quickly prohibited by regulation, but language in section 15 prevented the BOF and Game from implementing regulations to limit total fishing effort. In 1972, the Constitution was amended to facilitate a limited entry program for the Alaska commercial salmon fishery. Section 15 now reads: “No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State. This section does not restrict the power of the State to limit entry into any fishery for purposes (Whoops weasel clause)of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the State.

As long as limited entry is in place Alaska can't score 100 in any category that considers equitable access to resource by stakeholders.

The 3.x.x section also provides scoring for rules and procedures that demonstrate public access to the management process.The limited entry permit holders retain powerful control of this process in the rural and small town areas. Non permit holders near the population centers have been able to carve a piece out of the resource. i.e. personnel use sockeye beach netters in Cook inlet and scattered around in other areas, Sweetheart Creek Juneau. I apologize for weak supportive data on this item. There are other personal use areas I believe for crab, shrimp, etc. that have been established following long nights.

This section also provides high scoring for having written policies in place that discuss sustainable management, but there is no metric to see if they practice what they preach. What is available to the MRAG is research data and ADF&G reports that don't support this.
A demonstrated thirty year declining trend in Chinook stock characteristics seems hard to ignore.

Assessment Team Response:

Regarding the concerns about the scoring of the Principle 3 components of the fishery at the state level, this has been structured the way the MSC Standard requires. The first half of P3 looks at the overall governance system in place in which the fishery participates, and the second half looks at the management of the fishery itself. In this case "the fishery" is the Alaska salmon fishery. There is not an option to look at stock by stock management in P3. However, stock-level management is covered in Principle 1. In addition, P1 and P2 are where the management rules and regulations as described and evaluated in P3 should be evaluated in terms of operational practice. This is reflected in the "management" indicators within P1 and P2. The assessment is structured in this way to ensure that governance and management structure are evaluated in terms of containing the procedures and laws needed for sustainable fisheries in P3, and the functioning of these is covered in the other two Principles.

The assessment team understands the concerns raised relative to the allowance for limited-entry fisheries within the AK Constitution. However, it is not within the scope of our assessment according to the MSC standard to cover allocation issues as described by Mr. Young.

Now what?
Again taken directly from MRAG response verbage. ADF&G official policy indicates that a precautionary approach will be used to pursue sustainable mangement.
Shouldn't MRAG processses be consistent with that established requirement?

Here is a challenge.

Go back thru and rescore Alaska. See what you get. Do some Monte Carlo modeling to se how the 3.x.x criteria can influence final certification with no metrics to even measure compliance. Look what happens if you rescore any section that involves the demonstrated non sustainable management of the chinook stocks. I hope that generates some changes to the process before the next certification review.

One final apology for the disheveled cobbled response, there were too many acronyms for my dyslectic brain processes(not intended as a joke- a reality I live with) to absorb and too little time to do it. I will be better prepared next time and hopefully can get the response template link to work and actually follow the well thought out protocol to organize comments in a useful format and enforce at least primitive supporting documentation.

You have led our team thru a huge maze of information and done an outstandig job and presenting it in an organized format.(100 guide post scoring) I am looking forward to seeing this process get even better (individual stock based certs), the scoring to reflect more closely, the data and research that has been staring ADF&G in the face since statehood, sufficient funding to keep the enhancement evaluations funded. Qualification of the 3.x.x area to acknowledge that Limited Entry was a reactionary special interest driven policy (partly to bail out the government subsidized boat loan program) that disenfranchized Alaskans and probably disproportionately the native communities. Maybe just eliminate it.

Don't forget to be prepared for a significant shift in troll and some gillnet effort onto coho stocks. And a final homework assignement. Go back a couple of years and subtract the enhancement chums from the escapement goals of the chum systems in SAEK and see how many would not have met SEG's. Under the precautionary sustainable regulations.

Assessment Team Response: With regard to a potential shift in troll and gillnet effort onto coho stocks, this fishery will we subject to annual audits for progress on conditions and any new developments or information which may warrant reconsideration of fishery status or scores. Any future fishery impacts on coho will be assessed according to the same performance indicators identified under principle I that were used in this assessment of the fishery.

Kindest regards,

Greg

Marine Stewardship Council Technical Oversight

The MSC is the standard setter/scheme owner for the present recertification assessment. MRAG Americas received the following comments from Ms. Kate Dewar, MSC Fishery Assessment Manager. Assessment Team responses are given in the far-right column.

Grade	RequirementVersion	OversightDescription	Assessment Team Response
Guidance	FCR-7.10.6.2 v2.0	The rationales across P3 state 'SG 60 - see SG 100' and 'SG 80 - see SG 100'. From this text, it is not clear how each scoring guidepost and therefore, each scoring issue, is fully and unambiguously met.	This response format has been amended to be clear how each scoring issue is met to the degree required by the score awarded.
Minor	FCR - 7.10.7.3 v2.0	PI 2.3.1 SI (b) It is unclear from the rationale which scoring elements are being scored in this scoring issue. For example there are a number of species covered in the narrative of the report (pg 99) which have not been scored here (e.g. species covered by ESA designation such as northern right whales), and it is unclear why (e.g. for some of these species listed [e.g. Sea Otter, Albatross, Sei Whales, Northern Right Whale etc.]) the reference reports cited indicate that "fishing gear" is a source of continued threat.	The rationale has been updated to improve clarity relative to scoring elements.

Minor	FCR - 7.10.7.3 v2.0	PI 2.3.1 SI (c) It is unclear which scoring elements are being scored (e.g. the rationale refers to temporary avoidance of fishing areas by ETP species [birds and marine mammals] but it is unclear which gear/ETP combinations and relevant UoAs this relates to). Additionally it is unclear whether impact from ghost fishing has been considered (as per SA3.1.8).	Again, the rationale has been updated to improve clarity relative to scoring elements.
Major	FCR-7.10.6 v2.0	PI 2.3.2 SI (c) The rationale does not provide sufficient supporting detail on how the available data provides an 'objective basis for confidence that the measures/strategy will work' or how the team determined that SG80 was met. For example, the rationale does not include any information relating to bird scoring elements. Therefore it is not clear how the scoring issue is fully and unambiguously met.	The rationale has been updated to provie the detail required.
Minor	FCR-7.10.6 v2.0	PI 2.4.1. SI (a). SA 3.13.2 requires that commonly encountered habitat types are categorised by Substratum, Geomorphology and Biota (SGB). The rationale presented does not seem to conform to this requirement. Additionally, it is also unclear where these habitat types are located or how the team have considered "serious and irreversable harm" as per SA3.13.4.	The rationale has been updated to specify the habitats according to the SGB criteria.
Minor	FCR_7.12.2.1 v2.0	Table 33, Row 2 (p122) refers to the requirement of buying only from client group members. However, section 4.3 does not include the list (or a link to the list) of parties eligible to use the certificate.	Correct, this link is provided on the certificate itself.
Minor	FCR_7.12.1.6 v2.0	Section 4.4 refers to an MSC variation request and response pertaining to eligibility of IPI to enter into further chains of custody. There is no link to the request and response and one could not be found on the MSC website or scheme database.	This section has been updated to reflect the current status of the IPI variation and response, and will be updated again when a response is received.
Minor	FCR-7.10.6.2 v2.0	PI 3.1.2 SI (b) It is not clear in the rationale whether the management system demonstrates consideration of the information and specifically	This rationale has been revised to clarify the justification for SG100 accordingly

		explains how information is used or not used as required for a score of SG 100.	
Minor	FCR-7.10.6.2 v2.0	PI 3.2.1 SI (a) Whilst the rationale focuses on the consistency of the short and long term objectives in achieving the protection of wild salmon stocks, it is less clear from the rationale how the short and long term objectives are consistent with achieving outcomes expressed by MSC's Principe 2.	The rationale has been updated to include specific policy objectives pertinent to Principle 2. The score is unchanged as a result.
Minor	FCR-7.10.6.1 v2.0	PI 3.2.2 SI (d) It is not clear from the rationale that the information on fishery performance meets the criteria as specified in SA4.8.5, 4.8.6 and 4.8.7 and that this comprehensive information is 'available openly, publicly and regularly to all stakeholders' as required for a score of SG 100.	The rationale has been updated to clarify how the fishery meets the required criteria of SG100.
Guidance		A surveillance level has not been defined for this fishery.	A surveillance level has now been defined. Note this is not required in draft reports prior to the PCR.
Major	FCR-7.10.6.1 v2.0	PI 3.2.3 SI (a) Whilst the rationale indicates that a range of entities are involved in enforcement activities, it is not clear from the rationale exactly what those enforcement activities include and how they have 'demonstrated a consistent ability to enforce relevant management measures, strategies and / or rules' as required for SG 100.	The rationale has been updated to be more specific about enforcement activities.
Minor	FCR-7.10.6.2 v2.0	PI 3.2.3 SI (b) From the rationale provided, it is not clear that sanctions are being consistently applied as required for both SG 80 and SG 100.	The rationale has been updated to provide clarity
Major	FCR-7.10.6.2 v2.0	PI 3.2.3 SI (c) It is not clear from the rationale provided that hatchery operators comply with the management system under assessment particularly given the statement in the rationale for PI 3.2.1 SI (a) which states that 'specified straying limits are not being met'. It is also not clear from the rationale how the team has reached the conclusion that there is a 'high degree of	It is clear in this report that hatchery operators comply with the conditions of their permits, which include numbers and timing of releases. If the conditions of these permits change, for instance based on unacceptable stray rates, they would be expected to comply with these changes. There is no

		confidence that fishers comply with the management system'.	direct action required of hatchery operators in light of straying rates unless these are reflected in the conditions of their permits.
Major	FCR-7.10.6.2 v2.0	PI 3.2.2 SI (e) It is not clear from the rationale how the management system acts proactively to avoid legal disputes. While reference is made to section 3.6 of the report across P3, scoring tables should provide sufficient evidence based justification to support the scores awarded. Additionally, section 3.6 is not listed within the table of contents and section 3.5 relates to the 'Management System'.	The rationale has been updated to explicIty acknowledge the functioning of a transparent and inclusive management framework in proactively avoiding legal disputes.
Major	FCR-7.10.6.1 v2.0	PI 3.2.2 SI (b) It is not clear from the rationale how enhancement has been considered within the evaluation of the responsiveness of decision making processes, particularly considering the rationale provided in PI 3.2.1 where enhancement plans have been noted as not reflecting current information with straying limits not being adhered to.	The rationale has been updated to make explicit reference to hatchery permitting being contingent upon the adherence to hatchery management policies.
Guidance	FCR - 7.10.1 v2.0	General comment - information used to inform the assessment of enhancement components of the fishery dates back to 2012 and 2015, therefore it is not clear that ALL relevant information (including recent information) has been analysed to score these components of the fishery.	The report has been updated as a result of consideration of new information and stakeholder comment submitted during the public comment period. Much of this specifically pertains to enhancement. See other comments and responses in this section.
Guidance	FCR-7.15.4 v2.0	No stakeholder submissions have been included with this report.	No stakeholder submissions were received prior to the PCDR publication. THIS report (the FRD) clearly has all stakeholder submissions and team responses.

APPENDIX 5 SURVEILLANCE FREQUENCY

Table 4.1 : Surveillance level rationale

Year	Surveillance activity	Number of auditors	Rationale
1	.On-site audit	3	Default level of surveillance

Table 4.2: Timing of surveillance audit

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
1	November 2019	November 2019	Certificate anniversary
2	November 2020	November 2020	Certificate anniversary
3	November 2021	November 2021	Certificate anniversary
4	November 2022	November 2022	Certificate anniversary

Table 4.3: Fishery Surveillance Program

Surveillance Level	Year 1	Year 2	Year 3	Year 4
Level 5	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit & re-certification site visit

APPENDIX 6 OBJECTIONS PROCESS

(REQUIRED FOR THE PCR IN ASSESSMENTS WHERE AN OBJECTION WAS RAISED AND ACCEPTED BY AN INDEPENDENT ADJUDICATOR)

The report shall include all written decisions arising from an objection. *(Reference: FCR 7.19.1)*